

URDU TRANSLATION AND CROSS-CULTURAL VALIDATION OF THE WAY FINDING QUESTIONNAIRE FOR STROKE PATIENTS

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Abstract:

Background: Spatial navigation is integral to independence and quality of life; its impairment is a recognized but frequently underassessed sequela of stroke. The Way Finding Questionnaire (WFQ) is a validated 22-item self-report instrument that evaluates navigational ability across three domains Navigation and Orientation, Spatial Anxiety, and Distance Estimation and has demonstrated strong psychometric properties in Western populations. No Urdu-language version existed prior to this study, limiting its applicability within Pakistan's predominantly Urdu-speaking population.

Objective: To translate the original English WFQ into Urdu and to evaluate the validity and reliability of the resulting Urdu version (WFQ-U) in patients with stroke.

Methods: A cross-cultural validation study was conducted at Jinnah Hospital, Lahore, enrolling 70 stroke patients aged 18–65 years via convenience sampling. The translation followed the six-stage Beaton et al. framework, encompassing forward translation, synthesis, backward translation, expert committee review, pilot testing, and documentation submission. Reliability was assessed using Cronbach's alpha (internal consistency) and the intraclass correlation coefficient (ICC; test-retest reliability, one-week interval). Content validity was determined using the Content Validity Index (CVI). Concurrent validity was examined through Pearson correlation with the Floor Maze Test (FMT).

Results: The sample comprised 33 males (47.1%) and 37 females (52.9%), with a mean age of 46.91 ± 9.90 years. The mean total WFQ-U score was 75.29 ± 11.67 . Cronbach's alpha was 0.987 (Day 1) and 0.977 (Day 3), indicating excellent internal consistency. The ICC for test-retest reliability was 0.825 (95% CI: 0.780–0.865). The overall CVI was 0.825. Pearson correlation between the WFQ-U and the FMT was $r = 0.929$ ($p < 0.05$), demonstrating strong concurrent validity.

Conclusion: The WFQ-U is a valid and reliable patient-reported outcome measure for assessing navigational ability in Urdu-speaking stroke patients. Its adoption in Pakistani clinical and research settings is recommended.

Keywords: Stroke; Way Finding Questionnaire; Cross-Cultural Validation; Urdu; Spatial Navigation; Spatial Anxiety; Reliability; Validity.

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1. INTRODUCTION

Spatial navigation, the cognitive capacity to orient oneself, plan routes, and move purposefully through environments is a fundamental determinant of daily independence and quality of life (1). It is engaged in tasks as elementary as moving between rooms within a home and as complex as traversing an unfamiliar city, and its disruption measurably restricts an individual's ability to participate in social, occupational, and recreational activities without external assistance (2). Despite its centrality to functional autonomy, navigation remains one of the least systematically assessed cognitive domains in the clinical evaluation of neurological patients, including those who have sustained a stroke.

Stroke ranks among the leading causes of acquired neurological disability worldwide. In addition to its well-recognised motor, sensory, and language sequelae, stroke frequently disrupts higher-order cognitive functions subserved by distributed cortical and subcortical networks (3). Spatial navigation is among these functions, as it depends upon the coordinated activity of hippocampal, parietal, prefrontal, and parahippocampal circuits each vulnerable to ischaemic or haemorrhagic insult (4). Neuroimaging and neuropsychological studies have delineated at least three partially dissociable navigation subsystems: egocentric (body-centred) orientation, allocentric (landmark-based) route knowledge, and survey (map-based) spatial representation, each of which may be selectively impaired depending upon lesion location and extent (5). Yet despite this mechanistic complexity, clinicians frequently overlook navigation difficulty in post-stroke assessment, partly because standard cognitive screening tools do not capture it, and partly because patients themselves may attribute their difficulties to more general confusion rather than a specific navigational deficit (6).

Epidemiological evidence suggests that navigation impairment is more prevalent in stroke survivors than previously appreciated. De Rooij and colleagues (7) demonstrated in a cross-sectional study of 158 stroke patients that those with reduced WFQ scores were significantly more likely to be female, less educated, and to report greater cognitive and emotional burden alongside lower health-related quality of life. Cogné et al. (8) systematically assessed 77 stroke patients using a virtual environment paradigm and found that 33 individuals (42.9%) had clinically significant self-reported navigation complaints, of whom 27 showed objective performance deficits. Hamre et al. (9) followed 97 patients with mild stroke prospectively and reported that nearly one-quarter demonstrated spatial navigation impairment at 12 months, with executive dysfunction in the acute phase as an independent predictor. These findings collectively establish that navigation difficulty is a common, persistent, and functionally consequential consequence of stroke that warrants dedicated assessment.

The Way Finding Questionnaire (WFQ) was developed in 2016 as a psychometrically robust self-report instrument specifically designed to address the gap in navigation assessment (10). Existing tools such as the 15-item Sense of Direction scale and the Awareness and Spatial Cognitive Orientation Assessment either lack a spatial anxiety subscale a critical omission given that anxiety independently degrades navigational performance or fail to capture the full breadth of navigation-relevant constructs, including distance estimation (11). The WFQ comprises 22 items organised across three empirically validated subscales: Navigation and Orientation (11 items), Spatial Anxiety (8 items), and Distance Estimation (3 items). Each item is rated on a seven-point Likert scale, with higher scores on the Navigation and Orientation and Distance Estimation subscales indicating better ability, and higher scores on the Spatial Anxiety subscale reflecting greater anxiety. The instrument has demonstrated excellent internal consistency (Cronbach's $\alpha = 0.94-0.98$) and strong test-retest reliability across healthy and stroke-affected samples, and its three-factor structure has been confirmed by both exploratory and confirmatory factor analysis (10).

The clinical and research utility of any patient-reported outcome measure is contingent upon its linguistic and cultural accessibility to the intended population. Cross-cultural adaptation encompassing forward translation, synthesis, backward translation, expert review, pilot testing, and psychometric re-evaluation is the internationally mandated process for generating valid non-English versions of health measurement instruments (12). Versions of the WFQ have been adapted into Dutch, Hungarian, and Chinese, yet no Urdu translation existed prior to the present study. This is a substantive gap: Urdu is the national language of Pakistan, understood and spoken by approximately 98% of the population, and is the primary language of clinical communication in Pakistani healthcare settings. Without an Urdu WFQ, clinicians and researchers working with Pakistan's large and growing stroke population estimated at 350,000 incident cases annually lack a validated tool to screen for and quantify navigation impairment (13). This limitation is particularly consequential for patients with low literacy or limited English proficiency, for whom interview-based administration of a validated Urdu instrument represents the only feasible assessment modality.

Furthermore, navigation difficulties have implications that extend well beyond simple wayfinding. Because independent mobility underpins access to healthcare, social interaction, return to work, and community participation, undetected and unaddressed navigation impairment may silently erode functional recovery outcomes following stroke rehabilitation (14). Patients with mild or moderate stroke who are often discharged early under the assumption of good functional prognosis are particularly at risk, as their navigation deficits may remain invisible to clinicians relying

solely on standard motor and language assessments (15). A validated Urdu instrument would enable systematic identification of this impairment, inform discharge planning, and provide a reproducible outcome measure for intervention studies.

The present study was therefore undertaken to translate the WFQ into Urdu following the standardized six-stage cross-cultural adaptation framework of Beaton et al. (12), and to evaluate the psychometric properties of the resulting Urdu version (WFQ-U) specifically its internal consistency, test-retest reliability, content validity, and concurrent validity against the Floor Maze Test in a clinical sample of stroke patients recruited from Jinnah Hospital, Lahore, Pakistan. The primary hypothesis was that the WFQ-U would demonstrate acceptable to excellent reliability ($\alpha \geq 0.80$; ICC ≥ 0.80) and validity (CVI ≥ 0.70 ; Pearson $r \geq 0.70$ with the FMT) in this population.

The neuropsychological basis of spatial navigation impairment following acquired brain injury has been characterised progressively over the past two decades. Van der Kuil et al. (1) conducted a population-wide online study among patients with acquired brain injury and confirmed that navigation ability was significantly reduced relative to healthy controls, with deficits spanning landmark recognition, route continuation, and survey knowledge tasks. Goulter et al. (16) performed a meta-analytic review of distinct navigational domains in acquired brain injury and demonstrated that landmark identification and route maintenance were among the most sensitive indicators of brain injury across the included neuropsychological case studies and group comparison studies, reinforcing the multidimensional nature of navigation impairment and arguing against single-task assessment approaches.

The WFQ itself was developed and validated by Claessen et al. in a two-study programme (10). The first study administered the instrument to 356 healthy participants; exploratory factor analysis resulted in removal of four items and identification of the three-factor structure Navigation and Orientation, Spatial Anxiety, and Distance Estimation that underlies the final 22-item version. The second study used confirmatory factor analysis in a sample of 158 chronic mild stroke patients to validate this structure, demonstrating that the questionnaire maintained its psychometric integrity across both healthy and neurologically impaired populations. De Rooij et al. (7) subsequently established the clinical validity of the WFQ in a cross-sectional study of 158 stroke patients and 131 healthy controls, showing that stroke patients with navigation complaints differed significantly from those without on demographic, cognitive, emotional, and quality-of-life measures, and performed worse on objective virtual-reality navigation tasks.

Cross-cultural adaptation of the WFQ has been undertaken in several languages. Něma et al. (17) applied the WFQ to a

sample of patients with multiple sclerosis in a Czech-speaking cohort, comparing self-reported navigation ability against objective electronic navigation performance in a virtual environment; the study demonstrated that MS patients performed worse on both subjective and objective measures, and that self-reported cognitive ability significantly predicted navigation performance supporting the construct validity of the WFQ beyond stroke populations. Fryers et al. (18) examined navigation questionnaire methodology specifically in populations with intellectual disabilities, highlighting the importance of item comprehensibility and culturally appropriate wording in cross-cultural adaptation, considerations directly relevant to the development of the WFQ-U in the Pakistani context.

The Floor Maze Test (FMT), used in the present study as the concurrent validity criterion, is a two-dimensional walking maze task originally described by Sanders et al. and validated in community-dwelling older adults (19). It measures planning time, immediate maze time, and error frequency, and has been shown to correlate with executive function and objective spatial navigation performance across multiple studies. Almeida et al. (20) demonstrated that the FMT predicted cognitive decline in older adults living in nursing homes, with scores improving from baseline to 7.74 at three months, 8.60 at six months, and 8.43 at twelve months following targeted intervention. The concurrent validity between the English WFQ and the FMT has been established at $r = 0.67$ ($p < 0.001$) in prior research (21), providing a reference benchmark against which the present study's correlation could be assessed.

With respect to Urdu-language instrument adaptation more broadly, Boer et al. (22) reviewed cross-cultural equivalence methodologies and emphasized that semantic, idiomatic, experiential, and conceptual equivalence must each be explicitly evaluated during adaptation; failure to do so risks producing translations that are linguistically accurate but culturally non-equivalent in meaning. This framework underscores the importance of the expert committee stage in the Beaton protocol, which is designed to adjudicate precisely these forms of equivalence. No prior Urdu translation of the WFQ existed in the published literature, and this gap against a background of substantial stroke burden in Pakistan and a healthcare system in which Urdu is the dominant clinical language provides the direct rationale for the present study.

2. OBJECTIVES

1. To translate and culturally adapt the original English version of the Way Finding Questionnaire into Urdu.
2. To evaluate the content validity of the Urdu version of the Way Finding Questionnaire.

3. To assess the reliability (internal consistency and test-retest) of the translated Urdu version of the Way Finding Questionnaire in stroke patients.

3. MATERIAL AND METHODS

This study employed a cross-cultural validation design, the methodological standard for adapting patient-reported outcome measures across linguistic and cultural boundaries. Data were collected from the neurology and physiotherapy departments of Jinnah Hospital, Lahore, Pakistan, over a period of ten months following institutional ethics approval (Ref. No. REC/RCR & AHS/22/0207; date: March 04, 2022). The study was prospectively registered at ClinicalTrials.gov (identifier: NCT05375578). All procedures were conducted in strict accordance with the Declaration of Helsinki, and written informed consent was obtained from each participant in their preferred language (English or Urdu) prior to enrolment.

Participants were recruited by convenience sampling from among inpatients and outpatients presenting with a confirmed diagnosis of stroke. Inclusion criteria were: age 18–65 years; clinician-confirmed diagnosis of first or recurrent stroke occurring no more than six months prior to enrolment; ability to communicate in Urdu; and a Mini-Mental State Examination (MMSE) score of 25 or above, ensuring sufficient cognitive capacity for self-report completion (7, 9). Patients were excluded if they had severe global aphasia precluding questionnaire comprehension, severe mobility impairment or a history of orthopedic injury that would confound the Floor Maze Test, any additional neurological diagnosis (e.g., dementia, Alzheimer's disease, delirium), or documented cognitive decline antedating the stroke episode (10, 16). A total of 70 stroke patients met eligibility criteria and were enrolled. Sample size was consistent with precedent in WFQ validation studies and adequate for the planned psychometric analyses (9).

The translation procedure adhered to the six-stage framework of Beaton et al. (22). In Stage I (initial translation), two independent bilingual translators native Urdu speakers with proficiency in English produced separate forward translations (T1 and T2) of the original English WFQ, accompanied by written reports noting areas of linguistic uncertainty. In Stage II (synthesis), T1 and T2 were reconciled by the two translators working jointly with a neutral mediator to produce a single synthesized translation (T1-2), with a formal written record of all decision points. Stage III (backward translation) involved two additional translators, native English speakers without medical expertise and blind to the original English WFQ, independently producing backward translations (BT1 and BT2) of T1-2 to verify conceptual equivalence. In Stage IV (expert committee review), a panel comprising the four translators, three physiotherapists with more than five years of clinical experience, and a methodologist reviewed T1-2

and the backward translations for semantic, idiomatic, experiential, and conceptual equivalence, producing the pre-final version. In Stage V (pre-final testing), the pre-final WFQ-U was administered to 20 stroke patients as a comprehension pilot; each patient evaluated all 22 items using a binary understood/not-understood rating. Items rated as not understood by any participant were reviewed and revised by the expert committee. Following successful pilot testing, Stage VI (documentation submission) was completed with submission of all translation records to the original instrument developer.

The finalized WFQ-U was then administered to the 70-patient main sample. Each participant completed the instrument on two occasions separated by a one-week interval (Day 1 and Day 8), enabling assessment of test-retest reliability; participants were advised not to discuss their responses between sessions. The Floor Maze Test was administered on Day 1 following WFQ-U completion, in accordance with the original protocol described by Sanders et al. (21). In this test, participants navigate a 7×10 -foot wax-cloth maze on foot; outcomes comprise planning time (time from instruction completion to first step), immediate maze time (walk-through duration in seconds), and number of navigational errors (entries into dead ends). Demographic data including age, sex, marital status, occupation, stroke type (ischemic or hemorrhagic), and time since stroke were recorded at enrolment. Anthropometric variables weight, height, BMI, waist circumference, lean body mass, and body fat mass were measured by a trained physiotherapist using standardized equipment.

Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY). Internal consistency of the WFQ-U was quantified using Cronbach's coefficient alpha (α) separately for Day 1 and Day 3 administrations; values of ≥ 0.70 were considered acceptable, ≥ 0.80 good, and ≥ 0.90 excellent (22). Test-retest reliability was assessed using the two-way mixed intraclass correlation coefficient (ICC, model 2,1; absolute agreement); ICC ≥ 0.80 was considered the threshold for acceptable test-retest reliability. Content validity was established through the Content Validity Index (CVI), computed as the proportion of expert panel members rating each item as 'quite relevant' or 'highly relevant' on a four-point ordinal relevance scale (Waltz and Bussell criteria); a minimum item-level CVI of 0.70 was required for retention (22). Concurrent validity was evaluated by computing Pearson's product-moment correlation coefficient (r) between total WFQ-U score and total FMT performance time on Day 1; r values were interpreted as weak (0.00–0.19), moderate (0.20–0.39), strong (0.40–0.69), very strong (0.70–0.89), or near-perfect (0.90–1.00). Discriminant validity was examined by comparing WFQ-U scores between stroke patients and healthy controls using group means and standard deviations, stratified by sex. Descriptive statistics (mean $\pm$ SD for continuous variables; frequencies

and percentages for categorical variables) are reported throughout. A two-tailed p-value of < 0.05 was used as the threshold for statistical significance. No imputation was

applied for missing data; complete-case analysis was used, and missing data were reported.

4. RESULTS

Table 1. Demographic and Anthropometric Characteristics of the Study Sample (n = 70)

Variable	Measurement	Value
Age (years)	Mean $\pm$ SD	46.91 $\pm$ 9.90
Weight (kg)	Mean $\pm$ SD	71.83 $\pm$ 12.42
Height (cm)	Mean $\pm$ SD	163.17 $\pm$ 11.67
BMI (kg/m ²)	Mean $\pm$ SD	26.88 $\pm$ 5.06
Waist Circumference (cm)	Mean $\pm$ SD	33.08 $\pm$ 5.61
Lean Body Mass (kg)	Mean $\pm$ SD	65.58 $\pm$ 10.90
Body Fat Mass (kg)	Mean $\pm$ SD	6.21 $\pm$ 3.96
Sex: Male	n (%)	33 (47.1%)
Sex: Female	n (%)	37 (52.9%)
Marital Status: Married	n (%)	50 (71.4%)
Marital Status: Unmarried	n (%)	5 (7.1%)
Marital Status: Widow/Divorced	n (%)	15 (21.4%)
Stroke Type: Ischaemic	n (%)	47 (67.1%)
Stroke Type: Haemorrhagic	n (%)	23 (32.9%)

SD = standard deviation; BMI = body mass index. Age distribution showed approximate normality (histogram with overlaid normal curve; mean = 46.91, SD = 9.90).

The sample of 70 stroke patients was nearly equally distributed by sex, comprising 33 males (47.1%) and 37 females (52.9%), with a mean age of 46.91 $\pm$ 9.90 years (range 23–64 years) and an approximately normal age distribution. Ischaemic stroke accounted for 67.1% of

diagnoses (n = 47) versus 32.9% haemorrhagic (n = 23). The majority of participants were married (71.4%), and mean anthropometric values reflected a mildly overweight cohort (mean BMI 26.88 $\pm$ 5.06 kg/m²).

Table 2. Results of the Pilot Comprehension Test (n = 20 Patients, 22 Items)

Items Tested	Fully Comprehended n (%)	Item Not Understood	Patients
22	18 / 20 (90.0%)	None	18 patients
21	1 / 20 (5.0%)	Item 14	Patient 7
21	1 / 20 (5.0%)	Item 6	Patient 14

Comprehension evaluated using a binary understood / not understood scale for each of 22 items. Items 6 and 14 were subsequently reviewed and refined by the expert committee prior to finalisation of the WFQ-U.

In the pilot comprehension test, 18 of 20 participants (90.0%) understood all 22 items without difficulty. Two participants (10.0%) reported one item each as incomprehensible: Patient 7 did not understand Item 14, and

Patient 14 did not understand Item 6. Both items were reviewed by the expert committee, and wording adjustments ensuring idiomatic clarity in Urdu were incorporated before the instrument was finalised.

Table 3. Content Validity Index per Item of the WFQ-U (Expert Panel, n = 5)

Item	Relevance CVI	Clarity CVI	Simplicity CVI	Ambiguity CVI	Overall CVI
Q1	0.791	0.840	0.840	0.791	0.821
Q2	0.797	0.840	0.846	0.797	0.827
Q3	0.794	0.840	0.843	0.794	0.824
Q4	0.792	0.840	0.841	0.792	0.822
Q5	0.792	0.840	0.841	0.792	0.822
Q6	0.793	0.840	0.842	0.793	0.823
Q7	0.795	0.840	0.843	0.795	0.822
Q8	0.793	0.840	0.844	0.793	0.825
Q9	0.793	0.840	0.842	0.793	0.823
Q10	0.791	0.840	0.840	0.791	0.821
Q11	0.792	0.840	0.841	0.792	0.822
Q12	0.794	0.840	0.843	0.794	0.824
Q13	0.792	0.840	0.842	0.792	0.822
Q14	0.791	0.840	0.841	0.791	0.821
Q15	0.794	0.840	0.843	0.794	0.821
Q16	0.795	0.840	0.843	0.795	0.824
Q17	0.795	0.840	0.844	0.795	0.825
Q18	0.794	0.840	0.843	0.794	0.824
Q19	0.795	0.840	0.844	0.795	0.825
Q20	0.795	0.840	0.844	0.795	0.825
Q21	0.793	0.840	0.842	0.793	0.823
Q22	0.794	0.840	0.842	0.794	0.824
Scale-Level CVI					0.825

CVI = Content Validity Index, computed as the proportion of experts ($n = 5$) rating relevance, clarity, simplicity, or ambiguity as 3 (quite relevant) or 4 (highly relevant) on a four-point ordinal scale (Waltz & Bussell method). Minimum acceptable item-level CVI = 0.70. All items exceeded threshold.

All 22 items of the WFQ-U exceeded the minimum acceptable CVI of 0.70. Item-level overall CVI values ranged from 0.821 to 0.827, with a scale-level CVI of 0.825. Clarity scores were uniformly 0.840 across all items, reflecting strong expert consensus on linguistic clarity.

Items Q2, Q8, Q17, Q18, Q19, and Q20 received the highest overall CVI (0.825–0.827), indicating particularly strong expert consensus regarding their relevance and comprehensibility in the Urdu cultural context.

Table 4. Descriptive Statistics for WFQ-U Item Scores: Day 1 and Day 8 Administrations (n = 70)

Item	Description (abbreviated)	Min–Max	Day 1 Mean ± SD	Day 8 Mean ± SD	Subscale
Q1	Point to main entrance of unfamiliar building	1–7	3.39 ± 1.69	3.27 ± 1.74	N&O
Q2	Identify previously seen landmark direction	1–7	2.99 ± 1.57	3.07 ± 1.64	N&O
Q3	Read map in unknown city	1–7	3.04 ± 1.62	3.19 ± 1.70	N&O
Q4	Estimate route distance without map	1–7	3.31 ± 1.66	3.41 ± 1.74	DE
Q5	Estimate walking time from map	1–7	3.06 ± 1.67	3.23 ± 1.78	DE
Q6	Orient quickly in unknown environment	1–7	3.19 ± 1.76	3.31 ± 1.85	N&O
Q7	Always seek to know current location	1–7	3.83 ± 2.02	3.79 ± 2.05	N&O
Q8	Fear of losing way	1–7	4.26 ± 1.95	4.27 ± 1.95	SA
Q9	Fear of getting lost in unknown city	1–7	3.99 ± 2.08	3.99 ± 2.08	SA
Q10	Prefer group walking in unknown city	1–7	3.84 ± 2.16	3.84 ± 2.16	SA
Q11	Get nervous when lost	1–7	3.66 ± 2.01	3.66 ± 2.01	SA
Q12	Decide direction exiting transit station	1–7	3.56 ± 1.81	3.56 ± 1.81	N&O
Q13	Discomfort finding way in unknown building	1–7	3.04 ± 1.71	3.04 ± 1.71	SA
Q14	Discomfort finding way in unknown city	1–7	3.23 ± 1.75	3.23 ± 1.75	SA
Q15	Fear of going to unfamiliar destination	1–7	3.19 ± 1.76	3.19 ± 1.76	SA
Q16	Recall new route after one walk	1–7	3.01 ± 1.63	3.01 ± 1.63	N&O
Q17	Good at estimating distances	1–7	3.04 ± 1.69	3.04 ± 1.69	DE
Q18	Good at following route descriptions	1–7	3.27 ± 1.74	3.27 ± 1.74	N&O
Q19	Good at giving route descriptions	1–7	3.54 ± 1.95	3.54 ± 1.95	N&O
Q20	No need to re-orient after leaving store	1–7	3.87 ± 2.02	3.87 ± 2.02	N&O
Q21	Enjoy taking shortcuts	1–7	3.56 ± 1.97	3.54 ± 1.95	N&O
Q22	Find shortest route to known destination	1–7	3.43 ± 2.05	3.43 ± 2.05	N&O
Total	WFQ-U Total Score	46–99	75.29 ± 11.67	75.76 ± 12.37	—

N&O = Navigation and Orientation subscale; SA = Spatial Anxiety subscale; DE = Distance Estimation subscale. All items rated on a 7-point Likert scale (1 = completely disagree, 7 = completely agree). Higher N&O and DE scores indicate better navigation ability; higher SA scores indicate greater spatial anxiety.

Item-level scores ranged from a minimum mean of 2.99 ± 1.57 (Q2, landmark identification) to a maximum of 4.26 ± 1.95 (Q8, fear of losing way), with a total mean WFQ-U score of 75.29 ± 11.67 on Day 1 and 75.76 ± 12.37 on Day 8. The Spatial Anxiety items (Q8–15) tended to yield higher mean scores than Navigation and Orientation or Distance

Estimation items, reflecting a pattern in which anxiety about navigation was more prominently endorsed than perceived competence deficits. All items demonstrated the full range of possible scores (1–7), indicating absence of floor or ceiling effects at the item level.

Table 5. Internal Consistency of the WFQ-U: Cronbach's Alpha (Day 1 and Day 8)

Scale / Administration	n Items	Cronbach's α
WFQ-U — Day 1 (Test)	22	0.987
WFQ-U — Day 8 (Retest)	22	0.977

$\alpha \geq 0.90$ = excellent internal consistency. WFQ-U = Way Finding Questionnaire, Urdu version.

Internal consistency of the WFQ-U was excellent on both administrations, with Cronbach's $\alpha = 0.987$ on Day 1 and $\alpha = 0.977$ on Day 8. These values substantially exceeded the pre-specified acceptability threshold of 0.80 and are consistent with the α values of 0.94–0.98 reported for the original English WFQ in its validation studies, confirming that the 22-item Urdu version retains the strong inter-item homogeneity of the source instrument.

Table 6. Test-Retest Reliability: Intraclass Correlation Coefficient (ICC) per Item and Total Score

Item	Scale Mean if Item Deleted	Cronbach's α if Deleted	ICC Lower 95% CI	ICC Upper 95% CI
Q1	71.900	0.989	0.985	0.991
Q2	72.300	0.904	0.902	0.906
Q3	72.242	0.961	0.959	0.963
Q4	71.971	0.948	0.946	0.950
Q5	72.228	0.937	0.935	0.939
Q6	72.100	0.995	0.993	0.997
Q7	71.457	0.945	0.943	0.947
Q8	71.021	0.982	0.980	0.984
Q9	71.300	0.974	0.972	0.976
Q10	71.442	0.973	0.971	0.975
Q11	71.682	0.982	0.980	0.984
Q12	71.728	0.940	0.938	0.942
Q13	72.242	0.974	0.972	0.976
Q14	72.057	0.948	0.946	0.950
Q15	72.100	0.941	0.939	0.943
Q16	72.274	0.934	0.932	0.936
Q17	72.242	0.944	0.942	0.946
Q18	72.014	0.968	0.964	0.970
Q19	71.742	0.989	0.987	0.991
Q20	71.414	0.979	0.977	0.981
Q21	71.728	0.954	0.952	0.956
Q22	71.857	0.973	0.971	0.975
Total WFQ-U	—	0.977–0.987	0.780	0.865

ICC = intraclass correlation coefficient (two-way mixed, absolute agreement). Total WFQ-U ICC = 0.825 (95% CI: 0.780–0.865). ICC ≥ 0.80 indicates acceptable test-retest reliability. Cronbach's α if item deleted reflects the internal consistency of the remaining 21 items when the listed item is removed.

Test-retest reliability of the WFQ-U total score was 0.825 (95% CI: 0.780–0.865), meeting the pre-specified threshold of $ICC \geq 0.80$. At the item level, ICC 95% confidence intervals were uniformly narrow and all lower bounds exceeded 0.90, indicating that individual items demonstrated very strong temporal stability across the one-week test-retest interval. Item Q6 (orientation in unknown environment) exhibited the highest item-level α -if-deleted value (0.995), suggesting its particular contribution to scale homogeneity, while Q2 (landmark identification) had the lowest (0.904), indicating marginally less redundancy with the remaining items.

Table 7. Concurrent Validity: Pearson Correlation Between WFQ-U and Floor Maze Test (n = 70)

Instrument Pair	n	r	p-value
WFQ-U Total — Floor Maze Test	70	0.929	< 0.05

r = Pearson product-moment correlation coefficient. WFQ-U = Way Finding Questionnaire Urdu version; Floor Maze Test = objective spatial navigation performance measure. $r \geq 0.90$ = near-perfect correlation. A positive *r* indicates that higher WFQ-U scores (better self-reported navigation) correspond to better FMT performance.

Concurrent validity between the WFQ-U total score and the Floor Maze Test was near-perfect ($r = 0.929$, $p < 0.05$), substantially exceeding the pre-specified threshold of $r \geq 0.70$ and surpassing the $r = 0.67$ reported for the original English WFQ with the FMT. This strong convergence between self-reported and objective navigation performance provides robust evidence that the WFQ-U measures the intended construct in Pakistani stroke patients.

Table 8. Discriminant Validity: WFQ-U Total Scores in Stroke Patients versus Healthy Controls, by Sex

Group	Sex	n	Mean WFQ-U	SD
Stroke Patients	Male	4	68.50	10.15
Stroke Patients	Female	6	75.00	9.72
Healthy Controls	Male	4	90.75	29.94
Healthy Controls	Female	6	109.83	7.94

WFQ-U scores range from 22 to 154; higher scores indicate better navigation ability and/or greater spatial anxiety depending on subscale. Discriminant validity sub-sample only ($n = 10$ stroke, $n = 10$ controls). Note: formal inferential testing of group differences was not conducted in this sub-sample due to small *n*; differences are presented descriptively.

Descriptive comparison between stroke patients and healthy controls in the discriminant validity sub-sample

demonstrated that healthy controls consistently scored higher on the WFQ-U than stroke patients across both sexes: male controls scored 90.75 ± 29.94 versus 68.50 ± 10.15 for male stroke patients, and female controls scored 109.83 ± 7.94 versus 75.00 ± 9.72 for female stroke patients. The direction of these differences healthy controls consistently outperforming stroke patients — is consistent with the known pattern of navigation impairment following stroke and lends preliminary support to the discriminant validity of the WFQ-U. Formal inferential testing was precluded by the small sub-sample size and should be addressed in future work with adequately powered groups.

5. DISCUSSION

This study produced and psychometrically evaluated the first Urdu version of the Way Finding Questionnaire, an instrument specifically designed to capture the multidimensional character of self-reported navigation impairment, in a clinical sample of 70 stroke patients recruited from Jinnah Hospital, Lahore, Pakistan. The WFQ-U demonstrated excellent internal consistency, acceptable test-retest reliability, strong content validity, and near-perfect concurrent validity with an objective navigation measure, collectively establishing it as a psychometrically sound patient-reported outcome measure for Urdu-speaking stroke populations.

The Cronbach's alpha values of 0.987 on Day 1 and 0.977 on Day 8 indicate exceptional inter-item homogeneity that is consistent with, and in some cases exceeds, those reported for the original English WFQ ($\alpha = 0.94$ – 0.98) by Claessen et al. (10) and for the Spanish adaptation by Mendez-Lopez et al. (25), who reported $\alpha = 0.94$. This degree of internal consistency confirms that the 22 Urdu items function as a coherent, unidimensional composite within each of their respective subscales and that the Urdu translation preserved the conceptual integrity of the original instrument. It is worth noting that Cronbach's alpha values in excess of 0.95 may also reflect item redundancy, an issue that further factor-analytic work on the WFQ-U in larger Pakistani samples could usefully address.

Test-retest reliability ($ICC = 0.825$, 95% CI: 0.780–0.865) exceeded the threshold of 0.80 stipulated a priori and is consistent with the ICC of 0.94 reported in a healthy adult sample studied by van der Ham and Claessen (18), and the ICC values of 0.98 reported by Ulrich et al. (22) in a large cross-sectional study of sociodemographic and vestibular determinants of wayfinding. The modest attenuation of the present study's ICC relative to those earlier reports is attributable to the inherent variability introduced by studying patients in the post-acute phase of stroke, whose cognitive and emotional state may fluctuate over a one-week interval in ways not seen in healthy or stable chronic populations. The narrow confidence interval around the ICC nonetheless indicates that this estimate is precise and

reproducible. Item-level ICC confidence intervals were all narrow with lower bounds above 0.90, demonstrating that temporal stability is maintained at the individual item level as well as at the total score level.

The scale-level Content Validity Index of 0.825 exceeded the 0.70 threshold recommended by Waltz and Bussell and is comparable to the CVI values reported in Urdu adaptations of other rehabilitation instruments used in Pakistani stroke populations (24). All 22 items were rated above threshold by the expert panel, indicating that the translation achieved semantic, idiomatic, experiential, and conceptual equivalence with the original English items. The uniformity of clarity ratings (CVI = 0.840 for all items) suggests that the linguistic register of the WFQ-U is appropriately accessible for the target population. The two items flagged during pilot testing (Items 6 and 14) related to orientation and route-finding in urban contexts that carry specific cultural connotations in a Pakistani setting; their successful resolution through committee review illustrates the value of the experiential equivalence review stage in the Beaton framework (12).

The concurrent validity coefficient of $r = 0.929$ between the WFQ-U and the Floor Maze Test substantially exceeds the $r = 0.67$ reported for the English WFQ with the FMT (23). This higher correlation may reflect the more homogeneous and severely impaired clinical profile of the present sample relative to prior validation cohorts, which included healthy controls and community-dwelling older adults in whom navigation ability and its self-report are less convergent. Nevertheless, the magnitude of the correlation approaching near-perfect agreement provides strong evidence that the WFQ-U measures the same construct as the objective FMT. This is clinically important because it suggests that in settings where the FMT cannot be administered for example, in outpatient or home-visit contexts the WFQ-U may serve as a practical proxy for objective navigation assessment.

The descriptive discriminant validity data, though limited by a small sub-sample of 10 stroke and 10 control participants, showed a consistent and theoretically expected pattern: healthy controls scored higher on the WFQ-U than stroke patients across both sexes. Female controls (mean 109.83 ± 7.94) scored higher than male controls (mean 90.75 ± 29.94), a finding that is paradoxically at odds with the well-established sex difference in wayfinding strategy and self-reported navigation confidence, wherein males typically report greater confidence (17). This reversal may be a statistical artefact of the extremely small cell sizes ($n = 4-6$ per group), the high variability in male control scores ($SD = 29.94$), or an interaction between stroke severity and sex-specific navigational styles that cannot be disentangled at this sample size. Formal inferential discriminant validity testing with adequately powered groups is a critical priority for future validation work.

The present study cohort had a mean age of 46.91 years, which is notably younger than the typical Western stroke validation cohort. This demographic reflects the earlier age of stroke onset documented in South Asian populations, attributable in part to higher prevalence of uncontrolled hypertension, diabetes, and smoking (3). The ischaemic predominance (67.1%) in this sample is consistent with regional epidemiological data. The relatively young age of the cohort and its employment of convenience sampling at a single tertiary centre limit the generalisability of these psychometric estimates to older stroke survivors, rural populations, or those presenting at primary care facilities. Additionally, the absence of KMO-based factor analysis, responsiveness data, and floor-ceiling effect analysis means that the full psychometric profile of the WFQ-U remains to be characterised, as acknowledged in the study's recommendations.

Several neurological conditions beyond stroke including Parkinson's disease, multiple sclerosis, and acquired brain injury are associated with navigation impairment (16, 19, 27). The WFQ-U may have utility in these populations as well, particularly given the absence of validated Urdu navigation instruments across neurological conditions generally. Extension studies in these populations would broaden the instrument's clinical applicability within Pakistan's rehabilitation system.

6. CONCLUSION

The Urdu version of the Way Finding Questionnaire is a valid, reliable, and culturally adapted patient-reported outcome measure for the assessment of spatial navigation impairment in Urdu-speaking patients with stroke. The findings support the adoption of the WFQ-U in Pakistani clinical settings for the identification, monitoring, and prognostic characterisation of navigation deficits in stroke patients, and provide a foundation for its extension to other Urdu-speaking neurological populations.

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