



## DEVELOPMENT AND STANDARDIZATION OF URDU APHASIA ASSESSMENT TOOL (UAAT) FOR CLINICAL USE

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### ABSTRACT

**Objectives:** To develop and validate the Aphasia Assessment Tool in Urdu and determine its clinical accuracy.

**Methodology:** A mixed-methods exploratory study was conducted at Shifa International Hospital from September 2020 to September 2021. The developed tool underwent face validity through peer review. Following changes based on professional feedback, the test was further refined by language experts at the National University of Modern Languages and the Academy of Letters. The pilot study test was then administered to 467 individuals across four provinces in Pakistan, meeting the inclusion criteria. Inter-rater reliability was calculated by having the test scored independently by two therapists. Additionally, UAAT was administered to 70 patients with left middle cerebral artery and 21 patients with right middle cerebral artery infarcts. The sample was also evaluated using the translated version of the Mississippi Aphasia Screening Tool, and scores were compared. A re-administration of the UAAT test after one week on the sample population concluded the study.

**Results:** The Urdu Aphasia Assessment Test revealed a Cronbach's  $\alpha=0.89$  with significant correlation ( $p<0.001$ ,  $r=0.91$  with Mississippi Aphasia Screening Tool. The cut-off score quartiles computed at  $27.98\pm 25.21$  with a mean of 7.50. There was a high inter-item correlations.

The factor structure of the scale was assessed with the clinical sample, an exploratory factor analysis was conducted on the 38 items. A principal component analysis was conducted for the one-factor model structure, elucidating 94.00% of the variance. All 38 items exhibited high factor loading on the two-factor structure model, suggesting the retention of all items in the final version of the scale. The one-factor model estimation revealed satisfactory item loadings. Goodness-of-fit model indices..

**Conclusion:** In conclusion, the Urdu Aphasia Assessment Tool demonstrates reliability and validity for clinically assessing individuals with aphasia in the Urdu language

**KeyWords:** Aphasia, Assessment, Speech-language pathologists, Tools, Standardization.

## INTRODUCTION

The estimated annual incidence of stroke in Pakistan is 250/100,000<sup>1</sup>. Pakistan has the highest per capita stroke prevalence globally. With around 1,000 reported cases daily, strokes lead to 400 fatalities, while the remaining 600 cases are addressed through medical interventions and rehabilitation<sup>2</sup>.

Aphasia is a communication disorder resulting from the acquired impairment of language modalities, stemming from focal brain damage<sup>3</sup>. Aphasia impacts a minimum of one-third of the over 10 million new stroke instances worldwide annually. Despite the occurrence of spontaneous partial language recovery in many stroke survivors, challenges endure into the chronic phase for at least 40% of initially aphasic patients<sup>4</sup>. This communication deficit following brain damage constitutes a significant impediment to patient functionality, exerting detrimental effects on rehabilitation efforts and influencing the overall outcome of the stroke<sup>5</sup>. In 2010, the National Stroke Foundation's clinical guidelines for stroke management suggested that individuals suspected of having aphasia should undergo a formal assessment by a speech-language pathologist to confirm or exclude the presence of aphasia<sup>6</sup>. The effectiveness of treatment intervention depends upon the administration of a valid and reliable test<sup>7</sup>. Most extensively developed and validated aphasia assessment tools are available in the English language, such as the Boston Diagnostic Aphasia Examination and Western Aphasia Battery. There is one test available for aphasia assessment in Urdu, BAT-Urdu (Bilingual Aphasia Test in Urdu) but it lacks standardization and norming on aphasic patients, and as a result, it has not undergone clinical validation within the bilingual population<sup>8</sup>. The absence of psychometric data, either not acquired or published in English, poses a barrier for linguistic aphasiology researchers in evaluating the test's reliability and validity. Consequently, this limits broader access to assessing the linguistic abilities of bilingual individuals with aphasia using the BAT-Urdu<sup>9</sup>. A study conducted in Pakistan concluded that Speech-language pathologists in Pakistan heavily depend on informal assessment techniques, and the lack of a standardized and culturally appropriate assessment tool in the Urdu language emerged as a significant barrier to the adoption of formal assessment for aphasic clients<sup>10</sup>. Hence, keeping in view the high prevalence of aphasia in the local population<sup>11</sup> and the dire need for a valid and reliable Aphasia Diagnostic tool in the Urdu language current study was conceived to develop a reliable and valid tool for aphasia assessment in Urdu. The study is of immense importance because the developed tool will be useful for clinicians for the management of their patients as well as researchers to further research initiatives in this direction.

## MATERIAL & METHODS

The current study was conducted at Shifa International Hospital over 1 year from 15<sup>th</sup> September 2020 to 15<sup>th</sup> September 2021, following ethical approval of the Institutional Research Board vide Reference no. IRB#1199-475-2018 dated 17th January 2019. For the development and validation of the Urdu Aphasia Assessment Tool (UAAT) and to determine its clinical accuracy an Exploratory study design was utilized. The study was divided into three phases:

Phase 1: To start with a sample of N=10 speech-language pathologists with at least five years' experience working with aphasic clients were recruited using convenience sampling from four major cities of Pakistan including Islamabad, Karachi, Lahore, and Peshawar. The study included in-depth interviews using a self-structured interview guide with probe questions. Data recorded was transcribed and thematic analyses were drawn manually. Keeping into consideration the Pakistani clinical report and after a thorough literature search, an emphasis was laid upon all the professionals regarding the need for the development of an assessment tool in the Urdu language that could be easily administered and is not time-consuming.

Phase 2: In phase II of the study an assessment tool in Urdu language was developed comprising of two main sections: receptive language and expressive language assessments. To obtain face validity it was peer reviewed by an expert panel including experienced speech pathologists and linguists.

The assessment tool was forwarded to 10 practicing speech pathologists with at least 5 years of experience. After making necessary reformations as per suggestions given by professionals the assessment test was forwarded to language experts in the National University of Modern Languages for further improvements and keen analysis. For obtaining Content validity Lawshe's approach was used.

A Pilot study was conducted on a sample of N=50 individuals with no communication difficulties. Their responses were calculated and scores were given according to the accuracy of responses, for defining appropriate cut-off scores for "normal" performance, the test was administered to the normal population, using Urdu as a mode of communication. 12 speech therapists were trained in the administration and scoring of newly developed tool via Zoom and the test was applied to 467 individuals in four provinces of Pakistan recruited using convenience sampling. The sample included patients of both genders, aged > 40 to <71 years (mean age 59 years), having a minimum of ten years of education with acute Left or right MCA infarct as identified through pre-existing CT scan or MRI reports with functional hearing and visual abilities. While, patients with progressive disease, bilateral stroke, old stroke, psychological illnesses before the onset of aphasia, and those who were unable to understand and use URDU language for communication were excluded.

To calculate inter-rater reliability test was administered and scored by 2 therapists. 75 forms were discarded due to missing information and due to loss of follow-up. The remaining N=392 forms were scored as per the scoring manual which was developed based on pilot study results and literature review (table 1).

Phase 3: In the third phase test was administered on N=100 patients with left MCA infarct and 30 patients with Right MCA recruited using consecutive sampling. 25 forms were discarded (20 from left MCA data and 5 from right MCA data) because of incomplete information or discontinuation of the testing procedure due to various reasons. The sample was also evaluated on the translated version of MAST and scores were compared. UAAT Test was re-administered after one week on the sample population. Due to the loss of follow-up (10 from left MCA and 4 from right MCA), re-administration was carried out on only 70 patients with left MCA and 21 patients with right MCA infarct (table 1). The gender-wise distribution is depicted in figure 1.

Mississippi aphasia screening test MAST was translated into URDU after obtaining consent from the author of the test. Backward and forward translation technique was carried out, an expert panel reviewed the test after making culturally appropriate changes, a pilot study was carried out and then the test was administered to the clinical population to compare results on both tests.

Statistical Analysis:

Data analysis was carried out using Statistical Package for Social Sciences (SPSS) 22.00 and AMOS 26.00. For the standardization of normative score Z-scores of responses were calculated. Face validity was measured using an expert's opinion regarding the test. Content validity ratio (CVR) was calculated according to Lawshe's approach and intra-class correlation for all subscales using Cronbach's alpha coefficient for internal reliability was calculated. Test-retest reliability was measured by administering the same test after two weeks on the same sample. Inter-examiner reliability was calculated & Construct validity was calculated by comparing the developed test with MAST which is a reliable and valid test of aphasia assessment.

## RESULTS

The current study results revealed a high internal consistency for all 38 items of the UAAT assessed through Cronbach's alpha reliability analysis with  $\alpha=0.89$  compared to 0.8 for MAST (table 2a) & Concurrent validity was established by correlating the developed scale with the Mississippi Aphasia Screening Tool (MAST) (table 2b) which revealed a significantly strong correlation with the sum scores of MAST, affirming the developed scale's reliability and validity for assessing and diagnosing Aphasia.

To create the cut-off scores of the instrument mean and median were computed. The mean score of the clinical population was computed at  $27.98 \pm 25.21$  with a mean of 7.50. The data's dispersion was evident, as indicated by the wide spread of scores, as reflected by the standard deviation, hence

quartiles were calculated (table 2c)). The difference in participant scores based on gender revealed significant ( $p < 0.00$ ) differences with the majority of males 34(35%) suffering from moderate, followed by mild 15(19%) and severe 1(2%) aphasia; while the majority of females 28(30%) suffered mild, followed by severe 10(11%) and moderate 3(3%) aphasia.

Before delving into the factor structure of the scale, inter-item correlations were computed, revealing high correlations among items.

To assess the factor structure of the scale with the clinical sample, an exploratory factor analysis was conducted on the 38 items. Initially, a two-factor structure was examined, explaining 75% of the variance. However, a subsequent one-factor model was explored, demonstrating a remarkable 94% variance explanation. Following this analysis, a principal component analysis (PCA) was conducted for the one-factor model structure, elucidating 94.00% of the variance. The PCA, performed on 38 items with orthogonal rotation (varimax), indicated superb sampling adequacy based on the Kaiser–Meyer–Olkin test ( $KMO=0.87$ ). Bartlett's test of sphericity  $\chi^2 = 298.43$ ,  $p < .001$ , affirmed that correlations between items were adequate for PCA. All 38 items exhibited high factor loading on the two-factor structure model, suggesting the retention of all items in the final version of the scale. Item loading on the one factor is presented at Table 3 a.

Confirmatory factor analysis using AMOS 26.00 was then conducted based on the results from exploratory factor analysis. The one-factor model estimation revealed satisfactory item loadings. Goodness-of-fit model indices, as presented in Table 3 b., supported the unidimensional nature of the scale. The unidimensional model was statistically significant, with robust item loading.

## DISCUSSION

The absence of standardized aphasia assessment tools in Urdu poses significant barriers to clinical practice, evidence-based decision-making, and research within Urdu-speaking clinical populations. In response to this gap in evaluating neurogenic language disorders, a tool was developed and standardized in Urdu, taking into consideration the linguistic features known to influence language performance in Urdu.

The UAAT comprises five distinct segments, encompassing assessments of auditory comprehension at both word and sentence levels. Additionally, it evaluates patients' proficiency in naming everyday objects, engaging in picture description activities, and performing a task to assess repetition skills across word, phrase, and sentence levels. According to the clinical neurology guidelines for psychiatrists, as outlined in the 6th Edition published in 2007, standard aphasia tests typically focus on evaluating three fundamental language functions: comprehension, naming, and repetition. Comprehension is gauged through simple requests, such as instructing the patient to perform actions like picking up one hand, opening and closing eyes, or protruding the tongue. Naming involves prompting the patient to articulate the names of common objects, such as a pen or key. Repetition assessment entails the patient reciting several brief phrases, exemplified by prompts like, "The boy went to the store" <sup>12</sup>.

The UAAT is structured into two principal sections, encompassing assessments for both receptive and expressive language abilities. To ensure face validity, the tool underwent a rigorous peer review process conducted by an expert panel consisting of ten experienced speech pathologists. These experts systematically evaluated each item based on criteria such as relevance, cultural appropriateness, and clarity. In pursuit of content validity, the Content Validity Ratio (CVR) for each section was calculated using Lawshe's approach. The initial CVI was determined to be 0.87, and subsequent revisions were made based on the insightful suggestions provided by the expert panel. Following the revisions, a reevaluation of the CVI yielded a value of 1, indicating a high level of content validity.

The significance of achieving an optimal level of CVI is underscored by the Content Validity of Aphasia Screening Test Protocol, which recommends that an aphasia screening test with a CVI at

this level is deemed suitable as an effective screening tool for detecting aphasia<sup>13</sup>. This finding aligns with the broader understanding that content validation plays a crucial role in developing reliable and valid assessments. The content validation process of the JAAT, designed for the Jordanian-Arabic-speaking population, further emphasizes the importance of implementing a robust scheme of content validation and item development to enhance overall test construction practices in the field<sup>14</sup>.

Pakistan has experienced limited advancements in enhancing its literacy rate since the 2004-2005 period. According to the country report of 2013, the literacy rate had only marginally increased to 58%, implying that 42% of the population remains illiterate<sup>15</sup>. During the development of the UAAT, meticulous attention was given to ensuring simplicity in the test items, regardless of the individual's educational level. Although reading and writing components were incorporated into the test, no scores were assigned to these elements to adhere to the aforementioned objective. Upon administering the test on normative data, it was observed that individuals within the normative population consistently achieved full marks on the developed test.

Numerous prior studies have emphasized the principle that aphasia tests should not serve as measures of intelligence. Challenges often arise not with the "easy" items utilized in aphasia tests, but rather when constructing items of a more challenging nature. This dynamic blurs the distinction between language-specific abilities and broader cognitive intelligence. Consequently, aphasia tests must strategically shift the difficulty of item distribution toward the lower or "easy" end. This adjustment is imperative for effectively discriminating among varying levels of aphasia severity and determining distinct aphasic subtypes. It is noteworthy, however, that such a shift inherently results in a "ceiling" effect when the test is subsequently applied to individuals without aphasia, as their performance is likely to approach or attain a 100% correct score<sup>16</sup>.

Word-finding difficulties are commonly reported in individuals with aphasia, significantly impacting communication. In assessing naming ability within the developed tool, culturally appropriate noun picture cards and action picture cards were included. A study aimed at evaluating the validity of picture naming for assessing anomia concluded that utilizing picture-naming tasks is not only acceptable but also provides a valid means of assessing lexical retrievals<sup>17</sup>.

For the clinical diagnosis of auditory comprehension of discourse deficits, a narrative was crafted with increasing difficulty, followed by yes/no questions. The normative population exhibited no difficulty in comprehending, retaining, and responding to the questions. However, a group of individuals with brain damage, specifically left hemisphere damage (n=70), exhibited more errors, particularly on questions involving implicit information. Within this group, those with left-hemispheric damage and involvement of posterior and adjacent areas (n=45) displayed a more pronounced deficit compared to individuals with frontal lobe involvement. Clinical data from individuals with right MCA & Left MCA infarct showed comparatively better performance on this task. These findings align with a study conducted in Germany in 2004, focusing on patients with left and right hemisphere damage, which similarly concluded that a story comprehension test serves as a valuable diagnostic tool for neuropsychological assessment<sup>18</sup>.

Time constraints emerged as a significant impediment in the application of formal assessments, as indicated by participants in a study conducted in Pakistan<sup>10</sup>. Respondents emphasized the necessity for a swift and efficient assessment tool. The findings of the current study revealed that the Urdu Aphasia Assessment Tool (UAAT) required an average of 12 minutes for both administration and scoring.

This emphasis on efficiency aligns with the observations made by Marshall RC and Wright HH in their study on developing a clinician-friendly aphasia test, where they asserted that lengthy

assessments are often intolerable for acute stroke patients and those who have undergone surgery<sup>19</sup>. Similarly, the authors and developers of the Quick Aphasia Battery (QAB) emphasized the need for an aphasia battery that is less time-consuming to bridge the gap between comprehensive batteries and screening tests. This is particularly crucial for optimizing aphasia assessment in research contexts where time is limited<sup>20</sup>.

The principal objective of the developed tool is to identify both strengths and limitations. This approach aims to strengthen identified strengths and manage limitations through appropriate therapeutic interventions. Such an approach aligns with contemporary aphasia assessment paradigms that emphasize pinpointing deficits within specific language domains. Research in this area suggests that assessing damage to specific aspects of language can assist clinicians in tailoring rehabilitation plans for individual patients, potentially enhancing overall outcomes<sup>21</sup>.

## CONCLUSIONS

In conclusion, the Urdu Aphasia Assessment Tool demonstrates reliability and validity for clinically assessing individuals with aphasia in the Urdu language.

## AUTHORS CONTRIBUTION

**Faiza Badar** did the data collection, analysis, and manuscript writing and is responsible for the integrity of the work.

**Sajida Naz** was responsible for the conception & designing of research.

**Ghulam Saqulain** did the critical revision of the manuscript & responsible for the integrity of the research and publication of the article.

**Muhammad Kashif Khan** did the methodology and literature review

**Conflict of Interest:** None.

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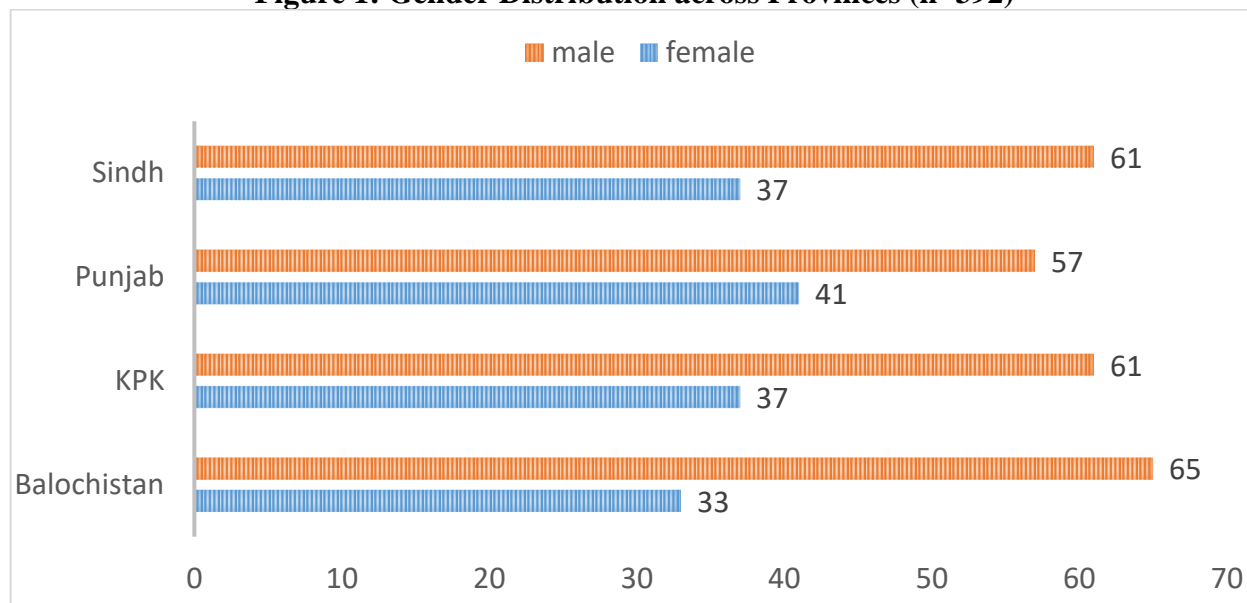
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**Table 1: Phase I (n=392) & II (n=91) Population Characteristics**

Phase	Variable	Category	Frequency	Percentage
Phase II	Gender	Male	244	62
		Female	148	38
	Province	Punjab	98	25
		Sindh	98	25
		KPK	98	25
		Baluchistan	98	25
	Education	10 years	94	24
		12 years	119	30
14 years		102	26	
16 years		77	20	
Phase III	Gender	Male	50	55
		Female	41	45
	Diagnosis	Left MCA	70	77
		Right MCA	21	33

**Figure 1: Gender Distribution across Provinces (n=392)****Table 2: Chronbach's Reliability, Inter scale Correlation Analysis & Cut-off score quartiles (n=91)**

a) Reliability Analysis of Scale		
Tool	No of items	$\alpha$
Urdu Aphasia Assessment Tool	38	0.89
Missisipi Aphasia Assessment test .	11	0.8
b) Inter scale correlation		
Tool	UAAT	MAST
Urdu Aphasia Assessment Tool	-	-
Missisipi Aphasia Assessment test .	0.91**	-
c) Cut-off scores quartiles (N =91)		
quartile	category	Interpretation
25<	Severe	Significant Impairment
26 - 50	moderate	Specific Clinical Indicators
50<	Mild	Mild deficits

Note: \*\*P < 0.001

**Table 3 Factor loading from Principal component analysis & Goodness-of-Fit statistics (n = 91)**

a) Factor loading from Principal component analysis					
Item	Items Loadings	Item	Items Loadings	Item	Items Loadings
A	0.87	Command1	0.89	Repitition4	0.97
B	0.8	Command2	0.88	Repitition5	0.97
Apple	0.72	Command3	0.83	Key	0.91
Cat	0.83	Command4	0.84	Glasses	0.9
Fish	0.77	Command5	0.79	Pen	0.89
Flower	0.79	Command6	0.78	Kite	0.89
Peas	0.77	Counting	0.81	Chair	0.81
Drinking	0.81	Days of week	0.92	Q1	0.79
Sleeping	0.79	F1	0.92	Q2	0.81
Playing	0.9	Repitition1	0.97	Q3	0.83
Running	0.93	Repitition2	0.97	Q4	0.89



Cooking	0.93	Repitition3	0.97	Q5	0.91
<b>b) Goodness-of-Fit statistics</b>					
Model	X2	Df	X2 /df	GFI	RMSEA
One Factor	273.10**	17	1.32	0.85	0.11

Note. \*\*p < .001, GFI: Goodness-of-Fit Index, RMSEA: root-mean-square error of approximation