ADAPTATION AND VALIDATION OF BEDSIDE WESTERN APHASIA BATTERY-REVISED IN HINDI FOR PERSONS WITH APHASIA

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CERTIFICATE

This is to certify that this dissertation entitled **" Adaptation and validation of bedside Western Aphasia Battery- Revised in Hindi for persons with aphasia"** is a bonafide work submitted in part fulfillment for the degree of Master of Science (Speech-Language Pathology) of the student Registration Number: 20SLP039. This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for an award of any other diploma or degree.

Mysuru

August 2022

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DECLARATION

This is to certify that this dissertation entitled "**Adaptation and validation of bedside Western Aphasia Battery- Revised in Hindi for persons with aphasia"** is the result of my study under the guidance of Dr. Hema N, Assistant Professor, Department of Speech-Language Sciences, All India Institute of Speech and Hearing, and has not been submitted earlier to any other University for any award of any other diploma or degree.

Mysuru **Registration Number: 20SLP039**

August 2022

Dedicated this work to my ***LORD SHIVA***, my ***GRANDMOTHER***, ***BAPA***,

MUMMY, BHAI, and my ***GUIDE*** without whom nothing was possible

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CHAPTER I

INTRODUCTION

Every human being needs some mode of communication to express their needs, emotions, and feelings towards others. Language is an essential mode of communication and is mostly expressed in the form of written, manual and oral forms. Any disruption in this process of communication can lead to language disorders.

Language is a tool for communication explained as “A code made up of rules that include what words mean, how to make words, how to put them together, and what word combinations are best in what situations” (ASHA, 1997). The several components of language include **Phonology** (study of sound), a language’s phonetic system and the rules that determine phonetic combinations; **Morphology** (structure/ form of a sentence), the structure that determines how words are combined and how word formations are produced; **Syntax**, regulates how words are arranged and combined to make sentences as well as how sentences constituent parts are related; **Semantics** (Content of Language), the system that governs word and sentence meanings; **Pragmatics** (Function of Language), the system that combines the aforementioned linguistic elements into communication that is both useful and socially acceptable (ASHA, 1982).

1.1 Aphasia

Aphasia is described as a central language disorder characterized by impaired comprehension, disturbance of reading and writing, paraphasia, word-finding difficulty along with dysarthria, problem-solving difficulty, non-verbal construction, and impairment in gestures (Kertesz et al., 1979). In persons with aphasia, linguistic knowledge and linguistic processing are affected. Studies have found that anterior lesions are seen mostly among young persons that lead to non-fluent aphasia and posterior lesions attribute to fluent aphasia which is seen in elderly individuals (Ferro & Madureira, 1997). Aphasia is a multimodality disorder in which naming, reading, writing, understanding conversation, and speaking modalities are affected. In some patients, comprehension is affected more than expression and in some vice versa (Davis, 2007; Duffy & Ulrich, 1976). Communication problems brought on by paralysis or poor coordination of the muscles used for speaking or writing or by poor vision or hearing are not called aphasia. However, such disturbances may accompany aphasia and thus complicate the clinical manifestation of the speech defect itself. Injury to specific areas of the brain that specialize in specific functions causes aphasia. Aphasia is known as a disruption in some or all of the skills, associations, and habits of spoken and written language, caused by cerebrovascular accidents in certain areas of the brain (Goodglass et al., 2001).

Aphasia is not the consequence of motor, psychological or intellectual impairment. A localized brain damage results in an acquired impairment of language modalities known as aphasia, a communication disorder. It can affect the person's involvement and quality of life with their family, friends, and society. It minimizes competence and interferes with functioning in relationships, life roles, and activities, which has an impact on social inclusion, social connections, access to information and services, equality, and wellbeing in family, community, and culture (Berg et al., 2022).

1.2 Incidence and Prevalence

A stroke is caused by a blockage of an artery leading to the brain and resulting in neurologic damage to the area of the brain (Vinson, 2007). Stroke is one of the primary causes of death and disability in India and it is estimated to be high by 2030. In developed countries, the incidence has declined by over 40% in the last few decades whereas it has doubled in India (Das et al., 2012). According to WHO (World Health Organization), stroke was the third most common cause of death in developed countries and the second most common cause of worldwide mortality (WHO, 2001). It affects 8,00,000 to 10,00,000 people in India each year (Aphasia and Stroke Association of India, 2013). For these patients' intensive therapy is very necessary for recovery, therefore early and accurate assessment is needed to diagnose the patient as early as possible so that early intervention can be implemented (Koenig-Bruhin et al., 2013). Across the globe, 20- 40% of stroke survivors are diagnosed with aphasia and in the Indian context; it ranges from 11 to 40% (Alladi et al., 2016; Lahiri et al., 2020).

According to statistics on stroke, the incidence of aphasia in developed countries varies from 0.02% to 0.06% with a prevalence of 0.1% to 0.4% (Code & Petheram, 2011). The fatality rate due to stroke ranges from 11.7% to 32.4% (Biswas et al., 2009; Mathur & Shah, 2011) and up to 42% of stroke survivors have aphasia (Ryglewicz et al., 2000). According to studies on stroke, between 15% and 42% of people who experience an acute stroke have speech disturbances (Inatomi et al., 2008). The prevalence of stroke is high worldwide. The stroke affected 25.7 million people in 2013, 10.3 million of whom experienced their first stroke. With an approximate incidence of 10.3 million new strokes across the world, these diverse epidemiological statistics are of global importance and result in an estimated global population gap of between 1.5 and 4 million per year (Feigin et al., 2017). Aphasia occurs in 21–38% of patients with acute stroke and is associated with high morbidity, mortality, and expenditure (Berthier, 2005).

According to several studies, the percentage of patients with symptoms of aphasia after stroke is between 21% and 38% (Berthier, 2005; Bhogal et al., 2003; Kauhanen et al., 2000; Pedersen et al., 1995). According to epidemiological data, the prevalence of aphasia patients in the overall population varies from 33 to 52 cases per 100,000 people per year (Engelter et al., 2006). Aphasia is relevant not just because it is so frequent, but also because it has been related to a worse prognosis after a stroke, in terms of quality of life, survival, and disability (functional, social, or occupational) (Bhogal et al., 2003; Engelter et al., 2006; Tate et al., 1989).

In 2005, Pandian et al. investigated that one-fifth of overall persons with stroke admitted to the hospital for the first time were aged below 40 years. The prevalence rate of stroke is 90- 222 per 100,000. It is also, investigated that the prevalence rate for stroke in India varies with region. According to previous epidemiological studies, the prevalence of stroke is 18- 32% high among young populations out of overall persons with stroke (Dalal et al., 2007).

The incidence and prevalence rate of stroke in the different states of India has been reported in the literature over the years. In a report from Tamilnadu, Vellore estimated the prevalence of stroke which was 0.56 per 1000. In Karnataka, the prevalence rate increased to 1.154 per thousand from 1993 to 1995 years (Banerjee & Das, 2006). The prevalence rate in the north Indian population; In Rohtak is 0.44 per 1000 population and in Kashmir 2.44 per 1000 population (Dhamija et al., 2000).

A study conducted from January 2005 to December 2006 in Mumbai to assess the incidence rate, indicated that out of 521 stroke cases 275 were males and 246 females (Dalal et al., 2008). Another study by Nagaraja et al. (2009) was conducted to assess the incidence rate of stroke at the NIMHANS hospital. The result revealed that out of 1174 cases (mean age = 54.5 years) 8.7% died during the hospital stay, 56.55%

were discharged alive and 6.90% died during the follow-up period (Nagaraja et al., 2009).

The above literature shows that there is an increment in the number of persons with stroke day by day in the Indian population. Hence, there is a need to evaluate and intervene with these persons according to the reported incidence and prevalence. Thus, there is a need to adapt a screening tool in the Indian language to assess the linguistic skills of persons with aphasia.

1.3 Signs and Symptoms

The signs and symptoms of aphasia can differ depending on the severity and extent of the communication disorder. Symptoms of aphasia vary across individuals, depending on the speaking situation. The most common symptoms are loss in spoken language comprehension, verbal expression, written language comprehension, and written expression (Lecours et al., 1988). According to the ICF (International Classification of Functioning, Disability, and Health) (WHO, 2001), persons with aphasia faces problem with functional communication, impaired social involvement (Davidson et al., 2008), and exhibit a poor quality of life (Kauhanen et al., 1999; Shadden, 2005). Aphasia is a leading cause of language disorders, especially in adults (Jani & Gore, 2014).

Various speech and language symptoms displayed in aphasia results in a syndrome (Drummond, 2006). Symptoms include impairment in auditory comprehension, oral expression, reading comprehension, and writing which can vary from patient to patient and are unique in every patient. Based on the location and severity of brain damage, the symptoms are going to arise. Aphasia symptoms are not only restricted to speech and language but also the extent to the areas that affect the patient’s quality of life. Persons with aphasia often face family issues and social breakdowns because of a loss of communication ability (Sarno, 1993). Psychological issues such as depression, personality problems, etc are also predominantly present among aphasia patients (Sarno, 1993).

The symptoms of aphasia are unique; may vary from patient to patient based on the site, size, and extent of brain damage, and may affect one or more modalities of language (Drummond, 2006). These patients experience other impairments along with language deficits such as paralysis/ paresis of the upper/ lower limbs (ASHA, 2014). Aphasia may co-occur with motor speech disorders such as apraxia or dysarthria (ASHA, 2014). Because of the disturbances in their social, education, and professional life, they find themselves in isolation, frustrated and depressed (Elbaum & Benson, 2007).

1.4 Etiologies

Cerebrovascular accident (CVA) and stroke is the leading cause of aphasia. The different types of cerebrovascular accidents (CVA) are hemorrhage, embolism, and thrombosis leading to stroke in cortical, subcortical, or mixed regions of the brain (Tonkonogiĭ & Tonkonogy, 1986). Stroke or CVA may result from various health conditions such as hypertension, diabetes, etc which in turn cause disability. Aphasia is also caused due to neurological conditions like brain tumors, infection, and head trauma because of falls, blows road traffic accidents, and other conditions like metabolic disorders, migraine, poisoning disorders (Recht et al., 1989), and neurodegenerative disorders like Alzheimer disease, frontotemporal lobar degeneration, and vascular dementia.

1.5 Body functions and structures, activities, and participation in the life

For people with aphasia, body structure and function are related to brain defects and brain function. Functional limitations mainly include the four modes of language: listening, speaking, reading, and writing, as well as daily tasks such as talking to a healthcare provider or family member, writing checks, and making phone calls. Traditionally, the focus of aphasia assessment and treatment has been on the four language systems in terms of levels of impairment and functional limitation. In recent years, functional tasks have become increasingly important for diagnosis.

1.6 Assessment

Assessment is an important aspect to describe language behaviors, identifying the level of existing problems in various domains, and also in planning appropriate management strategies and defining factors to facilitate retrieval of language to enrich the quality of life of persons with aphasia. A detailed assessment of aphasia provides invaluable information. It identifies the type of aphasia, as well as its severity, strengths, and weaknesses of persons with aphasia. Additionally, we can identify therapeutic activities and goals that are significant to the patient. There are numerous tools for assessing aphasia available to Speech-Language Pathologists (SLPs). The most commonly used diagnostic aphasia tests for specialized speech and language services available in Aphasiology are Western Aphasia Battery (WAB) (Kertesz, 1982; Kertesz et al., 1979), Western Aphasia Battery-Revised (WAB-R) (Kertesz, 2006), Boston Naming Test (BNT) (Goodglass et al., 1983)**,** and Boston Diagnostic Aphasia Evaluation (BDAE, 3rd Ed.) (Goodglass et al., 2001), but they are time-consuming and may be less applicable in low resource countries like India (Paplikar et al., 2020). However, these tests are oriented for detailed assessment purposes only and are also used to classify and calculate the severity of the problem (Romero et al., 2012). Diagnostic test batteries require a longer time to administer, which can lead to fatigue in patients with severe deficits. Also, as most aphasic patients are bedbound due to their clinical circumstances it is difficult to administer the whole test battery to diagnose the patient (Romero et al., 2012).

Aphasia at an acute and sub-acute stage can be detected using a screening tool that requires less time in a busy clinical setting (Paplikar et al., 2020). Screening tests for aphasia are intended to quickly assess the presence or absence of the disorder. They do not claim to provide an in-depth explanation of aphasic disorder (or of any single language skill) but are designed to check for the focus on the problem of aphasia is detected or seems probable (Paplikar et al., 2020). Clinician often uses these types of tests during a first visit of the patient in the acute stages of recovery when a more comprehensive examination would make too many demands on the patient. Another potential use of aphasia screening tests is their administration by staff members who are not speech clinicians, such as nurses in inpatient medical settings where speech clinicians are not readily available, however, the speech clinician supervises their test administration. Screening tools can assess functional communication in patients with limited communication ability or a low level of alertness (Biniek et al., 1991). It has higher efficacy in early diagnosis and detects aphasia in the acute stroke condition and busy clinical practice. Therefore, there is a need for a screening tool that requires less time, facilitates diagnosis at the screening level, and thus, has better efficacy in the early diagnosis of aphasia.

The most commonly used screening tools for aphasia patients are Acute Aphasia Screening Protocol (AASP) (Crary et al., 1989), Bedside Evaluation Screening Test 2nd Ed (BEST-2) (West et al., 1998), Frenchay Aphasia Screening Test (FAST) (Enderby et al., 1986), Mississippi Aphasia Screening Test- English (MASTen) (Nakase-Thompson et al., 2005) which has been developed for English speaking populations. Screening tests like the Language Screening Test in French

(LAST) (Flamand-Roze et al., 2011), and Mississippi Aphasia Screening Test- Spanish (MASTsp) (Romero et al., 2012) are very few tools available in non- English languages.

India is a socio- demographically diverse country in terms of culture, language, and ethnicity, with a significant percentage of the population being illiterate, therefore it is challenging to develop a screening tool that is linguistically, culturally, and educationally appropriate to rule out aphasia (Paplikar et al., 2020). Concerning the Indian context, the most commonly used tools in clinical setups are Frenchay Aphasia Screening Test- Kannada (FAST- K) (Paplikar et al., 2020), which is also standardized in Malayalam, Hindi, Bengali, and Telugu languages. The other screening tool is the Bedside Screening Test- Kannada (BST-K) (Ramya, 2011), which is also standardized in the Odiya language (Monalisa, 2012) and in the Malayalam language (Kanthima, 2011).

1.7 Need of the study

Hindi is one of the most extensively used languages in the world. Hindi is an Indo-Aryan branch of the Indo- European family of languages spoken mainly by the inhabitants of northern and central parts of India such as Bihar, Delhi, Haryana, Jharkhand, Madhya Pradesh, Rajasthan, Uttarakhand, and Uttar Pradesh; and also used in abroad countries. Nearly 425 million people speak it as a first language and 120 million speak it as a second language (Language Census of India, 2011). It is therefore one of the official languages of the Government of India.

Studies have reported that the occurrence of post-stroke aphasia is 20- 41% (Bohra et al., 2015; Dickey et al., 2010; Flowers et al., 2016; Pauranik et al., 2019; Pedersen et al., 2004). In developed countries, the incidence has declined by over 40% over the last few decades whereas it has doubled in India (Das et al., 2012).

Across the globe, 20- 40% of stroke survivors are diagnosed with aphasia and in the Indian context; it ranges from 11- to 40% (Alladi et al., 2016; Lahiri et al., 2020). The study conducted in the Swiss city of Basle found an incidence of 0.043% in aphasia patients following stroke (Engelter et al., 2006) whereas 40% among Bengali-speaking participants (Lahiri et al., 2020). In the year 2004- 2005, countries like Ontario, and Canada reported that 35% of 3207 inpatients with stroke had aphasia post-discharge (Dickey et al., 2010). In the Ontario population, the incidence of aphasia is found to be 0.06%. Recent studies have shown that the incidence and prevalence of aphasia patient following a stroke in the world is 0.02- 0.06% and 0.1-0.4% respectively (Code & Petheram, 2011).

Previous studies have reported that aphasia occurs in one-third of stroke victims (Flowers et al., 2016), and is more often associated with longer hospital stays and increased requirements for management and rehabilitation services (Ellis et al., 2012; Flowers et al., 2013, 2016). In these patients, an appropriate and accurate screening test can be administered for the detection and management of early aphasia symptoms mainly in aphasic patients with multiple disabilities (Boulanger et al., 2018). Therefore, stroke guidelines recommend performing screening and assessment for aphasic patients in very acute and transition stages. Screening tools have the potential to rapidly identify the problem sequel. Hence, routine implementation of screening protocol can easily detect aphasic patients, leading to faster and timely management by specialists and health care teams (Flowers et al., 2013; Girma et al., 2015).

The screening tools have many advantages such as the administration being quick, flexible, and suitable to distinguish between normal and aphasia, and also confirming which skills need in-depth evaluation. It is done rapidly and helps the clinician to make a quick baseline measurement in order to start early intervention. Also during the initial stage of recovery, the symptoms may vary from day to day and may require a re-assessment periodically. Therefore, screening is an ideal and mandatory assessment compared to a diagnostic assessment which is very extensive and time-consuming. The best example is the Bedside Western Aphasia Battery-Revised (Kertesz, 2006).

The screening tool of Western Aphasia Battery- Revised (Kertesz, 2006) consists of 8 domains namely: Spontaneous speech to assess content, spontaneous speech to assess fluency, auditory verbal comprehension, sequential commands, repetition, naming, reading, writing, and one optional domain is apraxia. Each of these domains consists of particular questions and test stimuli. Bedside aphasia score was obtained using only 6 domains except reading and writing whereas, bedside language scores were obtained using all the 8 domains. Based on the scores, classification of aphasia can be achieved using Bedside aphasia classification criteria. It is a screening tool that is designed to be used as a bedside screening tool and also to quickly screen patients in other settings to rule out aphasia. It is a very shorter and quicker test to assess the type and severity of aphasia and also requires very less materials during administration. This Bedside WAB- R was developed in the English language. The administration of the Bedside WAB-R will screen for the presence and absence of aphasia with reference to the type and severity of aphasia, which is not available in other screening tools mentioned in the above sections concerning Indian languages. There is also a need for the use of specific colloquial expressions and specific cultural-linguistic variables to be considered in clinical practice (Kaur et al., 2017) with reference to the Indian context.

Bedside screening tools are fast and efficient ways of screening for a patient with aphasia, they also serve as a baseline for further assessment and management of persons with aphasia. There are limited reports in the literature to develop such tools in the Indian context, especially in Hindi. For the Hindi population, there is no literature reported on the development of screening tools for aphasia. As the Bedside record form of WAB-R is an extensive (Kertesz, 2006) screening tool, it gives us the Classification of Aphasia and Bedside scores with a limited amount of test items and time.

There are many aphasia test batteries commonly used in both clinical and research settings. However, assessing persons from different ethnic, cultural, and linguistic backgrounds pose major challenges for clinicians. There are very few tests available to assess the linguistic abilities of persons with aphasia in the Hindi language. And the available Western assessment tests have limitations when used in the Indian context due to linguistic and ethnocultural diversity. Hence, there is a need to adapt the existing Bedside Record Form of WAB-R in the Indian language (Hindi) and validate the screening tool for the Hindi language-speaking population.

1.8 Aim

The present study aims to adapt, and develop Bedside Western Aphasia Battery-Revised (WAB-R) (Kertesz, 2006) in the Hindi language and validate the adapted record form for Hindi-speaking persons with aphasia.

1.9 Objectives of the study

1. To develop Bedside WAB-R in Hindi by adapting from Bedside Western Aphasia Battery-Revised (WAB-R) (Kertesz, 2006) of the English language.
2. To determine the content validity of the constructed screening tool by administering it to neurotypicals and persons with aphasia.

CHAPTER II

REVIEW OF LITERATURE

Every human being needs some mode of communication to express their needs, emotions, and feelings towards others. In order to express our thoughts, feelings, and emotions we need language. Language is an essential mode of communication and is mostly expressed in the form of written, manual and oral forms. Every individual acquires the capacity to comprehend, produce and use words to communicate effectively. Any disruption in this process of communication can lead to language disorders.

Aphasia was first introduced in 1864 and has evolved since then and the basic meaning has shifted from impaired language skills to impaired cognitive functioning (Hillis, 2007). According to American Speech and Hearing Association 2021, Brain injury can cause a language disorder called aphasia. The brain is divided into two parts, damage to the left hemisphere may cause speech and language problems whereas damage to the right hemisphere may lead to poor attention or memory problems. Aphasia is a cognitive-communication disorder due to impairment to the left hemisphere of the brain and can impair communication and cognition or both. According to previous studies, aphasia is defined as deficits in expressive and receptive language abilities and also includes the presence of impairment in understanding visual or auditory communicative symbols or word/phrase/sentence production through writing and speaking (Drummond, 2006). Persons with aphasia have difficulty with tasks such as perceiving the meaning of symbols, following directions, etc, and are unable to produce and understand language (LaPointe, 2005). It is commonly described as an acquired language disorder due to the occurrence of brain damage (Code & Petheram, 2011).

Language is the words we use and how we use them to express ideas and achieve what we want (American Speech and Hearing Association, 2021). Language deficits are generally categorized into expressive language deficits and receptive language. **Expressive language deficit** is a language impairment that makes it difficult to communicate intended meaning. Lesions in or close to Broca's region, in the anterior part of the left cerebral hemisphere, frequently cause expressive language difficulties. However, practically any injury in the left hemisphere's front region is likely to result in expressive difficulties. **A receptive language deficit** is a deficit in the ability to interpret meaning from language. Also, include language issues as well, which typically result from lesions in the Wernicke's region or nearby areas of the posterior left hemisphere.

The three most influential and commonly used aphasia classifications are 1). Classification of aphasia (Goodglass & Kaplan, 1972); Classified into 7 categories namely Broca's, Wernicke's, Conduction, Isolation, Transcortical Sensory, Transcortical Motor, and Anomic aphasia. 2). Luria's aphasia interpretation (Luria & Hutton, 1977): Classified the aphasics into 6 types namely acoustic- agnostic, acoustic amnesic, semantic, afferent motor, efferent motor, and dynamic aphasia. 3). Ardila's classification (Ardila, 2010): classified broadly into 3 types mainly primary aphasia, secondary aphasia, and dysexecutive aphasia. Another recent and most common classification of aphasia given by ASHA is non-fluent aphasia (Broca's aphasia, Mixed Non-fluent aphasia, and Global aphasia) or fluent aphasia (Conduction aphasia, Anomic aphasia, Wernicke's aphasia, and Transcortical sensory aphasia) based on the verbal expression traits to depicts distinct aphasia types (Davis, 2007; Goodglass & Kaplan, 1972) is shown in Table 1.

Table 1

Classification of aphasia

Aphasic Syndromes	**Characteristics**
Broca's Aphasia	Non-fluent type of aphasia, limited vocabulary, and grammar, articulation is affected, and well preserved auditory comprehension.
Global Aphasia	Several verbal comprehension deficits, vocabulary, and grammar are limited, and speech is restricted to stereotyped utterances.
Mixed Non-fluent aphasia	Non-fluent speech, moderate verbal comprehension problems but some expressive language.
Wernicke's aphasia	Fluent type of aphasia, impaired auditory comprehension, speech is paraphasic, presence of word finding difficulties.
Conduction aphasia	Fluent type of aphasia, repetition of sentences is selectively impaired in relation to auditory comprehension.
Transcortical sensory aphasia	Severe verbal comprehension deficits, near normal repetition, impaired naming with paraphasias, perseverations, and little extended expressive language.
Anomic aphasia	Fluent type of aphasia, severe word finding difficulties, speech is fluent with few paraphasias.
Pure word deafness/ Verbal auditory agnosia	They have poor verbal comprehension.

2.1 Aphasia Assessment

Assessment is an important and complex process in order to describe, and interpret an individual's communication ability and it is functioning in various domains and is also helpful in selecting appropriate management strategies to uplift the life satisfaction and quality of life of persons with aphasia.

The assessment aims to: (1) quantify and categorize communication skills and deficits; (2) spot the presence and potential impact of co-occurring disorders (3) set treatment objectives and (4) supply data to forecast the course of therapy and recovery (Murray & Chapey, 2001). The type of assessment is greatly influenced by the environment, the number of resources accessible to the clinician, and the current requirements and abilities of the person with aphasia (Murray & Clark, 2015). The focus on aphasia as a particular disorder of particular abilities or as a pervasive communication disorder, or aphasia as unitary in nature or as comprising of multiple "subtypes" directly affects how the test is constructed. When selecting an assessment method, we must take into account the following factors: a) The test's psychometric appropriateness b) The test items' portability and c) the amount of time required (Spreen & Risser, 2003).

For persons with aphasia, it is essential to consider the purpose for performing an examination while doing an evaluation and when choosing specific assessment instruments. In assessing aphasia, a total of six types of assessment objectives can be distinguished (Spreen & Risser, 2003): 1). **Screening procedures:** This refers to a brief and cursory examination to detect the presence of aphasia, often not exceeding 5 or 10 minutes. The procedure is best pursued when the clinician can identify in advance the implications of positive or negative results from the screening. 2). **Diagnostic assessment:** This refers to the thorough examination of a patient's language performance to arrive at both a diagnostic impression and a detailed description of areas of associated cognitive strength and weakness. 3). **Descriptive evaluation:** This type of evaluation is primarily useful for the purpose of rehabilitation and counseling. In this, information is collected regarding the functional strengths of the person. It is also important in making predictions of a recovery, the ability to process, learn, and remember new material. 4). **Progress evaluation:** Evaluation with respect to spontaneous recovery of the person and regarding the ability of the person to relearn or to compensate for what they have lost. 5). **Association of pragmatic commission:** The objective is to determine how efficiently the person can communicate despite the problem. 6). **Assessment of related disorders:** Aphasia can co-occur with other disorders including assessment of dysarthria, apraxia of speech, aprosodia of speech. Compared to all the procedures of assessment, screening tools were considered the easiest and quickest tool to detect the person's language ability in brain-damaged individuals.

There have been several tools available in India to assess various linguistic skills in persons with aphasia, some of them include Western Aphasia Battery (Kertesz, 1982), Western Aphasia Battery-Revised (WAB-R) (Kertesz, 2006), Mississippi Aphasia Screening Test (MAST) (Nakase-Thompson et al., 2005), Boston Diagnostic Aphasia Evaluation-3rd Edition (BDAE-3) (Goodglass et al., 2001), Boston Naming Test (BNT) (Goodglass et al., 1983), Cognitive-Linguistic Quick Test Plus (CLQT+) (Helm-Estabrooks, 2017) and Montreal Cognitive Assessment (MoCA) (Nasreddine et al., 2005).

2.2 Aphasia Assessment at screening level

According to ASHA in 2021, the series of information obtained during the evaluation procedure is necessary to evaluate and describe the communication skills of a person. Many people with aphasia, especially those in the acute and sub-acute phase, are bedridden and cannot be fully tested. Additionally, because aphasia symptoms are inherently unstable soon after a stroke and can change rapidly, thorough testing can be a time-consuming and waste of resources (El Hachioui et al., 2017). Hence, they need rapid and effective screening tools to identify the severity and type of aphasia for individuals at risk.

The screening tests are preferred when compared to the standard diagnostic tests for aphasia in India, such as the Boston Diagnostic Aphasia Evaluation (BDAE, 3rd Ed.) (Goodglass et al., 2001), Western Aphasia Battery (Kertesz, 1982; Kertesz et al., 1979), Linguistic Profile Test (LPT) (Karanth, 2010) and Bilingual Aphasia Test (BAT) (Paradis & Libben, 1987) that is helpful in assessing various skills in persons with aphasia. The standardized test requires the provisions of specialized language and language services, is time-consuming, limited resources are available, and can be more difficult to implement on a large scale in countries such as India, where multilingualism is a very serious concern.

Screening tools available in the western context are Frenchay Aphasia Screening Test (FAST) (Enderby et al., 1986), Sklar Aphasia Scale (SAS) (Sklar, 1973), Bedside Evaluation Screening Test 2nd Ed (BEST – 2) (West et al., 1998), these tests can be used for bedside assessment for at-risk individuals to identify for aphasia during the initial post-acute stages of recovery. The bedside screening is a clinical evaluation in the tradition of classical neurology (Spreen & Risser, 2003). Historically, bedside examination has been a key method for assessing aphasia and it remains a standard tool used by many other professionals such as Speech-Language Pathologists and other allied professionals. The depth of screening tools ranges from unstructured conversations with people with aphasia to structured sets of items, such as pointing, listing the days of the week, etc.

The three common types of screening procedures for aphasia: 1). Bedside screening tool: Used by neurologists, physicians, and speech-language pathologists for clinical evaluation which ranges from unstructured way to structured tests (Spreen & Risser, 2003). 2). Screening tests per se; these tests are made in standardized ways which are highly sensitive and relatively brief. 3). Tests to rule out the specific aspects of language ability in order to diagnose aphasia.

Screening in aphasia assessment can be performed in two ways; 1). The use of tests designed for screening and 2). The use of tests of specific language functions that are accepted as being sensitive to the presence of aphasia and therefore these tests can be used for screening.

The advantages of the bedside screening test are lies in its flexibility, conciseness, and convenience since the professional conduct the examination at the bedside by quickly skipping the areas of strength where there is no evident impairment. The bedside clinical evaluation has been an effective and important method of detecting aphasia. This screening procedure includes simple tasks which are arranged in a hierarchy varies from random conversation to a structured and organized activity like listing out months or pointing to the door (Spreen & Risser, 2003). Test of specific aspects of language functioning assesses various domains of language in a detailed manner (Spreen & Risser, 2003). Table 2 summarizes the various screening tools intended for the identification of aphasia.

Table 2

Details of Western and Indian screening tests

Sl. No	Name of the test	Author's name	Domains	Description	Languages available	Time duration
			WESTERN SCREENING TOOL			
1	**Halstead-Wepman Screening Test**	(Halstead & Wepman, 1949)	• Agnosia • Apraxia • Anomia • Dysarthria	Provide a quick evaluation and preliminary diagnosis of aphasia and its related disorders		30 mins
2	**Sklar Aphasia Scale (SAS)**	(Sklar, 1973)	• Auditory decoding • Visual decoding • Oral decoding • Graphic encoding	Each domain has 5 items. Scoring: 5-point rating scale (0- correct response to 4- no response)	English German	60 minutes
3	**Aphasia Language Performance Scale (APLPS)**	(Keenan & Brassell, 1975)	• Listening • Talking • Reading • Writing	Each domain has 10 items of increasing difficulty. Scoring is 0- 1 ('0' for 'Profoundly impaired' and '1' for 'Insignificant impairment')		20-30 minutes
4	**Frenchay Aphasia Screening Test (FAST)**	(Enderby et al., 1986)	• Comprehension • Verbal expression • Reading • Writing	Comprehension is assessed by pointing to objects and shapes on the picture card. Expression is assessed by verbally describing the scene presented on the card		3-4 minutes

5	**Acute Aphasia Screening Protocol (AASP)**	(Crary et al., 1989)	• Receptive function • Expressive function • Calculation tests	Evaluate patients with moderate to severe impairment of language function. Not suitable for the minimally impaired aphasic patient.		
6	**Sheffield Screening Test (SST)**	(Syder et al., 1993)	• Receptive skills • Expressive skills	The presence of a language deficit/ Aphasia	English	3-5 mins
7	**Bedside Evaluation Screening Test (2nd edition) (BEST-2nd ed.)**	(West et al., 1998)	• Conversational expression • Object naming • Object description • Sentence repetition • Pointing to objects • Pointing to parts of a picture and • Reading	Responses can be in any modality i.e, verbal, gestural (pointing) based on the domains	English	30 minutes
8	**Bedside WAB-R**	(Kertesz, 2006)	• Spontaneous speech- Content • Fluency • Auditory verbal comprehension • Sequential commands • Repetition • Naming	It determines Bedside Aphasia score, Bedside Language score, Bedside Aphasia Type and severity	English	15 mins

9	**Mississippi Aphasia Screening Test (MAST)- English**	(Nakase-Thompson et al., 2005)	• Receptive skills • Expressive skills	Detect potential alteration in different components of language. Determine which aspects of language will require a detailed evaluation.		5- 15 minutes
10	**Language Screening Tool- English (LASTen)**	(Flamand-Roze et al., 2011)	• Picture naming • Sentence repetition • Automatic speech • Picture identification • Verbal commands	It has two versions and each contains five subtests. Evaluate during acute and chronic phases of stroke.	German English French Spanish Chinese	2 minutes
11	**Screenling**	(Hachioui et al., 2012)	• Semantic • Phonology • Syntax	It determines the presence/ absence of aphasia	Dutch	15 mins
12	**Aphasia Rapid Test (ART)**	(Azuar et al., 2013)	• Execution of simple and complex orders • Repetition of words • Repetition of a sentence • Object naming • Dysarthria • Verbal fluency task	This test is helpful in evaluating and monitoring early changes in acute stroke patients. The scores vary from 0 to 26, the high the score value the more severe the impairment.	French English	<3 minutes

13	**Bedside Persian Western Aphasia Battery (P-WAB)**	(Nilipour et al., 2014)	• Spontaneous speech- Content • Fluency • Auditory verbal comprehension • Sequential commands • Repetition • Naming	Adaptation, reliability, and validity of P-WAB-1 were done from WAB-r English for Persian-speaking persons with brain damage.	
14	**Screening Test for Aphasia and Dysarthria (STAD)**	(Araki et al., 2022)	• Language • Articulation • Cognitive Function	It effectively determines the presence of aphasia, dysarthria, and cognitive function	10 mins
			INDIAN SCREENING TOOLS		
1	**Bedside Screening Test- Kannada (BST-K)**	(Ramya, 2011)	• Spontaneous Speech • Auditory verbal comprehension • Repetition • Naming • Reading • Writing	The three-point rating scale is used to score the responses. And has a total of 136 scores.	20 mins
2	**Bedside Screening Test- Malayalam (BST-M)**	(Kanthima, 2011)	• Spontaneous Speech, Naming • Auditory verbal comprehension • Repetition, • Reading, Writing	The three-point rating scale is used to score the responses. And has a total of 136 scores.	20 mins

3	**Bedside Screening Test- Odiya (BST-O)**	(Monalisa, 2012)	• Spontaneous Speech • Auditory verbal comprehension • Repetition • Naming • Reading • Writing	The three-point rating scale is used to score the responses. And has a total of 136 scores.		20 mins
4	**Bedside Screening Test- Telugu (BST-T)**	(Dhaamkar Santosh, 2013)	• Spontaneous Speech • Auditory verbal comprehension • Repetition • Naming • Reading • Writing	The three-point rating scale is used to score the responses. And has a total of 136 scores.		20 mins
5	**Mississipi Aphasia Screening Test (MAST)**		• Naming, • Automatic speech • Repetition • Verbal fluency • Writing • Yes/no responses • Object recognition • Following instructions • Reading	Detect potential alteration in different components of language. Determine which aspects of language will require a detailed evaluation.	Telugu	10-15 mins

6	**Frenchay Aphasia Screening Test-Kannada (FAST-K)**	(Paplikar et al., 2020)	• Comprehension • Verbal expression • Reading • Writing	Assess aphasia in both literate and illiterate populations.	Hindi Bengali Telugu Kannada Malayalam	5-10 mins

2.1.1 Screening tests in the western context

Halstead and Wepman developed the Halstead- Wepman screening test in 1949, which is one of the first screening tests to provide quick assessment and preliminary diagnosis of aphasia and its related disorders. It could also be used to classify the type of disorder, plan a therapeutic plan or evaluate progress in therapy. The test requires about 30 minutes duration to administer. This screening tool focuses on four domains, which include agnosias, apraxias, anomia, and dysarthria. The diagnosis could be expressive aphasia, receptive aphasia, expressive-receptive aphasia, or comments on the concomitant disorders. This test was used initially to assess individuals with aphasia but did not have a robust psychometric foundation.

Sklar introduced and composed Sklar Aphasia Scale (SAS) in 1973, and it included 4 dimensions such as auditory decoding, visual decoding, oral encoding, and graphic encoding. Each dimension has a subtest that further contains five items. The 5-point rating scale is used for scoring where ‘0’ indicates the correct response to ‘4’, which is no response. The screening tool SAS could able to distinguish fluent and non-fluent aphasia from brain-damaged, schizophrenic patients and control group subjects. However, this test fails to differentiate between fluent and non-fluent aphasics.

Keenan and Brassell designed the Aphasia Language Performance Scales (ALPS) in 1975, which is composed of four domains that are listening, talking, reading, and writing, and each domain is arranged according to complexity. Scoring is 1 for insignificant impairment and 0 for profoundly impaired. This test instrument is not standardized and comprehensive.

Enderby et al. developed the Frenchay Aphasia Screening Test (FAST) in 1986, to give medical professionals a quick and easy way to determine whether a patient has a language loss when working with patients who may have aphasia. It has four sections in total such as verbal expression, comprehension, reading, and writing and the administration time for the test is 3- 10 minutes. Picture cards or objects were used to assess comprehension using pointing. Also, concurrent validity was investigated between the two groups and found very high correlations between the two measures (r= 0.87and 0.96 respectively). To check the test-retest reliability, the FAST was administered on 50 older patients with repeat administration one or two weeks later, the result was found to be excellent with Kappa statistics (Kappa= 1.00) (Philp et al., 2002).

A pilot study was conducted by Snow (1987) using Aphasia Screening Test (AST) on 36 lateralized persons with aphasia with an etiology of stroke and tumor. Persons with left hemisphere damage and right hemisphere damage showed a statistically significant difference on only one item among 33 items. Results concluded that only one out of nine comparisons was significant. This study indicated the significant errors and suggested modifying AST.

An experimental study was conducted by Lecours et al. (1988) with a total of 100 neurotypical adults using an aphasia screening test, consisting of tasks like pointing, naming, and repetition abilities in both illiterate and literate populations. A statistically significant difference between the scores of the illiterate and literate population was observed for the tasks. They have concluded that the right hemisphere has a major role in the language in illiterate subjects.

The Acute Aphasia Screening Protocol (AASP) (Crary et al., 1989) was created to offer an objective evaluation of language deficiencies in acute patients who might not be able to withstand a more thorough examination. A preliminary psychometric evaluation of the 'acute aphasic screening protocol' was performed by assessing receptive function, expressive function, and calculation tests; the results revealed that when compared to other aphasia batteries, it exhibited a good content and constructed validity as well as good concurrent validity with the Western Aphasia Battery (Crary et al., 1989). High test-retest reliability demonstrated the procedure's temporal stability. Within and between patients, preliminary inter-judge reliability was high. These findings suggest that the AASP may be a helpful clinical tool for assessing aphasia when used for specified purposes. This tool evaluated patients with moderate to severe impairment of language function and was not suitable for minimally impaired aphasic patients according to Crary et al. (1989).

Al-Khawaja et al. (1996) compared Frenchay Aphasia Screening Test (FAST) (Enderby et al., 1986) with the Sheffield Screening Test (SST) (Syder et al., 1993). The correlation between the scores of receptive skill and comprehension skills on the FAST was 0.74 ($P < 0.001$). The scores on the two tests showed a strong association of 0.89 ($P < 0.001$), with the good correlation coefficient being 0.92 ($P < 0.001$). The total scores on the FAST and the Short Orientation, Memory, and Concentration test (SOMC) correlated favorably, with $r = 0.86$ ($P < 0.001$) and $r = 0.91$ ($P < 0.001$), respectively. The study showed that both assessments had comparable predictive values for detecting and diagnosing aphasia and were straightforward, quick, and easy to administer (Al-Khawaja et al., 1996). Additional benefits of the SST were discovered, including that it did not require specific tools or stimulus cards and was not affected by visual neglect.

The Bedside Evaluation Screening Test- second edition (BEST-2) was published by West et al. 1998, administered the test to 164 individuals with aphasia and 30 typical control individuals. It is efficient and convenient to assess language ability in patients with aphasia among English speaking population. It is a quick test that can be used as a bedside screening tool as well as a screening tool in various other settings to determine the type and degree of aphasia. This test is useful and highly adaptable in acute and chronic aphasia patients. It includes a picture book and contains test stimuli for five subtests namely conversational expression, naming objects, describing objects, repeating sentences, pointing to objects and parts of a picture, and reading. The severity ranges from no impairment to severe impairment based on scoring. An absence of literature was noted in the usage of the BEST-2, and its measurement properties are not available (Salter et al., 2006).

Nakase-Thompson et al. (2005) have presented and validated the Mississippi Aphasia Screening Test (MAST) as an aphasia screening tool to detect possible changes in the various language components in English-speaking stroke patients (Nakase-Thompson et al., 2002; Nakase-Thompson et al., 2005). Further, the psychometric properties of the test showed a sensitivity of 72.7% (low-moderate) and a specificity of 60% (low). MAST requires in-depth and detailed analysis to identify aspects of language. Standard and precise objectives for speech and language therapy rehabilitation programs may be established based on the in-depth analysis. The validity of this study has been published and its accuracy has been demonstrated in patients with language disorders secondary to various sudden events in the brain (Nakase-Thompson et al., 2005). Results found that the MAST has good criterion validity in differentiating neurotypical and persons with aphasia. This has also been validated for assessing patients with minimally conscious states to determine their communicative level (Nakase-Richardson et al., 2009), which makes it distinctive and interesting for neuro-rehabilitation professionals like Speech-Language Pathologists (SLPs). In contrast, the other screening tools available in Spanish, include the ‘‘bedside assessment of language’’ test (Sabe et al., 2008), MAST has many pros, including that it does not include culturally unknown items, does not include any outside material for completion of the assessment, and does not aim to classify based on the type of aphasia. This tool helps us to monitor improvement with time and plan detailed interventions for persons with aphasia. MASTsp is a valid screening tool for language deficits in patients with ischemic or hemorrhagic stroke and has good sensitivity and specificity to differentiate between neurotypical and healthy persons without aphasia from persons with aphasia following a stroke. MAST is practical in its usage, comprehensible, quick, and precise screening tool, which is useful as a screening tool for people with language impairment. MAST aimed to assess function as part of the World Health Organization's triple aim model. This restricts the identification of remarkable improvement in these patients.

A review study of available tools for identifying aphasia post-stroke was done by Salter et al. (2006). They evaluated the psychometric properties of the screening tools available in the literature on post-stroke. Six tools were reviewed and assessed based on validity, reliability, practical utility, and classification sensitivity. The Acute aphasia screening protocol (AASP) (Crary et al., 1989), Frenchay Aphasia screening test (FAST) (Enderby et al., 1986), Mississippi aphasia screening test (MAST), Reitan-Indiana aphasia screening examination (ASE), ScreeLing, and Ullevaal aphasia screening test (UAS) were among them. The authors said that there was a lack of published information that was freely available and constituted a difficulty in evaluating the tools found in their investigation. They concluded by saying that among the tests that they reviewed, FAST had undergone the most extensive reliability and validity testing of all the tools examined. Although the figures stated for the UAS were higher than FAST, the figures could not be found in the published literature. FAST's sensitivity is higher than the UAS's (87 % vs. 75 %), and its specificity is higher (80 % vs. 90 %).

Flamand-Roze et al. (2011) studied the psychometric properties of the Language Screening Test (LAST) (Flamand-Roze et al., 2011), which revealed a sensitivity of 98% (high) and specificity of 100% (high). The Intra-class correlation coefficient was 0.96 (high), and the Inter-rater agreement was 0.998 (high). Besides high parallel form reliability, score heterogeneity exists for individuals with aphasia and desired ceiling effects for those without aphasia. The results motivate a significant investigation of diagnostic accuracy in acute stroke patients. The screening tool LAST has features that include; 1) no written material 2) no complex visual material 3) no evaluation of verbal executive function and 4) suitability for bedside administration.

An attempt is made to adapt the bedside screening tool 'Language Screening Tool' (LAST) (Flamand-Roze et al., 2011) for English speaking population by Flowers et al. (2015). It comprises two versions, each contains five subtests namely picture naming, sentence repetition, automatic speech, picture identification, and verbal commands to assess expressive and receptive language. Each version has 15 items in total where correct response yields 1 score and incorrect or inappropriate yields 0 scores. LAST is a short and quick aphasia screening tool (Average testing time is 124 secs) and consists of two versions that are, LAST-a and LAST-b to avoid retest effects. The Intra-class correlation coefficient was 0.96 (high), and the Inter-rater agreement was 0.998 (high) and also has a high sensitivity of 98% and specificity of 100%. Unlike other screening tools, the LAST has superior psychometric validation and is more practical for acute aphasia settings. The LAST could be used as a routine screening tool because of its better psychometric nature, its construct validity, and practicality (Eusebi, 2013). This screening test doesn't measure verbal fluency whereas other screening tools (Azuar et al., 2013; Crary et al., 1989; Enderby et al., 1986) comprise discourse fluency or semantic fluency. Similarly, the LAST do not have any tasks measuring executive functions.

In 2012, Hachioui et al. studied the reliability and validity of the ScreeLing, by administering the test on 141 subjects (23 with chronic aphasia, and 138 healthy controls) with acute aphasia 2 weeks post-stroke. At 12 days after a stroke, it was found that the ScreeLing was valid and reliable for determining the presence and the severity of aphasia along with the linguistic difficulties present in persons with acute aphasia.

A bedside screening tool named Aphasia Rapid Test (ART) was developed by Azuar et al. (2013) that quantifies the aphasia severity in stroke patients using a 26-point rating scale. It assesses the severity of acute aphasia stroke patients which is composed of six domains such as execution of simple and complex orders, repetition of words, repetition of a sentence, object naming, dysarthria, and verbal fluency task. The test requires about <3 minutes duration to administer. The Aphasia Rapid Test (ART) is a very simple, quick, and reproducible language task, useful in observing early changes in acute conditions in patients with aphasia. It is designed well and easy to translate into any language and as much as possible it is not very language-specific. This tool can be administered by any health care professional without administering any specific test tool. A few obvious limitations of the ART test include, that the test is not used as a diagnostic tool for aphasia and this tool doesn't allow us to classify aphasic syndromes. The inter-rater reproducibility, sensitivity, and predictive value were checked. It was administered on 91 aphasics to check for reproducibility within one week of stroke onset. The weighted Kappa value was 0.93, and the inter-rater concordance coefficient was 0.99. The sensitivity is more than 90% and 80%

specificity (Azuar et al., 2013).

A review study on screening tests for aphasia in patients with stroke was reported where they recognized tests that could differentiate aphasics from non-aphasics and check psychometric properties for feasibility, reliability, and test accuracy (El Hachioui et al., 2017). Nine studies were included in this review study: 1) Frenchay Aphasia Screening Test (FAST) 2) Mississippi Aphasia Screening Test (MAST) 3) Language Screening Test (LST) 4) ScreeLing 5) Sheffield Screening Test for Acquired Language Disorders (SST) 6) Semantic Verbal Fluency (SVF) 7) Ullevaal Aphasia Screening test (UAS) 8) Mobile aphasia screening test (also abbreviated as MAST) and 9) Semantic Verbal Fluency (SVF). And concluded that there are a number of aphasia screening measures for stroke patients; however, many of these tests have not been adequately validated. Among all, LAST and ScreeLing have the most effective diagnostic features. LAST has a short and quick administration time and has an excellent diagnostic odds ratio (DOR).

1n 2021, Araki et al. conducted a validated study on the Screening Test for Aphasia and Dysarthria (STAD) for persons with neurological communicative disorders (Araki et al., 2022). This test evaluates several domains which include; language, articulation, and cognitive function, and is helpful in determining aphasia, dysarthria, and cognitive dysfunction. This brief (10 minutes) screening approach may be helpful in certain circumstances, such as in the early stages of bedside investigations, to quickly assess communicative function before administering other tests, and in situations where more extensive testing is impractical. Overall, sensitivity (82–92%) and specificity (77–78%) were balanced, with moderate to high positive and negative probability ratios (3.7-4.19 and 0.1-0.23). The correlation coefficients between the verbal and nonverbal sections and the Western Aphasia Battery Aphasia

Quotient, Assessment of Motor Speech for Dysarthria, and Western Aphasia Battery Nonlinguistic Skills were 0.89, 0.70, and 0.79 respectively. It was concluded that STAD was shown to have good content and concurrent validity for evaluating communication function in brain damage patients.

2.1.2 Screening tests in the Indian context

Bedside Screening Test- Kannada (BST- K) is a language-specific screening tool that was developed by Ramya (2011) at AIISH, aimed to identify the presence and absence of language disturbances specific to stroke patients. The test includes six domains namely spontaneous speech, auditory verbal comprehension, repetition, naming, reading, and writing with subsections within them. The materials used were in the form of picture cards /real objects and thus the screening kit was prepared. The study was carried out on 30 normal individuals and seven persons with stroke with three age groups varied from 30-40, 40-50, and 50-60 years. The stimuli were arranged in the increasing order of complexity. Each subsection has been provided with the instructions to be followed while administering the tool. Appropriate objects and or picture cards have been provided for the various sub-sections. According to the authors, the test takes about 20 minutes to administer. The study also attempted to compare the performance of normal and stroke patients to gauge the test's sensitivity. According to the normal group's findings, there is no noticeable difference in the three age groups across the subsections. These studies had the following implications- a) Tools can be used to screen stroke patients and evaluate their speech and language abilities. b) The screening tests require less time and provide a quick indication of whether stroke patients have any aphasic deficits. c) The tools can assist in creating an effective management plan for people with aphasia. The limitation of this tool is that we can only assess a person with stroke, the normative was obtained by considering only fewer participants, and also the test is not standardized, and the psychometric properties were unavailable. The same tool was also developed in Malayalam, Telugu, and Odiya languages; Kanthima - Malayalam (2011), Monalisa- Odiya (2012), and Santosh - Telugu (2013).

Nagendar and Ravindra, adapted the Mississippi Aphasia Screening Test to Telugu (MAST-T) in 2012. Three groups were tested for validation of the test: the neurotypical group (n=50), the left hemisphere damage group (n=25), and the right hemisphere damage group (n=05). The exam demonstrated excellent inter-rater reliability (r=0.993), excellent criterion validity (r =0.84), and good concept validity. The LHD group displayed more impairment on both subtests than the RHD group. Additionally, the outcomes demonstrated that neurotypical individuals outperformed both groups on all 46 items, except the object recognition task, which had nearly identical scores for all three groups. Thus, for Telugu-speaking individuals with aphasia, MAST-T is a valid and reliable screening technique for detecting aphasia.

Frenchay Aphasia Screening Test was adapted and validated by Palikar et al. in 2020, to the Indian context namely Telugu, Hindi, and Kannada languages, for the literate and illiterate population. This screening tool focuses on four domains, which include comprehension, expression, reading, and writing. The test requires about 5-10 minutes duration to administer. The test was administered to 116 neurotypical and 115 persons with post-stroke aphasia in the age range 18 years or above. The maximum score was 30 and the threshold values for the diagnosis of aphasia in patients with stroke were 27 and 25, respectively. In the sample, the best cut-off values for aphasia detection had good sensitivity and specificity, falling between 25 and 25.5 (for literate people) and 13.5 to 15.5 (for illiterate people). Moreover, aphasia scores for the WAB and the adapted FAST showed a significant association, demonstrating good convergent validity. The study concluded that it can help distinguish aphasics from neurotypical individuals. In addition, it is important to identify the impaired language skills required for detailed evaluation. Furthermore, suitable for detecting the acute or sub-acute type of stroke and concluded that it can be used for both educated and uneducated patients. However, validation of screening has not been done on any new individuals.

2.2.3 Summary of screening tests

Implementing screening tools ensures accurate and rapid identification of aphasia for early initiation of treatment after stroke, which is feasible (Laska et al., 2008) and effective (Godecke et al., 2012). Early and effective intervention in persons with aphasia improves recovery such as aphasia severity and total communication (Godecke et al., 2012).

There is a limited number of reliable and validated aphasia screening tools suitable for early identification and repeated assessment of aphasia after stroke. Most of the available screening tools are not validated against standardized batteries (Azuar et al., 2013; Enderby & Crow, 1996; Enderby et al., 1986; Nakase-Thompson et al., 2005), and normative are not available (Araki et al., 2022) require lengthy administration (Doesborgh et al., 2003; Halstead & Wepman, 1949; Keenan & Brassell, 1975; Sklar, 1973; West et al., 1998), and contain items that rely on executive functions (Azuar et al., 2013; Crary et al., 1989; Doesborgh et al., 2003; Enderby et al., 1986; Nakase-Thompson et al., 2005) or not available in different Indian languages, especially in Hindi languages.

So from the above review of literature, it can be concluded that professionals like neurologists, physicians, and speech-language pathologists do use screening tools for bedside evaluation as well as in normal clinical setup to rule out the presence or absence of aphasia. It has to be administered to all the patients to rule out aphasic components who are at risk of aphasia after brain injury.

2.3 Bedside Western Aphasia Battery-Revised

The Western Aphasia Battery Revised (WAB-R) (Kertesz, 2006) is a widely and consistently used clinical instrument for the assessment of adult language deficiencies in English and several other languages (Kang et al., 2010) including Indian languages. The test WAB-R was developed and standardized in the Tamil language (Hema & Vasuprada, 2019) and Bangla language (Mazumdar et al., 2018). It is used to assess language function after a stroke, dementia, or other acquired neurological illness, it is known as the Bedside Western Aphasia Battery-Revised (Bedside Record Form) (Kertesz, 2006). It has been stated to have excellent internal consistency, validity, and test-retest reliability (Kertesz, 2006). Kertesz and Poole (1982) developed WAB and Kertesz (2006) revised it to assess language modalities in adult patients with aphasia aged between 18 to 89 years (Kertesz, 1982, 2006). The modified version of the WAB-R contains the contents of the previous WAB. But it comprises two additional tasks (reading and writing of irregular and non-words) that help clinicians distinguish between surface, deep (phonological), and visual dyslexia (Kertesz, 2006).

The scoring pattern in the WAB-R provides four versions and three quantitative measures: The Aphasia Quotient (AQ), which gives the essential summary value of the individual aphasic deficit and is proportionate to the severity of aphasia irrespective of the type and cause. The Language Quotient (LQ) combines verbal and written language scores to emphasize the importance of communication and the relationship between these two modalities. The Cortical Quotient (CQ) includes optional nonverbal tests, apraxia, and written language tests in supplement to the AQ to provide a balanced summary of focal cortical functions (Kertesz, 2006; Kertesz & Poole, 1974). The interesting point is the bedside WAB-R comprises six subtests and takes about 15 minutes to complete. Based on the raw scores, AQ can be determined (Cummings, 2008; Kertesz, 2006). Because the WAB-R is a criterion-referenced exam based on the AQ, LQ, and CQ, it can be used to quantify the severity of aphasia in clinical and research settings. According to reports, the AQ has a high predictive value in stroke and could be used to classify Alzheimer's disease and Primary Progressive Aphasia in degenerative diseases (Kertesz, 2006).

Bedside aphasia screening tools are more effective in the early diagnosis of aphasia; one of a kind is the Bedside record form of WAB-R. The Bedside WAB-R consists of nine linguistic subtests which include Spontaneous speech, Fluency, Auditory verbal comprehension, Sequential commands, Repetition, Object naming, Reading, Writing, and Apraxia. Each subtest has a raw score of 10. Based on the raw scores recommended in the WAB-R manual, a percentile Aphasia Quotient (AQ) can be formulated to determine the severity of aphasia (Kertesz, 2006). The WAB-R Bedside record form includes the following 9 sections and each object is preceded by an appropriate space to record the patient’s responses. Scores are given as a baseline assessment of the severity of aphasia or the patient’s ability to undergo rehabilitation or surgery. It gives us three measures 1) the Bedside Aphasia Score, 2) the Bedside Language Score, and 3) the Bedside Aphasia Classification. These measures can be used to determine the type and the severity of aphasia and highly correlate with the quotients obtained from WAB-R (Kertesz, 2022).

The language subscales of the Bedside version of WAB-R were chosen to represent equally important functions of spoken language in achieving the numerical percentile index of severity (AQ) (Kertesz & Poole, 1974). The Bedside **Aphasia**

Score is a combination of Content, Fluency, Auditory verbal comprehension, Sequential commands, Repetition, and Object naming score. The Bedside **Language Score** is a combination of Content, Fluency, Auditory verbal comprehension, Sequential commands, Repetition, Object naming, and Reading and Writing score (Aphasia Score plus the reading and writing score). Finally, **the Bedside Aphasia Classification** helps us calculate the patient’s Bedside Aphasia classification, by comparing the patients' Fluency, Auditory Verbal Comprehension, and Repetition scores associated with the type of Aphasia.

A sociolinguistic translation of the English aphasia test Western Aphasia Battery-Revised (WAB-R) (Kertesz & Raven, 2007) into the Bangla language was studied by (Mazumdar et al., 2018). Three types of adaptation processes were included, the introduction of new words or phrases, direct translation, and direct translation replacing concepts was involved. Record form Part 1, gives aphasia quotient (AQ) which obtained 25% of sociocultural and linguistic changes, but Record form Part 2 gives cortical quotient and language quotient which obtained 57% of such changes. Bedside Record form's items were collected from Record Form Part 1 and 2. The performance of the normal controls was much higher than that of the patients, who performed significantly less well on most of the sub-tests. According to their test results, 80% of the patients had aphasia, and researchers were able to group the patients into different types of aphasia based on the AQ and bedside aphasia score. The Record form Part 1 subtest scores and the Bedside record form subtest scores had a high correlation. Preliminary validation research showed that the Bangla WAB-R could distinguish between the healthy population and aphasia patients based on language skills.

Studies reported that there is a strong concurrent validity in the chronic phase was shown by the close correspondence between summary measures from the Quick Aphasia Battery and associated measures from the WAB (Wilson et al., 2018). In numerous clinical groups, correlations between the Western Aphasia Battery and the Cognitive Linguistic Quick Test were discovered to be statistically significant (Kong, 2016). According to the pattern of correlations found with other measures like the WAB, the Communicative Effectiveness Index (CETI) was valid as a measure of change in functional communication skills (Lomas et al., 1989). Nearly all patients can be categorized using the WAB-R, which divides patients into one or more syndromes based on scores of fluency, naming, understanding, repetition, and auditory comprehension. A considerable number (50–60%) of aphasias cannot be classified using conventional descriptions or the BDAE (Ochfeld et al., 2010). In other investigations, there was less concordance between clinical impression and WAB classification (John et al., 2017).

The reliability and validity of the Bedside version of the Persian WAB (P-WAB-1) adapted from the Western Aphasia Battery (WAB-R) were assessed (Nilipour et al., 2014). P-WAB-1 was a short and quick bedside screening tool to measure the severity and type of aphasia in patients with brain damage based on Aphasia Quotient (AQ). The adaptation, reliability, and validity of P-WAB-1 were performed for 30 neurotypical, 60 patients with brain damage, and 40 epileptic patients. Based on the results of this study, this screening tool has good internal consistency (a= 0.71) and good test-retest reliability (r= 0.65, p< 0.001). AQ score was calculated to classify the aphasics into four distinct groups of severity. This screening tool was considered as an effective baseline for screening and diagnosis of Persian-speaking persons with brain damage. This study was the first step toward the adaptation of different versions of WAB-R to calculate the severity and type of aphasia using AQ, LQ, and CQ.

A review study was done on the Western Aphasia Battery to track its research and clinical applications in patients with aphasia (Kertesz, 2022). The WAB has been extensively used to evaluate patients with aphasia in the clinical setting and for research purposes, in stroke and degenerative brain disorders. Few limitations of the WAB with respect to its classification were discussed mainly; 1) The cut-off score used to classify aphasia has been considered by some to be too conservative, but many professionals use this as a standard score 2) Spontaneous fluency and grammaticality of speech are based on grading and are subject to greater inter-rater variability, affecting the classification of aphasia 3) classification of aphasia is based on the neural model instead of psycholinguistic theory (Kertesz, 2022). While there is still debate as to how to define aphasia and the classification also remains controversial, their effectiveness for recovery or anatomical studies is well supported. The acceptance of the test WAB by researchers and clinicians is because of its construct validity, its measurement of fundamental and unique language functions, and its comprehensiveness and length of procedure, which allow it to be used with a wide range of patients (Kertesz, 2022)

Hindi is the national language of India and is spoken in different parts of the continent. Hindi is written in the Devanagari script, a left-to-right writing system with a very characteristic top line. The major concentration of speakers of the language in the Indian states of Uttar Pradesh, Uttaranchal, Madhya Pradesh, Chhattisgarh, Bihar, Jharkhand, Haryana, Rajasthan, Himachal Pradesh, and Delhi. However, assessing persons with aphasia in these states using a standardized tool is not possible due to the limited number of tests in the Hindi language. Thus, it is necessary to have culturally standardized tests to identify the problem and classify them into various groups for diagnosis, therapy, and prognosis for Hindi-speaking persons with aphasia.

Hence, it can be concluded from the literature that professionals use screening tools in research and clinical settings. However, there have been few attempts to develop such tools in Hindi and the existing screening tools do not provide us with results that include the benefits of Bedside WAB-R. The objective of the present study is therefore to adapt and validate the bedside version of WAB-R in Hindi.

CHAPTER III

METHOD

In a country like India where there are numerous ethnocultural differences present, it sometimes becomes difficult to adequately assess the problem of the person and list the shortcomings if the assessment tool is not available in his/ her native language. Apparently, in western countries, there are different tools for people with aphasia, but not sufficient tools in the Indian context. This view urged to make an effort to adapt Bedside Western Aphasia Battery- Revised (Bedside WAB-R) in the Hindi language from the Bedside Western Aphasia Battery- Revised in English (Kertesz, 2006).

3.1 Research design

The present study is a descriptive study reported to develop by adaptation and validation of the Bedside WAB-R for Hindi speakers with aphasia. In addition, a standard group comparison method was used to compare the scores of persons with aphasia and neurotypical individuals. A cross-sectional study design and purposive sampling were used for the present study.

3.2 Participants

Twenty-five participants were considered for the present study and were grouped under two headings, Group I (clinical group) and Group II (control group). Group-I included 10 persons with aphasia and Group II included 15 neurotypical individuals in the age range of 18 to 89 years. All the participants were right-handers. The demographic details were obtained from the participants using a self-reporting questionnaire. Information regarding their education, the onset of the problem, age at the onset of the problem, handedness, and absence or presence of any associated problem like hemianopia or hemiplegia was collected from participants or caregivers.

3.2.1 Ethical Consideration

For the persons with aphasia, the participant and family member/caretaker were explained the objective and procedure of the present study, and a consent form was signed by the participants or the caregivers. All India Institute of Speech and Hearing, Mysore, ethical committee guidelines for Bio-behavioral Sciences for human subjects (2009) were followed in the present study for collecting data.

3.2.2 Sources of the participants

Persons with aphasia were selected from Netaji Subhash Chandra Bose Medical College, Jabalpur, and Ali Yavar Jung National Institute for the Hearing Handicap, Kolkata. The information or data were collected online via videoconferencing by the candidate. And all the participants followed specific inclusionary and exclusionary criteria as mentioned below.

3.3 Inclusionary criteria for the persons with aphasia

- All the participants were diagnosed with aphasia by the speech-language pathologist on the administration of Western Aphasia Battery and confirmed by the neurologist with reference to the radiological evaluation.
- Any associated disorders like dementia, other psychological illnesses, and sensory deficits reported in the informal interview were excluded (e,g, visual, and auditory deficits).

3.4 Inclusionary criteria for the neurotypical individuals

- Participants with no history or complaint of speech, language, hearing, sensory, cognitive, or other communication disorders were considered based on self-report.

- They do not have symptoms of any severe emotional, behavioral or physical disorders based on self-report.
- A WHO Ten-Question Disability Screening Checklist (Singhi et al., 2007) was used to examine all the subjects for hearing, intelligence, motor function, and behavioral and emotional factors.
- Cognition was normal as per Montreal cognitive assessment (MoCA) (Nasreddine et al., 2005) and the scores obtained were below the cut-off score (>28 scores) for each participant.

3.5 Inclusionary criteria for neurotypical individuals and persons with aphasia

- Participants were proficient in the Hindi language and their mother tongue (L1) was Hindi and L2 was English (most frequently used/or medium of instruction at workplace/ academic places) and information about the other language if any was noted.
- These individuals were having a minimum of 10 years of formal education irrespective of the medium of instruction. However, the medium of instruction was also noted.

Table 3

Details of participants in the study

Types of population	Age range (in years)	Mean Age	Number of participants
Neurotypical participants	18-89	52.6	15
Persons with aphasia	18-89	47.6	10

Table 4

Demographic details of Persons with Aphasia

Sl. No	Age (Yrs)	Sex	Education	Handedness	Time post onset of stroke (Yrs)	CT scan report	WAB Scores	Diagnosis
1	72	F	10th	Right-handed	2 years	Multiple small to moderate size confluent areas of restricted diffusion in the left cerebral hemisphere consistent with recent non-hemorrhagic infarcts in the near complete left MCA territory	20	Broca's aphasia
2	35	M	BA	Right-handed	6 months	Sub-acute infarct in bilateral corona radiata. Mild periventricular ischemic changes. Chronic hemorrhages in the basal ganglia region. CVA infarct	21.2	Broca's aphasia
3	35	M	12th	Right-handed	6 years	MCA territory infarct acute coronary syndrome with cardio embolic stroke	63.8	Broca's aphasia
4	46	M	LLB	Right-handed	4 months	CVA infarct- acute infarct in distal left MCA hemorrhage	32.8	Conduction aphasia
5	31	M	11th	Right-handed	7 months	Left temporo parietal lobar region infarction	7.2	Global aphasia
6	36	M	MBA	Right-handed	12 years	Cortical atrophy with bilateral fronto parietal temporal lobe, chronic infarct bilateral basal ganglia compression.	22.8	Broca's aphasia

7	70	F	Engineering	Right-handed	1.6 years	Sub-acute infarct in the left frontal lobe left centrum semi-ovale, left parietal lobe, and left occipital lobe	24.5	Broca’s aphasia
8	64	M	LLB	Right-handed	4 years	Acute infarct in left MCA territory with chronic microvascular ischemic changes seen in supratentorial	82.6	Transcortical motor aphasia
9	55	M	BSc	Right-handed	1.8 years	Acute large infarct in the left frontal-parietal region	81	Transcortical motor aphasia
10	32	M	BSc	Right-handed	6 months	Acute infarct in left parieto-occipital lobe	89	Anomic aphasia

Note. M= male, F= female, Educational Qualification: BA= Bachelor of Arts, LLB= Bachelor of Laws, MBA= Master of Business Administration, BSc= Bachelor of Science

3.6 Procedure

The present study was conducted in four phases, Phase 1- Sociocultural Adaptation and Translation of Bedside WAB-R to the Hindi language; Phase 2- Subsections considered in the Bedside WAB-R; Phase 3- Content Validation of the adapted and developed Bedside WAB-Revised in the Hindi Language; and Phase 4- Pilot study.

3.6.1 Phase 1: Sociocultural Adaptation and Translation of WAB-R Bedside record form to the Hindi language

At first authors' consent was obtained prior to the initiation of the present study to adapt and translate the bedside WAB-R into the Hindi language (Kertesz, 2006). The test was adapted from the standardized tool Bedside WAB-R (Kertesz, 2006) in the Hindi language. Before the translation began, the original version of the screening test was carefully analyzed and the sociocultural appropriateness of the stimulus was taken into consideration. The test stimuli were modified based on the cultural and linguistic adaptations for the Indian context while the method of the test administration and scoring remained the same. A literal translation of the questionnaire was not enough and it needed to be adapted to a particular language (Hindi). Regardless of the cultural differences in terms of the definitions, vocabulary, and expressiveness of the language, the newly translated screening test should assess the same objective that it was intended to convey.

For the sociocultural adaptation, one native Hindi-speaking Speech Language Pathologist (with a Ph.D. degree) and proficient in English were asked to analyze the stimulus of the screening test and to suggest modifications wherever necessary. As suggested by the examiner, few modifications were incorporated while translating the screening tests. Since we do not culturally use a name such as "Smith" and surname such as “Brown” it was changed to “Rahul” and “Kumar” respectively. Furthermore, as the present test is a screening test developed for patients with aphasia mainly those in the acute stage or sub-acute stage and mostly the test would be administered in a hospital setup, few stimuli were changed based on the easy availability of items under the domain of “Object naming” such as “bed” and “pillow” were changed to “coin” and “book” respectively.

The following steps were followed in this study for the translation (Brislin, 1970), and the Hindi-translated Bedside WAB-R screening test is attached in Appendix A.

Step I- Forward Translation: Initially, the investigator used the forward translation procedure for direct translation from the source language (English) to the target language (Hindi) which was carried out by two professional experts. One was by the Speech-Language Pathologist, who was a native Hindi speaker, and an expert in reading and writing the same language. The other expert was the Linguist, with an affiliation of Ph. D in linguistics who was a native Hindi speaker and skillful in reading and writing the Hindi language, and reverse translation was carried out using a method introduced by Brislin, (1970). While translating the test materials syntactic and semantic aspects of the Hindi language were looked at in detail.

Step II- Synthesizing Common Translation: The two forward translated versions were then compared by the researcher to identify and resolve the poorer word selections and then corrections were made.

Step III- Backward Translation: The final forward translation was given for blind backward translation to two translators except for the previous ones (both were informed regarding the concepts). One was by a teacher expert in Hindi and another by a Speech-Language Pathologist who was a native Hindi speaker. The two backward translated versions were then compared by the researcher to identify the conceptual errors and inconsistencies were identified and modified.

Step IV- Expert Committee Review: The Hindi-translated versions of the Bedside WAB-R were matched with the original Bedside WAB-R (Kertesz, 2006) English version by the SLP as the final stage to cross-check and identify the discrepancies in the translation process. Their suggestions and feedback were considered to correct the final translated version.

3.6.2 Phase 2: Subsections considered in the WAB-R Bedside Record form (Brief description and scoring and interpretation)

Description of the test

The present screening tool has subtests based on analogous outlines as that of bedside WAB-R. Under each subtest, the stimulus material was developed. These stimulus materials are mainly translations of the bedside WAB-R English version, but few modifications were done based on the frequency of the occurrence of the words, the availability of the stimulus in the testing environment, considering the cultural context, the difficulty of pronouncing the words and the grammatical forms to suit linguistic principles of Hindi language. Thus the subtest of the study was as follows and the summary is shown in Table 5.

Subsection I and II: Spontaneous Speech- Content and Fluency

This section is aimed to elicit the patient’s spoken language in response to interview questions and picture descriptions. Two significant domains of spontaneous speech to be examined were the information content and fluency. It comprises four questions which were primarily the translations of the original bedside WAB-R and the picture card. This picture card has been modified based on Indian culture.

General conversation was carried out with the participant and the examiner observed the person's speech and language skills with respect to fluency and information content. The examiner made a note which included any effort during speech production, hesitation, paraphasias (phonemic, semantic, and neologistic), word-finding difficulty, circumlocutions, rate of speech, short phrase length, and any semantic or syntactic errors. For conversational questions, the person had to verbally respond to three questions (e.g., name, address, and reason for being in the hospital) and for picture description, the person had to describe the picture given in the stimulus book.

Scoring: Information content and fluency were scored according to the set criteria for spontaneous speech (see Appendix A).

Subsection III: Auditory verbal comprehension

As the patient's performance is often complicated by difficulties with oral expression, apraxia, and intellectual functions, the reception task attempts to cover various aspects of this feature by using “Yes- No questions”.

Yes- No Questions: The patient was asked to respond (by nodding) ‘Yes’ or ‘No’ to 10 stimuli orally or by gestures. The first four questions were the most appropriate for the patients. The next two questions are about the environment and the last four are more general in their context, although they are semantically simple, they are short, and the linguistic complexity requires a deeper comprehension of syntax.

Instruction: I'm going to ask you some questions. Answer ‘yes’ or ‘no’. Patients may respond verbally or gestural.

Scoring: Score 1 point for each correct response and if the response was inconsistent or ambiguous, score 0.

Subsection IV: Sequential commands

This subtest was also used to examine the comprehension of syntax and its execution which consists of 4 commands. The first three commands would be short and very simple and the last one was a complex command. Mostly, sequential commands involve the influence of touching one object with another using prepositions of "on/ top" "over" etc.

Materials: Coin, piece of paper, and pen

Instruction: Place a coin, a piece of paper, and a pen in front of the patient. Say, see the coin, the paper, and the pen. I will ask you to point to them and do things with them. Are you ready? Read each item.

Scoring: The maximum score of this domain is 10. Each correct response, partial response, and no response for the task was given a score of 2, 1, and 0 respectively.

Subsection V: Repetition

Complex words, numbers, a combination of numbers and words, sentences with high and low probability, as well as words with a high frequency of use were repeatedly checked for length and grammatical complexity. It included a test of oral dexterity; it checks stimuli containing all the letters and checks sentences that comprise small grammatical words. For example, if the examiner says "Window" the participant has to repeat just the word "Window".

Instructions: Ask the patient to repeat the words listed below. Say, repeat these words. Say window.

Scoring: Scored 1 point for each recognizable word. Minor dysarthric errors or colloquial pronunciations were scored as correct and subtracted 0.5 points for each phonemic paraphasia or word order error.

Subsection VI: Object naming

Twenty common easily available prototypical objects were shown individually. It included various categories, forms, and sizes. The patient was asked to name the target object that was visually presented. In case of ‘no response’ or invalid response, the patient is permitted to participate and if required, the first phoneme of the word is provided as a cue. For example, if the picture presented was “pen” the participant should name it “pen”.

Instruction: Ask the patient to name objects in the room. Say, what is this? Or what is the name of this object?

Scoring: Scored 0.5 points for each correct response or with minor articulatory error.

Subsection VII: Reading

Reading tasks were designed to assess the visual-verbal function which was also important in the diagnosis of aphasia. A short paragraph was presented and participants were asked to read it. Also, the reading comprehension was determined by asking a few questions with respect to the reading passage.

Instruction: Ask the patient to read a paragraph aloud from a magazine. Determine the level of reading comprehension by asking questions.

Scoring: Scored 5 points for correct and fluent sentences and 1 point is deducted for each significant wrong utterance or omission error. Additionally, 5 points were scored for reading comprehension.

Subsection VIII: Writing

Writing task assesses the orthographical representation, which was important in the diagnosis of aphasia. For the writing task, the person was asked to write their name, address, etc. and along with that a picture was shown and instructed to write in semantically and syntactically corrected sentences regarding the picture.

Instruction: Place a piece of paper and pen on the table and say, write whatever I'm dictating to you as well as write about what is happening in the picture.

Scoring: Scored according to the set criteria for writing (see Appendix A).

Subsection IX: Apraxia

Description: Five commands corresponding to the upper limb and other body parts to assess a person's performance on an apraxia task. This task would tell whether the person with aphasia was associated with apraxia or not.

Instruction: Say. I'm going to ask you to do some things. Try to do them as well as you can.

Scoring: The patient scored 2 for each task for acceptable performance.

Table 5

Subsections of the Bedside WAB-R subsections

Sl No	Domain	Task Given	Patient response and Scoring	Test Stimuli	Total Score
1.	Spontaneous Speech	Content: Three 'wh' questions and one picture description task was given.	Based on length and complexity of sentences, word-finding difficulty, and paraphasias.	1. How are you today? 2. What is your full address? 3. Why are you here? 4. Show the patient a magazine picture of some complexity. Say, Tell me what is happening in this picture.	10
		Fluency:	Rated based on the picture description. Where, 10 = Normal speech, 9 = Some hesitations and word-finding difficulty, 8 = Circumlocutory, fluent speech with semantic paraphasia and word-finding difficulty, 7 = Fluent phonemic jargon, resemblance to English syntax and phonology, 6 = Logopenic but normal syntax; few, if any, paraphasias; significant word-finding difficulty, 5 = Halting, paraphasic, but more complete sentences; significant word-finding difficulty, 4 = Agrammatic, effortful; verb-noun phrases, but only one or two propositional sentences, 3 = Mostly unintelligible, low volume mumbling; some single words, 2 = Single words, often paraphasias, effortful and hesitant, 1 = Recurrent, stereotypic utterances with meaningful intonation, 0 = No words or short, meaning utterances.	Picture stimulus was used	10

2.	Auditory Verbal Comprehension	Ten Yes/No Questions were asked.	The patient may respond verbally or gestural and a score of 1 or 0 is given.	1. Is your name **Rahul**? 2. Is your name **Kumar**? 3. Is your name _____? 4. Are the lights on in this room? 5. Are you a doctor? 6. Is the door closed? 7. Will paper burn in fire? 8. Does March come before June? 9. Do you eat a banana before you peel it? 10. Is a horse larger than a dog?	10
3.	Sequential Commands	Four commands of increasing order of complexities were given. The patient was asked to follow the command.	Coin, piece of paper, and pen were used. Scoring will be based on the complexity of the command. Each command fetches a score of 1.	1. Point to the coin and the pen. 2. Point with the pen to the paper. 3. Point to the pen with the paper. 4. Put the pen on the paper and turn over the coin.	10
4.	Repetition	Patients were asked to repeat six words and sentences of increase in complexity of syntactic structure.	Scoring was based on the complexity of the sentence. 0.5 would be deducted for phonemic paraphasia or word order error.	1. Bed 2. Window 3. Forty-five 4. The telephone is ringing. 5. No ifs, ands, or buts. 6. The quick brown fox jumps over the lazy dog.	10

5.	Naming	Patients were presented with twenty items one by one and asked to name each object.	A score of 0.5 was given for each correct response.	**1. Coin** 2. Telephone **3. Book** 4. Color of an article of clothing 5. Elbow 6. Door 7. Magazine/Calendar 8. Shoulder 9. Glass/cup 10. Key 11. Hair 12. Chair 13. Watch band 14. Collar 15. Button 16. Light 17. Pen 18. Straw 19. Window 20. Index finger	10
6.	Reading	The patient was asked to read a paragraph aloud from a magazine.	Patients were scored according to reading fluency and correctness of words. Scoring of up to 5 points for fluent, correct sentences and 5 extra points for reading comprehension. 1 point was deducted for significant error or omission.	Reading material from magazine/ newspaper	10
7.	Writing	Four writing tasks with increasing order of complexity were given. Scores of tasks increase as complexity increases.	A paper and pen were provided to the patient, he/she has to respond to the questions asked through writing mode and were scored accordingly.	1. Write your name. 2. Write your address. 3. Write, "The telephone is ringing!" 4. Picture description	10

8.	Apraxia (Optional)	Five different commands were presented to the patient, with increasing order of complexity.	A score of 2 was given per task if the patient carries out the command appropriately.	1. Wave goodbye. 2. Close your eyes. 3. Pretend to blow out a match. 4. Pretend to use a toothbrush. 5. Pretend to knock at a door and open it.	10 (optional)
Total	7+1 Domains	49+4 Tasks	-		80+10

Note. + Indicates Tasks and Scores from the Apraxia domain as it is optional

As shown above, the present test contained subtests that were based on the same principles as the WAB-R. Domains of each subtest were mainly translations of WAB-R English, with some material updated to account for India's cultural settings and the Hindi language's linguistic principles.

Interpretation

The screening tool provides 1). The Bedside Aphasia Score; The total scores of spontaneous speech content, fluency, auditory verbal comprehension, sequential commands, repetition, and object naming divided by 6 and then multiplied by 10 gives the Bedside Aphasia Score. 2). The Bedside Language Score; The total scores of spontaneous speech content, fluency, auditory verbal comprehension, sequential commands, repetition, object naming, reading, and writing divided by 8 and then multiply by 10 gives the Bedside Language Score. The Bedside Language Score is being used to assess cognitive function. 3). The Bedside Aphasia Classification, helps us to classify the type of aphasia (Global aphasia, Broca's aphasia, Isolation aphasia, Transcortical aphasia, Wernicke's aphasia, Transcortical sensory aphasia, Conduction aphasia, and Anomic aphasia) based on the scores of Fluency, Auditory Verbal Comprehension, and Repetition.

Thus, the screening test with the sections mentioned above provides information about the aphasia type within a 15-minute administration. The bedside aphasia score and bedside language score serve as a baseline for therapy and/or give a quick diagnosis of the presence or absence of aphasia (Kertesz, 2022).

3.6.3 Phase 3: Content Validation of the adapted and developed Bedside WAB- Revised in the Hindi Language

After preparing the translated screening test in the Hindi language, the test items were reviewed by three Speech-Language Pathologists for content validity, who were native Hindi speakers, fluent in reading and writing Hindi, and had a minimum of two years of work experience as Speech-Language Pathologists. The rating of stimuli was done using a content validation questionnaire (Goswami et al., 2012) which has parameters like simplicity, familiarity, size of the picture, color and appearance, arrangement, presentation, volume, relevance, complexity, iconicity, accessibility, flexibility, trainability, stimulability, feasibility, generalization, the scope of practice, scoring pattern, publications, outcomes and developers and coverage of parameters, and they were asked to rate using a 5-point rating scale (where 0- very poor, 1- poor, 2- fair, 3- good, 4- excellent). Valid recommendations and suggestions from the reviewers were considered for finalizing the screening tool which suits the Indian context. The three SLPs investigated the translated screening test with mostly scores 3 and 4 for all the items and therefore implied that the stimulus represented good socio-cultural appropriateness and clarity.

3.6.4 Phase 4: Pilot study

The final adapted Bedside Western Aphasia Battery- Revised in Hindi was administered to the two groups, the clinical population involving persons with aphasia and neurotypical individuals. It was administered to 10 persons with aphasia and 15 healthy adults in different seating sessions depending on the comfort of each individual. Depending on the task, the presentation of picture cards was varied and verbal instructions were given to perform the tasks.

Arrangement and mode of data collection

For the Group I participants, the picture cards and objects were placed on a table in the order of the presentation, in front of the participant. The participants of Group I was asked to sit comfortably in front of the table where it was suitable for him/ her to pick up the picture cards or objects that were presented. For Group II participants, the administration was via online mode, and the picture cards were presented through mobile/ laptop where the person with stroke was seated comfortably to visualize whereas the objects were presented by the caregiver with prior information to the caregiver. The objects and picture cards that are not required during the administration of particular subtests were kept out of the visual field of the participant to avoid any distractions.

3.7 Statistical analysis

The scores were coded and then subjected to IBM SPSS software (20 versions) for statistical analysis. Mean (X), Median (M), and Standard Deviation (SD) values were calculated across the domains to compare neurotypical individuals and persons with aphasia. Then a test of normality was performed to check whether both groups follow a normal distribution.

CHAPTER IV

RESULTS

The main rationale of the study was to adapt and validate a Bedside Western Aphasia Battery- revised (WAB-R) screening test for persons with aphasia in the Hindi Language. The study aimed at developing Bedside WAB-R in Hindi by adapting from Bedside Western Aphasia Battery-Revised (WAB-R) (Kertesz, 2006) of the English language, which is sensitive in early identification of the presence or absence of aphasia in persons with stroke. The study contains two groups of participants: 1) Neurotypical individuals (age ranges 20 to 80) and 2) Persons with aphasia (age ranges 20 and above). The objectives of the study were (a).To develop Bedside WAB-R in Hindi by adapting from Bedside Western Aphasia Battery-Revised (WAB-R) (Kertesz, 2006) of the English language. (b).To determine the content validity of the constructed screening tool by administering it to neurotypical individuals (NTI) and persons with aphasia (PWA).

The quantitative data collected from 25 participants (10 persons with aphasia and 15 neurotypical participants) were subjected to statistical analysis using Statistical Package for the Social Sciences (SPSS-20.0 version) software. The descriptive analysis was carried out to find Mean (X), median (M), and Standard deviation (SD) scores for all domains and was extracted by comparing the tabulated raw scores between the groups. The results of this study are documented under two headings, 1) The content validation of the adapted test and 2) The pilot study.

4.1 Content validation of the Adapted test

The adapted B-WAB-R was subjected to content validation. The test stimuli and pictures for the test were selected based on the ratings on the 'Feedback questionnaire' (see Appendix B) given by three speech-language pathologists (SLPs) with at least 2 years of working experience who held a Master's Degree in Speech-Language Pathology and proficient in the Hindi language. The stimuli were rated by a questionnaire based on the tool developed by Goswami et al. (2012). The parameters considered in the 'Feedback questionnaire' were simplicity, familiarity, size of the picture, Color and appearance, arrangement, presentation, volume, relevance, complexity, iconicity, accessibility, flexibility, trainability, stimulability, feasibility, generalization, the scope of practice, scoring pattern, publications, outcomes and developers (professional background) and coverage of parameters (reception and expression) were asked to rate using a 5 point rating scale (where 0- very poor, 1- poor, 2- fair, 3- good, 4- excellent). And all three validators were requested to validate each stimulus of the adapted test material for all the parameters listed in the 'Feedback questionnaire'. The majority of the responses for each of the test items by all the validators were more or less similar, and the same was considered validated responses, as shown in the tables below. The suggestions and recommendations of the validators were taken into consideration, and changes were made to the test. Results were found to be similar and the same was considered validated responses as shown in the following Table 6 to 13.

Table 6

Content Validation scores obtained for the domain- Spontaneous Speech Content and Spontaneous Speech Fluency

	S			**F**			**A**			**R**			**C**			**I**			**FL**			**ST**			**G**			**SP**			**Size of picture**		
Validators	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
SSC1	4	4	4	3	4	4	3	-	3	4	3	3	3	3	3	3	3	3	3	4	3	3	3	3	3	3	3	4	3	3	-	-	-
SSC2	3	3	4	4	3	4	3	-	3	3	3	3	3	3	3	3	3	3	3	4	3	3	3	3	4	3	3	3	3	3	-	-	-
SSC3	4	3	4	3	3	4	3	-	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	3	3	3	3	3	-	-	-
SSC4	3	3	4	3	3	4	3	-	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
SSF	4	3	4	4	3	4	3		3	3	3	3	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	3	3	-	-	-
P	3	3	4	3	3	4	3	-	3	3	3	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Note. SSC= Spontaneous Speech Content, SSF= Spontaneous Speech Fluency, P= Picture, C1= Content Validator 1, C2= Content Validator 2, C3= Content Validator 3. S= Simplicity, F= Familiarity, A= Arrangement, R= Relevance, C= Complexity, I= Iconicity, FL= Flexibility, ST= Stimulability, G= Generalization, SP= Scoring Pattern. This table demonstrates the content validation scores for the spontaneous speech section, including the picture description task. As seen above almost all the items were scored between good and excellent. The suggestions and recommendations received by the validators were considered, and changes are incorporated into the constructed test.

Remarks: No Remarks, hence no changes were made.

Table 7

Content Validation scores obtained for the domain- Auditory verbal Comprehension

	S			**F**			**A**			**R**			**C**			**I**			**FL**			**ST**			**G**			**SP**			**Size of picture**		
Validators	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
AVC1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
AVC2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
AVC3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
AVC4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
AVC5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
AVC6	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	-	-	-
AVC7	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
AVC8	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
AVC9	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
AVC10	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-

Note. AVC= Auditory Verbal Comprehension, C1= Content Validator 1, C2= Content Validator 2, C3= Content Validator 3. S= Simplicity, F= Familiarity, A= Arrangement, R= Relevance, C= Complexity, I= Iconicity, FL= Flexibility, ST= Stimulability, G= Generalization, SP= Scoring Pattern. This table demonstrates the content validation scores for the Auditory Verbal Comprehension domain. As seen above all the items were scored between good and excellent. The suggestions and recommendations received by the validators were considered, and changes are incorporated into the constructed test.

Remarks: Names on AVC1, and AVC2 were changed to more appropriate names for the Indian context.

Table 8

Content Validation scores obtained for the domain- Sequential Commands

	S			**F**			**A**			**R**			**C**			**I**			**FL**			**ST**			**G**			**SP**			**Size of picture**		
Validators	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
SC1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
SC2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
SC3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
SC4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-

Note. SC= Sequential Commands, C1= Content Validator 1, C2= Content Validator 2, C3= Content Validator 3. S= Simplicity, F= Familiarity, A= Arrangement, R= Relevance, C= Complexity, I= Iconicity, FL= Flexibility, ST= Stimulability, G= Generalization, SP= Scoring Pattern. This table demonstrates the content validation scores for the Sequential Commands domain. As seen above all the items were scored between good and excellent. The suggestions and recommendations received by the validators were considered, and changes are incorporated into the constructed test.

Remarks: SC4- Change in the grammatical form of the sentence was incorporated.

Table 9

Content Validation scores obtained for the domain- Repetition

	S			F			A			R			C			I			FL			ST			G			SP			Size of picture		
Validators	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
R1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
R2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
R3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
R4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
R5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
R6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-

Note. R= Repetition, C1= Content Validator 1, C2= Content Validator 2, C3= Content Validator 3. S= Simplicity, F= Familiarity, A= Arrangement, R= Relevance, C= Complexity, I= Iconicity, FL= Flexibility, ST= Stimulability, G= Generalization, SP= Scoring Pattern. This table demonstrates the content validation scores for the Repetition Domain. As seen above all the items were scored between good and excellent. The suggestions and recommendations received by the validators were considered, and changes are incorporated into the constructed test.

Remarks: R6- Change in the grammatical form of the sentence was incorporated.

Table 10

Content Validation scores obtained for the domain- Object Naming

	S			F			A			R			C			I			FL			ST			G			SP			Size of picture		
Validators	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
ON1	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	-	-	-
ON2	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3	-	-	-
ON3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON7	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON8	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON9	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON10	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON11	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON12	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON14	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON15	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON16	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON17	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON18	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON19	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
ON20	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-

Note. ON= Object Naming, C1= Content Validator 1, C2= Content Validator 2, C3= Content Validator 3. S= Simplicity, F= Familiarity, A= Arrangement, R= Relevance, C= Complexity, I= Iconicity, FL= Flexibility, ST= Stimulability, G= Generalization, SP= Scoring Pattern. This table demonstrates the content validation scores for the Object Naming domain. As seen above all the items were scored between good and excellent. The suggestions and recommendations received by the validators were considered, and changes are incorporated in the constructed test.

Remarks: Items on ON6 and ON13 were changed to more appropriate words.

Table 11

Content Validation scores were obtained for the domain- Reading and Writing

	S			F			A			R			C			I			FL			ST			G			SP			Size of picture		
Validators	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
RD	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
W1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
W2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
W3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
W4	3	3	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Note. RD= Reading, W= Writing, C1= Content Validator 1, C2= Content Validator 2, C3= Content Validator 3. S= Simplicity, F= Familiarity, A= Arrangement, R= Relevance, C= Complexity, I= Iconicity, FL= Flexibility, ST= Stimulability, G- Generalization, SP- Scoring Pattern. This table demonstrates the content validation scores for the Reading and Writing domain. As seen above all the items were scored between good and excellent. The suggestions and recommendations received by the validators were considered, and changes are incorporated into the constructed test.

Table 12

Content Validation scores obtained for the domain- Apraxia

	S			**F**			**A**			**R**			**C**			**I**			**FL**			**ST**			**G**			**SP**			**Size of picture**		
Validators	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
A1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
A2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
A3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
A4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
A5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
A6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-

Note. A= Apraxia, C1= Content Validator 1, C2= Content Validator 2, C3= Content Validator 3. S= Simplicity, F= Familiarity, A= Arrangement, R= Relevance, C= Complexity, I= Iconicity, FL= Flexibility, ST= Stimulability, G= Generalization, SP= Scoring Pattern. This table demonstrates the content validation scores for the Apraxia domain. As seen above all the items were scored between good and excellent. The suggestions and recommendations received by the validators were considered, and changes are incorporated in the constructed test.

Remarks: A1- Change in the grammatical form to a more culturally appropriate form was incorporated.

Table 13

Content Validation scores obtained for the overall adapted Bedside WAB-R Hindi

PARAMETERS	Very Poor	Poor	Fair	Good	Excellent
Simplicity				1	2
Familiarity				2	1
Size of the picture				3	
Color and appearance				2	1
Arrangement				2	1
Presentation				3	
Volume				3	
Relevance				1	2
Complexity				3	
Iconicity				3	
Accessibility				3	
Flexibility				3	
Trainability				3	
Stimulability				3	
Feasibility				3	
Generalization				3	
Scope of Practice				3	
Scoring Pattern				1	2
Publications, outcomes, and developers (Professional Background)				3	
Coverage of parameters (Reception & Expression)				3	

Note. The overall test material was rated by the three content validators, who gave it ratings ranging from Good to Excellent across all domains. The suggestions and recommendations of the validators were taken into account, and changes were made to the test. As a result, the translated test was validated and used in the pilot study ahead. The adapted Bedside WAB-R Hindi is attached in Appendix A.

The ratings of the SLP using a feedback questionnaire revealed that:

1) Parameters concerned with respect to the selection of the stimuli of the test (Simplicity, familiarity, presentation, complexity, etc.): SLPs rated the test stimuli with reference to the syntactic and semantic aspects of the Hindi language. The ratings for the test stimuli on these parameters were ‘good’ and ‘excellent’. This specifies that the test stimuli selected for the study are appropriate for assessing the language skills and are also acceptable based on the cultural dimensions of the considered participants for the study. As suggested by the examiner, few modifications were incorporated while translating the screening tests. Since we do not culturally use a name such as “Smith” and surname such as “Brown” it was changed to “Rahul” and “Kumar” respectively. Furthermore, as the present test is a screening test and mostly the test would be administered in a hospital setup, few stimuli were changed based on the easy availability of items under the domain of “Object naming” such as “bed” and “pillow” was changed to “coin” and “book” respectively.

2) Parameters concerned with respect to the selection of picture stimuli of the test (size of the picture, color, and appearance, arrangement, and iconicity): SLPs rated the picture stimuli based on these five parameters, it was found that the picture stimuli were an iconic, culturally acceptable and clear representation of the intended task.

3) Parameters concerned with respect to the test structure: The SLPs rated the parameters volume, relevancy, complexity, accessibility, flexibility, and stimulability as ‘good’ and ‘excellent’, which indicate that the test can fulfill its purpose successfully.

4) Parameters concerned with respect to the output of the test: The SLPs rated the following parameters scope of practice, generalization, and scoring pattern as ‘good’ and ‘excellent’ indicating that the test has implications in its suitability to assess the target population, practice, scoring pattern used. It also gives an idea for determining the type of aphasia and planning the goals for the intervention.

4.2 Pilot Study

The mean scores were analyzed and the measures were subjected to quantitative statistical analysis and the comparisons between the groups were made using the non-parametric test. The result revealed that there was a significant difference between neurotypical individuals (NTI) and persons with aphasia (PWA) across the domains. The result further revealed that there was a significant difference between the two groups.

After conducting the pilot study, a few notable responses were obtained. Firstly, the picture used for the spontaneous speech section was not found to be very culturally appropriate. Some neurotypical participants hesitated to describe a part of the picture where the lady is pouring wine in a glass. Some took a pause and said alcohol, furthermore, some said liquid to drink after a pause while some others said that the lady was pouring something in the glass. Secondly, in the object naming section, there were a few objects for which the investigator kept two options as acceptable responses; mostly the other acceptable response was a borrowed word from English which is more commonly used, especially in the urban parts of the country. For instance, in the test, for the index finger, the responses were /t̪əɾ.d͡ʒə.niː/, / fɪŋgər/ and /ˈɪndeks fɪŋgər/ and also for the light, both responses /ɾoːʃ.niː/ and /laɪt/ could be accepted and the participants also responded in the same way. Out of the total participants, 80% of the participants responded as ‘light’ for that object while the others said /ɾoːʃ.niː/, and also 60% of the participants responded as ‘/ fɪŋgər/ or /ˈɪndeks fɪŋgər/’ for that object while the others said /t̪əɾ.d͡ʒə.niː/. All the neurotypical participants named it a ‘finger’, after, a probe question ‘which finger is it?’ which was needed in order for them to respond as ‘index finger’. However, 60% of the neurotypical participants (especially those who are younger adults) did not know what the index finger is called in Hindi. Hence, if they responded in English, calling it an index finger, it was accepted as a response.

For these issues noted after conducting the pilot study, the investigator suggests the following changes 1) adaptation of the picnic picture (WAB-R) to an Indian context and 2) accepting commonly used borrowed words in the object naming section such as /laɪt/ and /ˈɪndeks fɪŋgər/.

Further, using SPSS software (version 20.0), the results of the test administered to the participants were analyzed in various aspects.

The following statistical analyses were carried out between the groups:

- Descriptive statistics to obtain Mean (X), median (M), and Standard deviation (SD) scores of all the parameters for Neurotypical and Persons with Aphasia.
- Test of normality called the Shapiro Wilk test was performed through statistical analysis to check whether the data is normally distributed or vice versa.
- Mann-Whitney U test was performed to see the significant differences among neurotypical and persons with aphasia within each parameter due to increased differences in sample size between groups.
- Spearman’s correlation was performed through statistical analysis to check the correlation between the aphasia quotient obtained through WAB diagnostic test and Bedside Aphasia Scores obtained through bedside WAB-R.

4.2.1 Descriptive Statistics

To describe and summarize the characteristics of the data set, descriptive statistics were done for all the domains of B-WAB-R in Hindi and the score of B-WAB-R in Hindi, the Bedside Aphasia score, and the Bedside Language score. The domains were spontaneous speech content (SSC), spontaneous speech fluency (SSF), auditory verbal comprehension (AVC), sequential commands (SC), repetition (R), Object Naming (ON), reading (RD), writing (W), and apraxia (A) scores were computed for both the groups. The Bedside Aphasia score has been computed from spontaneous speech content, spontaneous speech fluency, auditory verbal comprehension, sequential commands, repetition, and object naming domains, and the Bedside Language score have been computed from spontaneous speech content, spontaneous speech fluency, auditory verbal comprehension, sequential commands, repetition, object naming, reading and writing domains. Mean, Median, and Standard Deviation (S.D) were calculated for each domain and are tabulated in Table 14

Table 14

Mean, median, and standard deviation for Neurotypical and Persons with Aphasia

Domains and scores of B-WAB-R-Hindi	**Neurotypicals**			**Aphasics**		
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation
SSC	10.00	10.00	0.00	4.50	4.50	3.34
SSF	10.00	10.00	0.00	3.40	4.00	2.36
AVC	10.00	10.00	0.00	7.50	8.00	2.17
SC	9.86	10.00	0.52	6.00	7.00	3.77
R	10.00	10.00	0.00	4.05	4.00	3.32
ON	10.00	10.00	0.00	4.80	4.75	3.48
RD	10.00	10.00	0.00	3.00	.00	4.02
W	10.00	10.00	0.00	1.20	1.00	1.81
A	10.00	10.00	0.00	8.60	10.00	2.05
BAS	99.77	100.00	0.87	49.41	39.95	25.09
BLS	99.83	100.00	0.64	42.54	38.72	22.57

Note. SSC= Spontaneous Speech Content, SSF= Spontaneous Speech Fluency, AVC= Auditory Verbal Comprehension, SC= Sequential Commands, R= Repetition, ON= Object Naming, R= Reading, W= Writing, A= Apraxia, BAS= Bedside Aphasia score and BLS= Bedside Language score.

While comparing the mean scores across all the domains of the B-WAB-R, it is evident that the NTI performed better than the PWA group across all domains. For spontaneous speech content, spontaneous speech fluency, auditory verbal comprehension, sequential commands, repetition, object naming, reading, and writing, the mean score obtained by the group with NTI was 10 (S.D=.00), which means that all normal scored 100% scores irrespective of age and gender. For the Sequential commands section, the mean scores obtained by the group with NTI were 9.86 (S.D=.52). By comparing these scores with the ones obtained by the PWA group, the group with PWA obtained poorer scores in all the domains. The mean scores obtained by the group with PWA were as follows, SSC= 4.50 (S.D=3.34), SSF= 3.40 (S.D=2.36), AVC= 7.50 (S.D=2.17), SC= 6.00 (S.D=3.77), R= 4.05 (S.D=3.32), ON= 4.80 (S.D=3.48), RD= 3.00 (S.D=4.02), W= 1.20 (S.D=1.81), A= 8.60 (S.D=2.05) respectively. The Bedside Aphasia score and the Bedside Language score are obtained by applying formulae to various domains of the test. These scores indicate the presence of aphasia as well as its severity. The mean Bedside Aphasia Scores and Bedside Language Scores obtained by the group with NTI are BAS- 99.77 (S.D=.87) and BLS-99.83 (S.D=0.645) respectively while the ones obtained by the group with PWA are BAS-49.41 (S.D=25.09) and BLS- 42.54 (S.D=22.57) respectively. Hence, there is an evident difference between the two group means obtained. The mean scores obtained by both groups are shown in Figure 1. The mean scores of BAS and BLS by both groups are shown in Figure 2.

Figure 1

Figure representing the mean scores obtained by NTI and PWA across all subsections

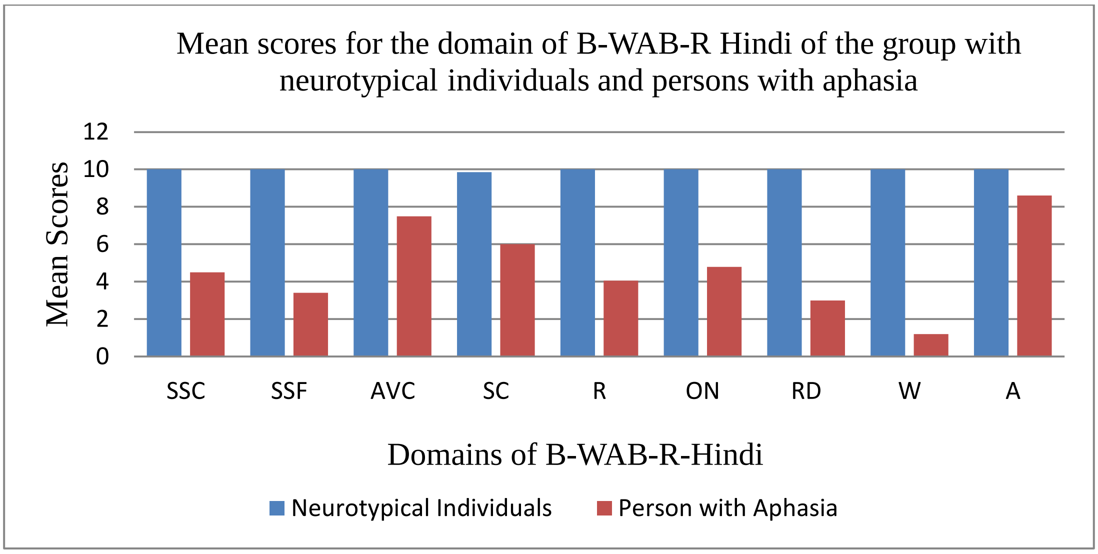
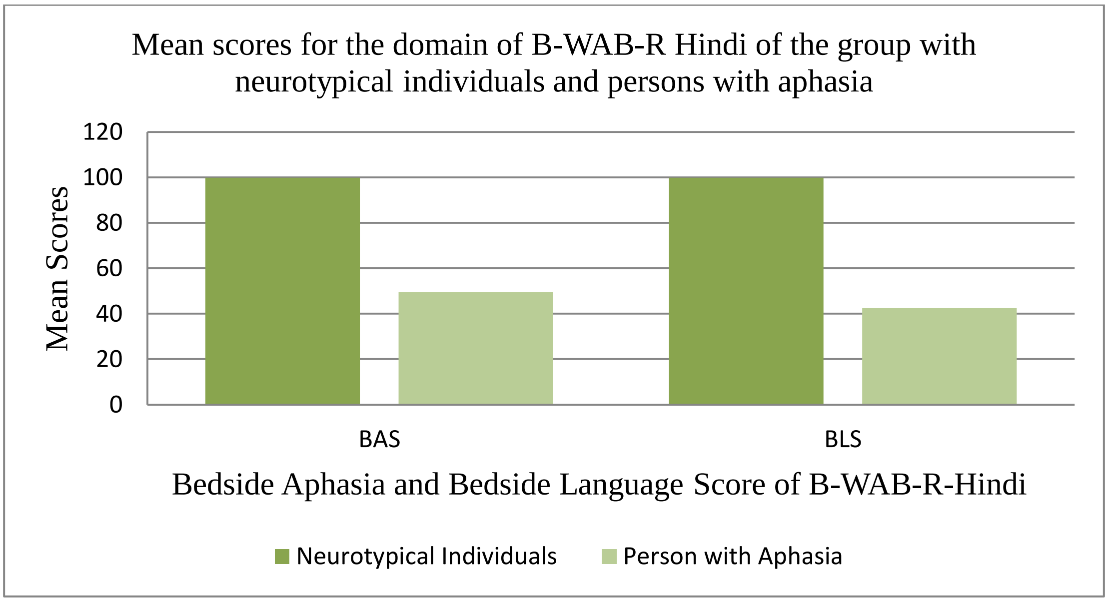


Figure 2

Figure representing the mean scores of BAS and BLS obtained by NTI and PWA



Median is a better statistical measure of a central tendency for the current study as the sample size is small and the number of participants is uneven across the two groups. The median scores obtained by neurotypical individuals for all the subsections of B-WAB-R Hindi are 10 for each individual. All the neurotypical individuals scored 100% scores across all the subsections of the adapted test material.

For BAS and BLS, the median scores were 100 each. The median scores obtained by Persons with aphasia were as follows, SSC= 4.50, SSF= 4.00, AVC= 8.00, SC= 7.00, R= 4.00, ON= 4.75, RD= 0.00, W= 1.00, A= 10.00 respectively. When the median scores for BAS and BLS were calculated for the group with PWA, they came to be BAS- 39.95 and BLS- 38.72 respectively. Thus, when we compare the median scores across the groups, it is evident that the group with NTI performed better on the test as compared to the group with PWA. The median scores obtained by both groups are shown in Figure 3. The median scores of BAS and BLS by both groups are shown in Figure 4.

Figure 3

Figure representing the median scores obtained by NTI and PWA across all subsections on the adapted material.

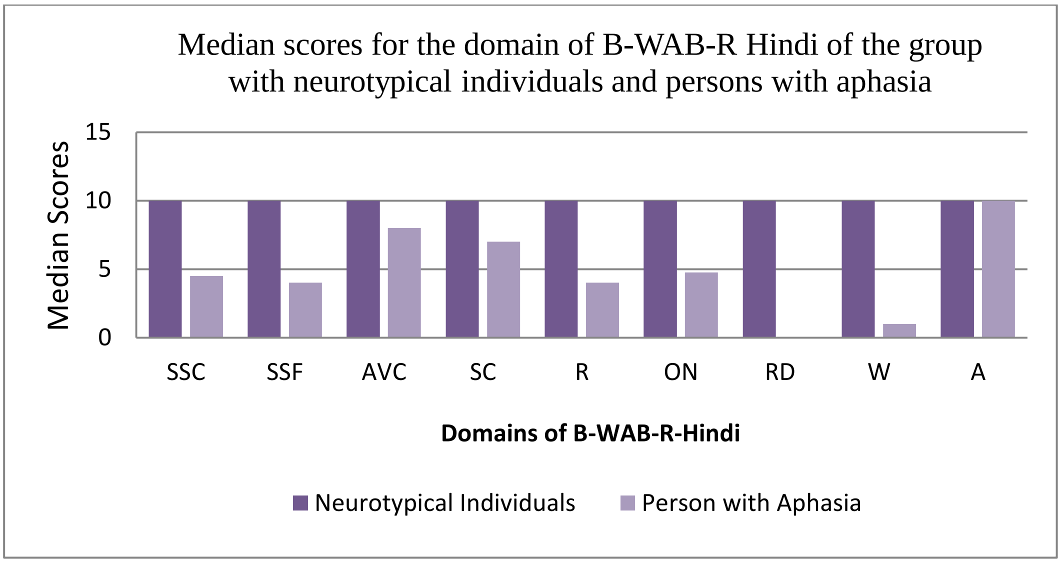
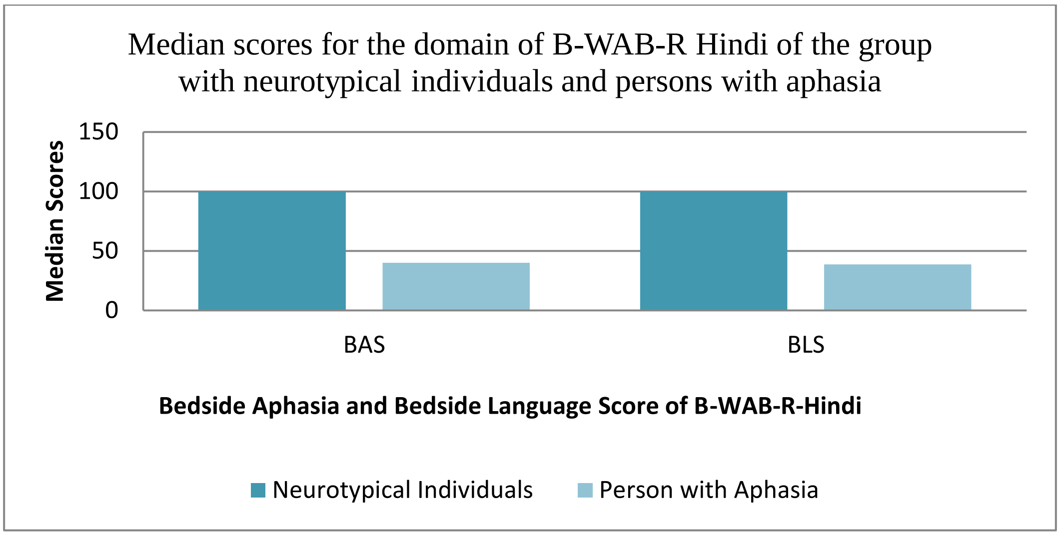


Figure 4

Figure representing the median scores of BAS and BLS obtained by NTI and PWA



By comparing median values of the scores as well as on visual inspection, it's very evident that there is a difference between scores obtained by the two groups. However, to confirm whether a statistically significant difference was present across the two groups, the data sets were subjected to further analysis.

4.2.2 Comparison of neurotypical participants and persons with aphasia

After calculating the mean, median, and standard deviation, a statistical test was administered to check whether there was a statistically significant difference present or not across the groups. First, the Shapiro-Wilk test of normality was run on the data to check whether the data followed normal distribution or not, which suggested that the data did not follow a normal distribution, i.e., $p < 0.05$. Hence, a non-parametric test was administered for comparing the performance of NTI and PWA. The Mann-Whitney U test was administered to compare the performance of individuals from both groups. The results of the Mann-Whitney U test are depicted in the following Table 15.

Table 15

Results of the Mann-Whitney U test when NTI was compared with PWA

Domains and scores of B-WAB-R-Hindi	**Mann-Whitney U**	**Z**	**Asymp. Sig. (2-tailed)**
SSC	0.000	-4.700	0.000
SSF	0.000	-4.709	0.000
AVC	15.000	-4.021	0.000
SC	25.000	-3.353	0.001
R	0.000	-4.700	0.000
ON	7.500	-4.357	0.000
RD	0.000	-4.739	0.000
W	0.000	-4.720	0.000
A	52.500	-2.212	0.027
BAS	0.000	-4.582	0.000
BLS	0.000	-4.580	0.000

Note: SSC= Spontaneous Speech Content, SSF= Spontaneous Speech Fluency, AVC= Auditory Verbal Comprehension, SC= Sequential Commands, R= Repetition, ON= Object Naming, R= Reading, W= Writing, A= Apraxia, BAS= Bedside Aphasia score and BLS= Bedside Language score.

From the Mann-Whitney U test results, it is revealed that all the subsections of the adapted test material are statistically significantly different between the group with NTI and PWA because the U statistic is 0.00 for most of the domains except auditory verbal comprehension, sequential commands, object naming, and apraxia. Furthermore, the $|Z| > 1.96$, ($p<0.05$) for all the domains is in accordance with the above findings. The $|Z|$ value for each of the domains were as follows, SSC= 4.700 (p=.00), SSF= 4.709 (p=.00), AVC= 4.021 (p=.00), SC= 3.353 (p=.001), R= 4.700 (p=.00), ON= 4.357 (p=.00), RD= 4.739 (p=.00), W= 4.720 (p=.00), A= 2.212 (p=.027), BAS= 4.582 (p=.00), BLS= 4.580 (p=.00) respectively.

Therefore, it is evident that the performance of the group with NTI was statistically significantly different from the group with PWA.

4.2.3 Correlation between Bedside Aphasia scores and Aphasia Quotient

Bedside Aphasia Score is the total scores obtained using six domains namely 'spontaneous speech content', 'fluency', 'auditory verbal comprehension', 'sequential commands', 'repetition', and 'object naming' divided by 6 and then multiply by 10. These oral language domain scores are being used to assess the severity and presence or absence of aphasia. The maximum obtainable score on B-WAB-R is 100 and a score below 93.8 indicates a presence of aphasia. Likewise, the Aphasia Quotient (A.Q.) is a score obtained out of 100 which determined the presence or absence of aphasia with the same cut-off score (93.8) by administering Western Aphasia Battery-Revised (WAB-R). According to Kertesz (2006), the BAS and A.Q. are comparable in the original test material.

Therefore, to check the correlation between the adapted B-WAB-R Hindi and the A.Q. scores as obtained on WAB-R (diagnostic test), a statistical test of correlation was performed. Since the data did not perform normal distribution, Spearman's rank correlation was used to check the strength of the relationship between BAS and A.Q. scores. The results indicated a perfect positive correlation between the two scores, i.e., ρ (3) =0.915 when p<0.01. And the results of Spearman's rank correlation test are depicted in Table 16.

Table 16

Spearman's rank correlation between BAS and A.Q

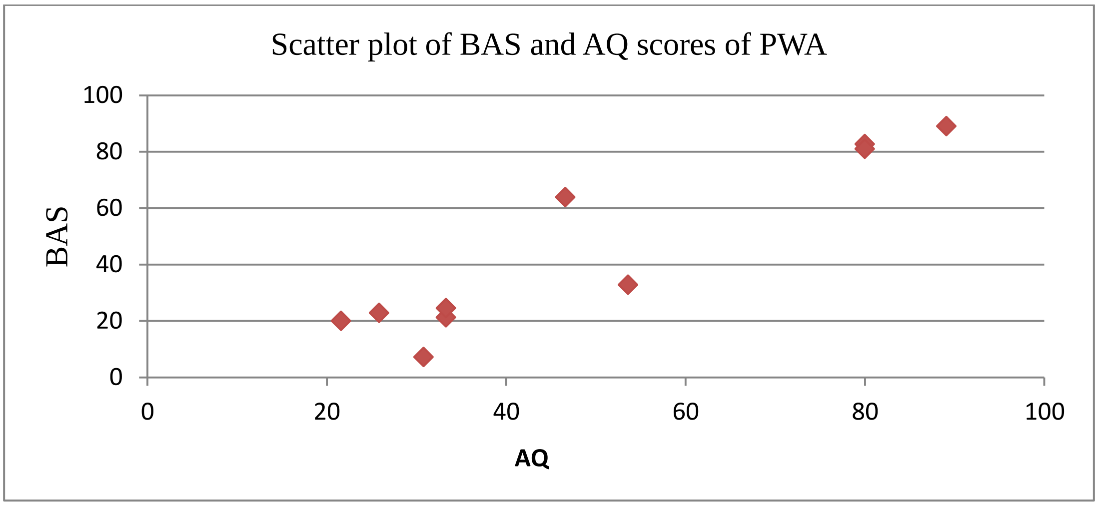
Correlations	**Group**			**BAS**	**WAB**
Spearman's rho	APHASIA	BAS	Correlation Coefficient	1.000	0.915**
			Sig. (2- tailed)	0.000	0.00
			N	10	10
		WAB	Correlation Coefficient	0.915**	1.00
			Sig. (2- tailed)	0.000	0.000
			N	10	10

****Correlation is significant at the 0.01 level (2- tailed).**

From Table 4.11, the correlation was observed to be the highest (rho= 0.915, p< 0.01) between Bedside WAB-R overall score and WAB-R overall score.

Figure 5

Figure representing scatter plot of the correlation between BAS and A.Q.



Therefore, it is statistically evident that there is a perfect positive correlation between the BAS and A.Q. scores which indicates that both the tests produce very similar results.

To conclude, the results indicated that all the items in content validation were rated between ‘Good’ and ‘Excellent’, and also similar findings were obtained when rated on the overall test material. Hence, the translated test was adapted and validated for the Hindi language. By comparing the mean and median values as well on visual inspection, there was a significant difference between persons with aphasia and neurotypical individuals. Further to check for the statistical difference, the Mann-Whitney U test was done as the data did not follow a normal distribution. The results of the Mann-Whitney U test suggested that there was a statistically significant difference across the groups for all the subsections, as well as Bedside Aphasia Score (BAS) and Bedside Language Score (BLS) which suggests that the neurotypical individuals performed better than the persons with aphasia. To check the strength of the relationship, the BAS was correlated with Aphasia Quotient (AQ), Spearman's rank correlation was used to check the strength of the relationship between BAS and A.Q. As a result, it is statistically proven that there is a perfect positive correlation between the BAS and A.Q. scores, which indicates that both the screening and the diagnostic tests produce very similar results.

CHAPTER V

DISCUSSION

Stroke patients with aphasia must be detected right away to facilitate appropriate recommendations and intervention as early as feasible because it has a negative impact on the quality of life, post-stroke intervention, and stroke care expense. Therefore, it is essential to have a quick and simple aphasia screening test that can be used by Speech Language Therapists (SLTs) and other medical professionals soon after the onset of the condition and is appropriate for persons with aphasia for whom a detailed test tool is too challenging. An aphasia screening tool may potentially be useful for research and for assessing and identifying persons with aphasia (El Hachioui et al., 2017).

In the current study, an attempt was made to adapt and validate the Bedside Western Aphasia Battery Revised Hindi screening test for persons with aphasia. The objectives of the study include (a). To develop Bedside WAB-R in Hindi by adapting from Bedside Western Aphasia Battery-Revised (WAB-R) (Kertesz, 2006) in the English language. (b). To determine the content validity of the constructed screening tool by administering it to neurotypical individuals and persons with aphasia. The administration of WAB-R Hindi on neurotypical individuals and persons with aphasia with age ranges from 18- 89 years is discussed in detail. This test investigated linguistic skills at the level of 'spontaneous speech fluency', 'auditory verbal comprehension', 'sequential commands', 'repetition', 'object naming', 'reading', 'writing', and 'apraxia' in different modalities for neurotypical individuals and persons with aphasia.

Bedside WAB-R Hindi was successfully culturally and linguistically adapted for the Indian setting while retaining the domains of the original screening test. The adaptation procedure was completed based on the suggestions from the experts during the translation procedure. The test has good internal validity, as it correlates well with gold standard WAB scores. This finding is in accordance with the study by Paplikar et al. (2020) documented a strong association between the Indian FAST total score and the Aphasia Quotient of the Western Aphasia Battery (diagnostic tool), which indicates that domains of the Indian version of FAST appear to be adequate for screening for language impairments and their severity levels (Paplikar et al., 2020).

The Frenchay Aphasia Screening Test (FAST) seems to be the most commonly used and frequently evaluated screening tool among all the widely utilized western screening techniques accessible in the stroke research literature (Salter et al., 2006). To conclude this reliability, validity, classification sensitivity, and practical utility were assessed. FAST had the best psychometric features and was a simple screening method for diagnosing linguistic deficits caused by stroke. It is a valid test that can be used by non-experts to differentiate between aphasics and non-aphasics. The exam has an advantage over the other screening instruments since it is quick and simple to give, and preliminary investigations have shown good test-retest reliability (Enderby et al., 2012). Therefore, from the resources available on screening tools for aphasia in the western context, FAST was observed to be a widely used tool; however, in the study by El Hachioui et al. (2017) and Salter et al. (2006), they omitted Bedside WAB-R in their review.

El Hachioui et al. (2017) evaluated ten studies that reported on the validation of eight screening tests for aphasia following stroke, with a focus on the methodological quality of the validation study. According to the findings, FAST had a 100% sensitivity rate and a 90% specificity rate. The aforementioned study, however, stated that it was not the ideal screening tool because it only screened for the four language skills of comprehension, verbal expression, reading, and writing. It simply determines whether aphasia is present or absent and requires a testing kit to evaluate. Sheffield Screening Test (SST) for Acquired Language Disorders and FAST were two aphasia screening tests that were evaluated by Al Khwaja et al. in 1996. As a result of its independence from specific instruments or stimulus cards and its resistance to the effects of visual neglect, the SST was found to have more advantages. Additionally, FAST does not produce a score comparable to AQ, which indicates the degree of aphasia. It does not assist us in classifying aphasia into its various kinds. It is advised to be cautious when administering FAST to patients with the following conditions: visual field deficits, neglect or inattention, illiteracy, deafness, lack of concentration, or disorientation (Al-Khawaja et al., 1996; Enderby et al., 1986; Gibson et al., 1991).

In contrast, the Bedside Record Form of the WAB-R (Kertesz, 2006) helps to identify aphasia, provides the severity of aphasia, a baseline level of performance to monitor changes over time, and a Bedside aphasia score that is comparable to the Aphasia Quotient. In approximately 15 minutes, it also divides aphasia into several subtypes. Additionally, it evaluates non-linguistic abilities impacted by neurological conditions like dementia and the linguistic skills most typically affected by aphasia. Another notable aspect of this bedside screening instrument is the assessment of eight language domains and apraxia in the WAB-R Bedside Record Form (Kertesz, 2006). The validity and reliability of the Persian WAB's Bedside version (P-WAB-1) were investigated by Nilipour et al. (2014). Results revealed that bedside WAB-R had good internal consistency and test-retest reliability, and the subtests are sensitive enough to contribute to Aphasia Quotient (AQ).

An individual's language performance after brain trauma is impacted by a number of factors; including age, gender, literacy, socioeconomic level, handedness, and the number of languages known (Ivanova & Hallowell, 2013). Since this was a pilot study, the extraneous variables were controlled by maintaining strict inclusionary criteria to ensure consistency between the groups. However, these variables which could impact the performance of the individuals are discussed and could be studied further.

5.1 Performance of neurotypical individuals (NTI) on the adapted B-WAB-R Hindi

The mean and median scores of neurotypical individuals were significantly high across all the domains. In the present study, the neurotypical individuals performed better in all the domains namely 'spontaneous speech content', 'spontaneous speech fluency', 'auditory verbal comprehension', 'sequential commands', 'repetition', 'object naming', 'reading', 'writing' and 'apraxia'.

On the B-WAB-R Hindi, the neurotypical individuals had an "Aphasia Quotient" greater than 93.8 (the cut-off criteria used to diagnose aphasia), indicating that the participants are normal. Numerous normative studies revealed that there is a mild decline in the performance and a slight reduction in overall AQ scores with increasing age and also the highest decline was observed in the age range of 61- 70 years on the administration of the Western Aphasia Battery (Kertesz, 1982), Western Aphasia Battery- Revised (Kertesz, 2006), Western Aphasia Battery in Kannada (Chengappa & Kumar, 2008), Western Aphasia Battery in Malayalam (Jenny, 1992), Western Aphasia Battery in Hindi (Kaur et al., 2017), Western Aphasia Battery in Bangla (Keshree et al., 2013), Western Aphasia Battery in Telugu (Pallavi, 2010). Additional factors for poorer performance in elderly persons may include their declining cognitive and motor abilities, which also decline with age. Likewise, faulty productions may also be caused by their decreased psychomotor speed rather than their declining cognitive and linguistic abilities with age (Rodríguez-Aranda, 2003).

According to Al-Thalaya et al. (2018), persons over 60 years of age who were healthy and non-aphasic showed a reduction in their repetition scores. The deterioration of short-term memory can explain by aging (Buckner, 2004). Additionally, they saw a significant reduction in fluency and AQ scores in persons over 60. In contrast, the other skills like content, comprehension, complex auditory commands, and naming were not significantly different among age groups. However, language remains intact in them (Harada et al., 2013). Whereas in the present study, '*age*' was not considered as a contributing factor, as the inclusionary criteria considered were very strictly for the pilot study.

According to WAB-R, males had more impairment based on AQ. Their performance was poor on the WAB-R, including the domains of information content, fluency, repetition, sentence completion, responsive speech, and comprehension (yes/no, auditory word identification, and sequential instructions) (Sharma et al., 2019). In the current study, the influence of '*gender*' on their performance, was not studied due to less number of participants. Whereas numerous studies have reported the presence of gender differences significantly in each task. According to Rubia et al. (2013), males and females use different cortical and subcortical regions to carry out motor control which in turn proves the gender differences in language processing. For example, during writing males showed left-lateralized activation in Exner's region whereas females showed bilateral activation (Yang et al., 2020). A study reported that there is a significant difference in the performance of male and female participants (in the age range of 30- 40 years) who were neurotypical individuals for 'sequential command' where females performed better than males (Hema & Vasuprada, 2019).

Furthermore, females performed better than males in writing tasks because fine motor skills are better developed in females compared to males (Hall & Kimura, 1995).

Concerning handedness, the most transient aphasias were found among the left-handers. Agraphia and alexia occurred significantly more frequently in lesions contralateral to the dominant hand in all left-handed patients. Aphasia occurred in right-handed patients only in those with left cerebral lesions, while it occurred in left-handed patients with left and right hemispheric damage. There are a number of unclassifiable aphasias in the left-handers than in the right-handers. Both groups experienced common syndromes such as Wernicke's, Broca's, and global aphasia (Gloning, 1977). However, these variables mentioned above were kept constant in the present study as it is a pilot study, and variables could not be manipulated.

5.2 Performance of Persons with Aphasia (PWA) on the adapted B-WAB-R Hindi

The results of this study make Bedside-WAB-R-Hindi potentially the first reliable bedside assessment tool that can be used as a clinical tool to screen for language impairments in Hindi-speaking brain-damaged individuals. It might be used to compare pre-/post-scores to evaluate the effectiveness of treatment, determine the severity of language impairment and provide the type of aphasia present.

The mean and median scores of persons with aphasia were lower across all the domains when compared to neurotypical individuals. In the present study, the persons with aphasia performed better on 'Auditory Verbal Comprehension' and 'Sequential commands' when compared to other domains of Bedside-WAB-R-Hindi.

Numerous studies have reported the presence of significant gender differences on each task for persons with aphasia. Basso et al. (1982) reported that women experienced less severe forms of aphasia than men as well as women recovered better on oral expression tasks when compared to men but not in auditory comprehension tasks. Chen and Li (2009) also found that women had less severe impairment than men. Similarly, Yao et al. (2015) stated that men showed higher morbidity of aphasia following stroke than women. The majority of the WAB-R measures include 'information content', 'fluency', 'repetition', 'sentence completion', 'responsive speech', 'yes/ no comprehension', 'auditory recognition', and 'sequential commands' also revealed gender differences. Furthermore, few studies have examined group differences in the forms of aphasia, with more males than females being diagnosed with Broca's and Wernicke's aphasia (Basso et al., 1982; Chen & Li, 2009; Yao et al., 2015). Most men were found to have Broca's aphasia (Yao et al., 2015). Evidence showed that lesions leading to aphasia in males were more posteriorly situated locations whereas lesions in women were more anteriorly located areas, this could be the cause of men performing poorly in the majority of the execution tasks (Roquer et al., 2003).

The present study found that the persons with aphasia scored poorly than the neurotypical individuals on all the domains as well for the bedside aphasia score which was in accordance with a study by Khatoonabadi et al. (2015). The aphasic patients performed very poorly than the healthy subjects on all the domains along with the overall score, receptive index, and expressive index. In this study, none of the patients scored 0 (no floor effect) or 100 (no ceiling effect) on the B-WAB-R Hindi total score, and also the total scores were well dispersed and a similar result was found by Khatoonabadi et al. (2015) which stated that lack of ceiling or floor effects proves the content validity of the test. Furthermore, the results of the present study were in agreement with those of the B-WAB-R English version (Kertesz, 2006).

The performance of persons with aphasia showed significant variation across tasks as compared to neurotypical individuals. Persons with fluent aphasia scored much better than non- fluent aphasia in both auditory and orthographic modes on the entire task. Due to the inclusion of Global aphasia and Broca's aphasia in this group, the performance was poor in persons with non-fluent aphasia.

In the current study, results showed a statistically significant difference between PWA and neurotypical individuals in the 'spontaneous speech content' domain, probably because the first few items questioned in the domain were automatic answers. In contrast, the complexity of the task increased in the further items; therefore, the scores obtained in the content domain were mainly because the first few items had more automatic answers. Also, spontaneous speech content requires both comprehension and expression of language. Since the present study had heterogeneity among the PWA group, the overall content scores were low for PWA. It was also seen that participants who scored low in the spontaneous speech content section had an overall low Bedside Aphasia score which is equivalent to a low Aphasia quotient. A study by Crary and Rothi (1989) also confirms that 'information content' was the best predictor of the severity of aphasic impairment as measured on AQ. The information content score reflects several aspects of a patient's communicative abilities and contributes significantly to the Aphasia Quotient calculation. According to Kertesz et al. (1979), the information content score represents a measure of functional communication, which means that the patient must have some comprehension and expression abilities to respond appropriately to the task. There was a statistically significant difference among the groups for the Spontaneous speech fluency domain. This may be because of the heterogeneity within the PWA group.

With reference to 'auditory verbal comprehension', the persons with aphasics, most of the participants were fair at simple sentence comprehension and poor when the linguistic complexity increases. Auditory comprehension of spoken language is dependent on the sense of hearing and auditory perception. Higher-level decoding of the perceived auditory information involves extracting the denotative and connotative meanings from words, sentences, and discourse. The brain needs to operate as a whole for auditory comprehension tasks with the combination of sensory and hearing level cognitive and linguistic processes. There is a lack of functioning in certain areas of the brain of the person with aphasia during the initial post-acute stages of recovery (Ramya, 2011).

Auther et al. (2000) reported that, if there is any lesion in the temporal areas of the brain, the person exhibits auditory processing difficulties which lead to poor performance in auditory comprehension. Several studies have reported that deficits in auditory verbal comprehension could also be caused due to deficits in verbal short-term memory along with the aging process (DeDe et al., 2004; Hough et al., 1997).

In the present study, persons with aphasia experienced difficulty in following commands when the length and syntactic complexity increased. Most participants could only follow simple one-step commands, which suggests that their performance decreased as the complexity of the commands increased. A study by Goswami (2004), has reported that sentence length and complexity have an impact on auditory comprehension, and also the difficulty in following commands becomes evident when the syntactic complexity of the commands increases.

In the present study with reference to the 'repetition' domain of B-WAB-R, persons with aphasia experienced difficulty in repeating the stimuli, performance was better for words but decreased when the complexity of the stimuli increased to phrase and sentence level. One reason the repetition was affected in the PWA group was that this domain requires phonological processing, short-term auditory memory, and working memory to be relatively intact and is not just a function of language (Neves et al., 2014). In the current pilot study except for Transcortical Motor Aphasia and Anomic Aphasia, all other participants performed poorly in this section. Therefore, the repetition subsection was sensitive enough to tap on the deficits of these individuals while the neurotypical individuals normally performed on it. All the other participants could not respond as the complexity of the sentence increased. The findings of the present study are in consensus with a study done by Bohland and Guenther (2006) which reported that increased syllable sequence complexity increases cortical activity in anterior and posterior lobes, and if there is damage to the somatosensory component, will result in difficulties in repetition and spontaneous speech production. Some authors relate deficits in repetition in persons with aphasia to cognition deficits. This statement has been supported by several findings of Dick et al. (2001); Friedmann and Gvion, (2003); Murray, (2004); Connor et al. (2000), where limitations in working memory have a significant effect on the linguistic processing. Hence, the current study and literature suggest that the repetition difficulties arise from any disruption of the circuits connecting the multiple cognitive components or injury to the various brain regions.

With reference to the domain called “Object Naming”, in general, naming deficits are resulted due to deficits in decoding (perception), storage, selection (retrieval), or actual encoding (production) of the word (Benson, 1979). Persons with aphasia exhibit deficits in naming; thus, this domain is necessary for aphasia assessment. In spite of the lesion sites or the type of aphasia, naming deficits are common in persons with aphasia (Goodglass & Blumstein, 1973). As anomia is one of the hallmark features of aphasia the object naming section is essential in detecting the presence of aphasia. Even though confrontation naming is a simple task, the inability to name simple objects helps clinicians to identify the presence of aphasia. In the present study, five out of the ten participants performed better than the other PWAs, scoring around 6 in the object naming subsection. These participants were diagnosed with Broca's Aphasia, Transcortical Motor Aphasia, and Anomic aphasia. The primary type of anomic errors found was semantic and neologistic paraphasias followed by circumlocutions. Verbal paraphasias consist of words usually of allied meanings example, ‘lock’ for ‘key’, and ‘shoulder’ for ‘elbow’ was observed. Neologistic paraphasias are very common than verbal paraphasias in the present study. According to Goodglass and Wingfield (1993), injuries to some brain regions can lead to impaired picture naming. When performing the naming tasks, the replies' qualitative analysis revealed paraphasias, circumlocutions, and retrieval issues. Similar findings are also reported (Benson, 1979).

Numerous studies have shown that the mechanisms linking a specific word form representation to semantic representation are disrupted in stroke patients, which may lead to naming difficulty. Also, disassociation between the semantic and phonological representations of the word forms might result in naming deficits. Hillis and Caramazza (1995) reported that semantic errors in comprehension and naming are resulted due to semantic processing deficits; this finding is congruent with the present study.

A study by Mayer and Murray (2012), reported that the confrontation naming scores were strongly correlated with the severity of aphasia, which correlates with the current study findings as the investigators found a trend between the severity of aphasia and the object naming scores. Similarly, Richardson et al. (2018) concluded that there was a strong correlation between narrative production and the naming test scores as obtained on the WAB-R, which supports the current study's findings as the investigators also found a trend between spontaneous speech content and the object naming scores.

Another domain, severely affected in the PWA group was ‘reading’ and ‘writing’. With reference to ‘reading’, reading skill is accomplished by converting a grapheme to a phoneme. ‘Writing’ is a skill dependent on parietal lobe function which requires regulated upper limb movements, focused visual attention, eye gaze, and the prediction of visual movement (Castiello, 2005). Because of the lesion, persons with aphasia show difficulties in upper limb movements, which affects the feedback loop that helps with writing ability and the motor restrictions due to hemiplegia. Therefore, in the present study, it is evident that the persons with aphasia performed poorly in comparison with the neurotypical participants. One possible reason is that majority of the patients (six out of ten patients) had hemiparesis of their dominant hand (Right hand). These participants were diagnosed with Broca's Aphasia, Conduction Aphasia, and Global aphasia. They also had limited verbal output (Broca's aphasia, Global aphasia), which resulted in low scores in the reading domain. The site of lesion also impacts reading and writing skills. In the present study, most neurological findings were left MCA lesions. According to some studies, the activation of specific brain regions is essential in facilitating reading.

Binder et al. (2003) and Fiebach et al. (2002) discovered bilateral mid-fusiform gyrus activation during reading tasks. Several studies have also suggested that the left angular gyrus is involved in orthography to phonology conversion at the word and sub-word levels. According to Dehaene-Lambertz et al. (2002) functional imaging and lesion studies, orthographic stimuli processing is more concentrated in the left fusiform gyrus while reading. The findings of Foundas et al. (1998), Raymer et al. (1997), and Price and Devlin (2003) support the importance of brain damage disrupting access to orthographic word forms, resulting in difficulties with oral naming and reading. Thus, difficulties in accessing the stored word and orthography to phonology conversion are present in persons with stroke during the post-acute stages of recovery due to the varied lesions in the areas of the brain and cognitive limitation. In the present study, compared to the neurotypical individuals, the group of persons with aphasia performed poorly in the “Writing domain” which is in agreement with the study by Khatoonabadi et al. (2015) and explained that the cause could be that right-handed people’s dominant left hemisphere needs to remain intact in order to perform the task of writing.

The results showed a statistically significant difference between PWA and NTI in the ‘apraxia’ domain, with PWA scoring poor. It was observed that individuals diagnosed with Broca's and Global Aphasia had poor apraxia scores, followed by Wernicke's Aphasia. This is probably because of the site of lesion of damage, as the frontal lobe is responsible for planning and programming. Thus, it mostly always occurs with Broca’s and Global aphasia. Individuals with Wernicke's aphasia also had poor apraxia scores due to comprehension deficits; therefore, they could not understand the commands. The present study's findings follow the same lines as that of Kertesz (2007), who states that praxis is intimately linked to language and, consequently, apraxia follows language disorders. Basilakos et al. (2015), noted that cortical motor regions were most significantly linked to the pattern of brain damage associated with apraxia, with somatosensory areas also involved. Apraxia or aphasia-related speech production deficiencies were linked to an injury to the temporal lobe and the inferior pre-central frontal areas.

Addressing the construct validity of the current test, the investigators tried to do a preliminary test. The B-WAB-R-Hindi revealed a substantial link between the AQ scores of the participants as obtained on WAB-R and their BAS scores on the adapted test. The findings of Spearman's rank correlation suggest that the individuals performed similarly on both the original and the adapted tests in view of the fact that a perfect positive correlation was obtained between the two test results. These findings were similar to previous studies done to develop tests based on the framework of B-WAB-R (Al-Thalaya et al., 2018) or adaptation studies of B-WAB-R (Persian WAB).

To conclude, the overall differences found in each test component is mentioned above along with relevant research. Given the increasing prevalence of stroke aphasia, the Hindi version of B-WAB-R is helpful in identifying aphasia in acute and sub-acute stroke settings and is recommended for use in hospital setups. Significant findings from the current study have probable explanations that are in accordance with the existing literature. A significant correlation between the adapted test and the original test was also revealed by the preliminary content validity test. The B-WAB-R-Hindi is therefore possibly a sensitive and specific bedside screening tool to determine the presence of aphasia, type, and severity of aphasia, based on the results of the pilot study.

CHAPTER VI

SUMMARY and CONCLUSION

The current study aimed to adapt and validate the Bedside WAB-R screening test in the Hindi language for persons with aphasia. It was adapted to be used by a speech-language pathologist for screening any speech-language disturbances during the acute stages of recovery following stroke. The objective was to evaluate and identify the linguistic deficits, their severity, and the type of aphasia in persons with aphasia. For validation of the adapted screening test, this test was administered to a clinical population of persons with aphasia. A review of literature has confirmed the presence of receptive and expressive deficits in persons with aphasia at several linguistic levels across tasks and modalities (Burchert et al., 2003; Ellis, 1987; Nickels & Howard, 1995). Previous studies reveal that screening tools are quick and simple for assessment and have good internal consistency and reliability (Sabe et al., 2008).

The present study was adapted with the purpose to provide a language-specific screening tool in the Indian context for the Hindi population to assess speech language disturbances. The screening test was designed to identify the presence or absence of language disturbances in persons during the acute stage as well as in the clinical setting. It can be widely used as a screening tool for various brain-damaged individuals and persons with dementia and primary progressive aphasia to detect the presence of language impairments and/or aphasia. The basis to adapt a bedside screening test in the Hindi language was because; there has been very limited screening tool available in Hindi for quick screening following a stroke. Hence, the present study aimed to adapt and translate the screening tool for persons with aphasia for an Indian language Hindi.

The Bedside WAB-R screening test consists of nine domains like spontaneous speech, fluency, auditory verbal comprehension, sequential commands, repetition, object naming, reading, writing, and apraxia (optional). The screening test was carried out using environmental stimuli and picture cards. Culturally appropriate picture stimuli were used wherever necessary. All the stimuli were presented in auditory and pictorial modes separately.

Out of 25 participants, a total of 15 neurotypical of age range 18- 89 years and 10 persons with the stroke of age range 18-89 years were taken as participants for the study. The study was administered to the participants by following the ethical standards as stated by AIISH, Mysore.

The objective of the study was to develop Bedside WAB-R in Hindi by adapting from Bedside Western Aphasia Battery-Revised (WAB-R) of the English language. To determine the content validity of the constructed screening tool by administering it on neurotypical individuals and persons with aphasia. The results revealed all the items in content validation were all rated between Good and Excellent and the overall test material was also rated the same. Hence, the translated test material fulfilled the criteria of appropriate adaptation and validation to the Hindi language.

The data were collected and tabulated appropriately. Statistical analyses were performed using the SPSS software package (Version 20.0). Descriptive statistics were carried out to extract the Mean, Median, and Standard Deviation values of the scores obtained on the different domains by the participants and were calculated separately for neurotypical individuals and persons with aphasia. A test of normality was carried out for the scores obtained by the participants to check the normal distribution of the data. Mann- Whitney test was carried out to check the presence or absence of significant differences in the scores of neurotypical individuals and persons with aphasia.

Results of the present study with respect to the comparison of the performance of the two groups revealed that there is a significant difference between neurotypical individuals and persons with aphasia. The performance of persons with aphasia was poorer when compared to neurotypical individuals. Persons with aphasia had difficulties in all the domains namely spontaneous speech content, spontaneous speech fluency, auditory verbal comprehension, sequential commands, repetition, object naming, reading, writing, and apraxia. Therefore, indicating that the test is suitable to differentiate between neurotypical individuals and persons with aphasia.

A summary of the findings of the current study are:

- All the neurotypical participants performed equally in all the tasks across modalities except for subtle variations which were negligible.
- Age and gender effects were not considered in this study.
- The mean and standard deviation values obtained by the neurotypical individuals can be used as normative values to identify any linguistic deficits in Hindi-speaking persons in the age range of 18 to 89 years.
- Persons with aphasia performed poorly compared to neurotypical individuals in all the tasks, across modalities of stimulus presentation.
- There is a perfect positive correlation between the BAS scores (obtained from B-WAB-R Hindi) and A.Q. scores (obtained from WAB Hindi) which indicates that both the tests produce very similar results.

The current study had significant findings with possible reasons which are in congruence with the available literature. In the present study, the persons with aphasia performed better on ‘Auditory Verbal Comprehension’ and ‘Sequential commands’ when compared to other domains of Bedside-WAB-R-Hindi.

Results showed a statistically significant difference between PWA and neurotypical individuals in the ‘spontaneous speech content’ domain, probably because the first few items questioned in the domain were automatic answers. Also, spontaneous speech content requires both comprehension and expression of language. With reference to ‘auditory verbal comprehension’, the persons with aphasics, most of the participants were fair at simple sentence comprehension and poor when the linguistic complexity increases because if there is any lesion in the temporal areas of the brain, the person exhibits auditory processing difficulties which lead to poor performance in auditory comprehension.

Persons with aphasia experience difficulty in following commands when the length and syntactic complexity increase because sentence length and complexity have an impact on auditory comprehension, and also the difficulty in following commands becomes evident when the syntactic complexity of the commands increases.

Persons with aphasia experienced difficulty in repeating the stimuli, performance was better for words but decreased when the complexity of the stimuli increased to phrase and sentence level. This domain requires phonological processing, short-term auditory memory, and working memory to be relatively intact and is not just a function of language.

Object naming deficits in persons with aphasia are resulted due to deficits in decoding (perception), storage, selection (retrieval), or actual encoding (production) of the word. In spite of the lesion sites or the type of aphasia, naming deficits are common in persons with aphasia. Semantic errors in comprehension and naming result due to semantic processing deficits.

Persons with aphasia performed poorly in the reading domain compared with the neurotypical participants. Because of the lesion in bilateral mid- fusiform gyrus or left angular gyrus which helps in orthography to phonology conversion at the word and sub-word levels. Also, they performed poorly in the writing domain compared with the neurotypical participants. Because of the lesion, persons with aphasia show difficulties in upper limb movements, which affect the feedback loop that helps with writing ability and the motor restrictions due to hemiplegia.

Persons with aphasia diagnosed with Broca's and Global Aphasia had poor apraxia scores, followed by Wernicke's Aphasia. This is probably because of the site of lesion of damage, as the frontal lobe is responsible for planning and programming. Also due to comprehension deficits, they could not understand the commands.

The B-WAB-R Hindi revealed a significant link between the AQ scores of the participants as obtained on WAB-R and their BAS scores on the adapted test. The findings of Spearman's rank correlation suggest that the individuals performed similarly on both the original and the adapted tests in view of the fact that a perfect positive correlation was obtained between the two test results. These findings were similar to previous studies done to develop tests based on the framework of B-WAB-R (Al-Thalaya et al., 2018) or adaptation studies of B-WAB-R (Persian WAB) (Nilipour et al., 2014). The test has good internal validity, as it correlates well with gold standard WAB scores. This finding is in accordance with the study by Paplikar et al. (2020) documented a strong association between the Indian FAST total score and the Aphasia Quotient of the Western Aphasia Battery (diagnostic tool), which indicates that domains of the Indian version of FAST appear to be adequate for screening for language impairments and their severity levels. Therefore, The preliminary content validity test showed a strong correlation between the adapted test with the original one. Hence, based on the pilot study, it can be said that the B-WAB-R Hindi is potentially a sensitive and specific bedside screening tool to identify the presence, type, and severity of aphasia.

6.1 Implications of this study

The present study depicted the importance of having a language screening tool for persons with stroke. The data obtained was collected from the native Hindi speakers and hence, the performance can be generalized to the general population who are native speakers.

- This screening tool would help us identify the presence or absence of aphasia in individuals with neurological impairment, especially at their acute stages.
- This screening tool is less time-consuming and can quickly give an idea about the presence of any phasic deficit in persons with stroke.
- This tool can be administered when a comprehensive diagnostic test cannot be performed due to the medical condition of the person following a stroke.
- This tool would help us classify the type of aphasia within less administration time.
- Help to quantify and qualify the severity of the problem among persons with aphasia (PWA).
- It would serve as a baseline for detailed assessment followed by treatment for PWA.
- Help in monitoring the treatment plan which is appropriate for PWA.

- This culturally and linguistically adapted tool would be a very useful tool from a clinical as well as a research point of view pertaining to the Hindi language.

6.2 Limitations of the study

- This screening tool can be used only for the Hindi population
- The test was administered on less number of participants in both normal and persons with stroke due to stroke.
- Some of the variables like age, gender, and site of the lesion were not taken into consideration.

6.3 Future suggestions

- The screening tool can be adapted and translated into other languages.
- The standardization of the tool on a large number of controls on variables like gender, age, and education can be taken up in the future.

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Appendix A

Bedside Western Aphasia Battery- Revised Hindi Record Form

Demographic details:

Name:__________________ Date: ________________DOB:___________
Age: ______ Gender: ______ Diagnosis:____________________________

Date of Onset: ___________ Neuroimaging:________________________

Bedside Record Form Hindi हिन्दी
Western Aphasia Battery Revised

Spontaneous Speech: Content

Directions: Ask the patient these questions and encourage complete responses. Score length and complexity of sentences, word finding difficulty and paraphasias.

Item	Score
१. आज आप कैसे हैं? (1 point = any meaningful response)	(1)
२. आपका पता क्या है? (2 points = complete address; 1 point = street of city only)	(2)
३. आप यहाँ क्यों आए हैं? (2 points = complete response; 1 point = Incomplete response)	(2)
४. इस तस्वीर में जो कुछ हो रहा है, उसके बारे में कुछ बताएं। (5 points = complete description; 4 points = incomplete description; 3 points = essential Items; 2 points = few Items only; 1 point = some relevant words; O points = no meaningful response)	(5)

Content Score: ☐ **(10)**

Spontaneous Speech: Fluency

Directions: Circle the point value that represents the statement that best describes the patient's speech fluency.

10 = Normal speech
9 = Some hesitations and word-finding difficulty
8 = Circumlocutory, fluent speech with semantic paraphasias and word-finding difficulty
7 = Fluent phonemic jargon, semblance to English syntax and phonology
6 = Logopenic but normal syntax; few, if any, paraphasias; significant word-finding difficulty

5 = Halting, paraphasic, but more complete sentences; significant word-finding difficulty
4 = Agrammatic, effortful; verb-noun phrases, but only one or two propositional sentences
3 = Mostly unintelligible, low-volume mumbling; some single words
2 = Single words, often paraphasias, effortful and hesitant
1 = Recurrent, stereotypic utterances with meaningful intonation
0 = No words or short, meaningless utterances

Fluency Score: ☐ **(10)**

Auditory Verbal Comprehension: Yes/No Questions

Directions: Say, I'm going to ask you some questions. Answer yes or no. (Patients may respond verbally or gesturally)

Items	Score	
१. क्या आपका नाम राहुल है?	1	0
२. क्या आपका नाम कुमार है?	1	0
३. क्या आपका नाम __________ है?	1	0
४. क्या इस कमरे में रोशनी है?	1	0
५. क्या आप डॉक्टर हैं?	1	0

Items	Score	
६. क्या इस कमरे का दरवाजा बंद है?	1	0
७. क्या आग में कागज जलेगा?	1	0
८. क्या मार्च महीना जून से पहले आता है?	1	0
९. क्या आप छीलने के पहले केला खाते हैं?	1	0
१०. क्या घोड़ा कुत्ते से बड़ा है?	1	0

Auditory Verbal Comprehension Score: ☐ **(10)**

Sequential Commands:

Materials: Coin, piece of paper, pen. **Directions:** Place a coin, a piece of paper, and pen in front of the patient. Say, See the coin, the paper, and the pen? I will ask you to point to them and do things with them. Are you ready? (Read each item)

Items	Score
१. सिक्का और कलम दिखाइये।	(2)
२. कलम से कागज को दिखाइये।	(2)
३. कलम को कागज से दिखाइये।	(2)
४. कलम को कागज के ऊपर रख कर सिक्के को पलट दिजिऐ।	(4)

Sequential Commands Score: ☐ **(10)**

Repetition:

Directions: Ask the patient to repeat the words listed below. Say, Repeat these words.(Subtract 1/2 point for each phonemic paraphasia or word order error.)

१. बिस्तर
२. खिड़की
३. पैंतालीस
४. फ़ोन बज रहा है।
५. कोई अगर, और या परंतु नहीं।
६. तेज भूरी लोमडी, आलसी कुत्ते के उपर कुदती है।

Repetition Score: ☐ **(10)**

Object Naming:

Directions: Ask the patient to name objects in the room. **Say:** What is this? What is the name of this object? (Score 1/2 point for each correct response).

Items		Score	Items		Score
1.	सिक्का		11.	बाल	
2.	टेलीफ़ोन		12.	कुर्सी	
3.	किताब		13.	घड़ी का पट्टा	
4.	कपडे से बनी किसी वस्तु का रंग		14.	कॉलर	
5.	कोहनी		15.	बटन	
6.	दरवाजा		16.	रोशनी	
7.	पत्रिका/कैलेंडर		17.	कलम	
8.	कंधा		18.	नली	
9.	कप / गिलास		19.	खिड़की	
10.	चाभी		20.	तर्जनी	

Object naming score: (10)

Bedside Aphasia Score

Sum the Content, Fluency, Auditory Verbal Comprehension, Sequential Commands, Repetition, and Object Naming scores. Divide the sum by 6; then multiply by 10 to obtain the Bedside Aphasia Score.

Sum of scores ÷ 6
× 10

Bedside Aphasia Score:

Bedside Language Score

Sum the Content, Fluency, Auditory Verbal Comprehension, Sequential Commands, Repetition, Object Naming, Reading, and Writing scores. Divide the sum by 8; then multiply by 10 to obtain the Bedside Language Score.

Sum of scores ÷ 8
× 10

Bedside Language Score:

Reading:

Directions: Ask the patient to read a paragraph aloud from a magazine, Score up to 5 points for fluent, correct sentences. Deduct 1 point for each significant error or omission. Determine level of reading comprehension by asking questions. Score up to 5 additional points for reading comprehension. **Reading Score:** 10)

Writing:

Directions: Place a piece of paper and a pen on the table and say,

Items	**Score**
अपना नाम लिखिए।	(1)
अपना पता लिखिए।	(2)
"टेलीफोन बज रहा है!" लिखिए।	(2)
Picture description: मरीज से किसी पत्रिका से किसी जटिल चित्र के बारे में लिखने के लिए कहें। आप कहें, चित्र में जो हो रहा है, उसके बारे में लिखे।	(5)
5 points = complete description; 4 points = incomplete description; 3 points = essential items; 2 points = few items only; 1 point = some relevant words; 0 points = no meaningful response.	

Writing Score: **(10)**

Bedside Aphasia Classification Criteria

Directions: To determine the patient's Bedside Aphasia Classification, compare the patient's Fluency, Auditory Verbal Comprehension, and Repetition scores to the three scores associated with each aphasia type.

Aphasia Type	**Scores**		
	Fluency	**Auditory Verbal Comprehension**	**Repetition**
Global	<5	<4	<5
Broca's	<5	>3	<8
Isolation	<5	<4	>4
Transcortical Motor	<5	>3	>7
Wernicke's	>4	<7	<8
Transcortical Sensory	>4	<7	>7
Conduction	>4	>6	<7
Anomic	>4	>6	>6

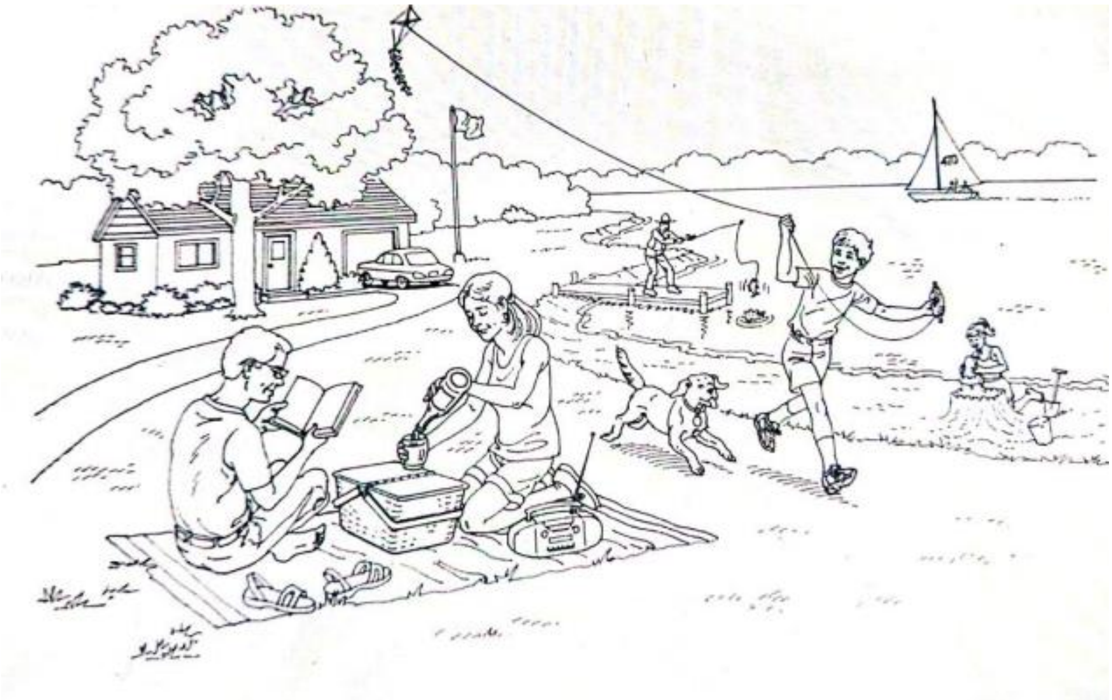
Apraxia (Optional)

Directions: Say, I'm going to ask you to do some things. Try to do them well as you can.

Items	**Score**
१. हाथ हिलाइये।	(2)
२. आँखें बंद कीजिये।	(2)
३. माचिस की तीली बुझाने का ढोंग कीजिये।	(2)
४. दांत साफ करने का ढोंग कीजिये।	(2)
५. दरवाजा खोलने का ढोंग कीजिये ।	(2)

Apraxia score: **(10)**

(Picture cards used during administration)



Appendix B

Validation form used for the constructed manual

Adapted from the Manual for Non-Fluent Aphasia Therapy in Kannada

(Goswami et al., 2012)

Sl. No	Parameters	Very Poor	Poor	Fair	Good	Excellent
1.	Simplicity					
2.	Familiarity					
3.	Size of the picture					
4.	Color and appearance					
5.	Arrangement					
6.	Presentation					
7.	Volume					
8.	Relevance					
9.	Complexity					
10.	Iconicity					
11.	Accessibility					
12.	Flexibility					
13.	Trainability					
14.	Stimulability					
15.	Feasibility					
16.	Generalization					
17.	Scope of Practice					
18.	Scoring Pattern					
19.	Publications, outcomes, and developers (Professional Background):					
20.	Coverage of parameters (Reception & Expression):					

Put a (tick**) in the appropriate box**
Any other suggestions:

Definition of parameters

1. ***Simplicity:*** Are the test stimuli comprehendible?
2. ***Familiarity:*** Is the test material familiar to the user?
3. ***Size of the picture:*** Whether the picture stimuli are of appropriate size?
4. ***Color and appearance:*** Are the picture stimuli appropriate in terms of color and dimension?

5. ***Arrangement:*** Whether the picture stimuli are within the visual field of an individual?
6. ***Presentation:*** Are the number of stimuli in each section placed appropriately?
7. ***Volume:*** Is the overall manual appropriate in size?
8. ***Relevance:*** Whether the test material is culturally and ethically acceptable?
9. ***Complexity:*** Is the material arranged in the increasing order of difficulty?
10. ***Iconicity:*** Does the picture stimuli appear to be recognizable and representational?
11. ***Accessibility:*** Is the test material user-friendly?
12. ***Flexibility:*** Can the stimuli be easily modified?
13. ***Trainability:*** Can the stimuli be used for intervention purposes in different milieu?
14. ***Stimulability:*** Does the stimulus material elicit responses from the individuals?
15. ***Feasibility:*** Whether the test material is viable?
16. ***Generalization:*** Can the test material be generalized to any other adult language disorders and various settings?
17. ***Scope of Practice:*** Is the test material within the profession's scope of practice or within the personal scope of practice?
18. ***Scoring Pattern:*** Whether the scoring pattern followed in the resource material applicable?
19. ***Publications, outcomes, and developers (Professional Background):*** Is there any other resource material similar to this test material which you are aware of?
20. ***Coverage of parameters (Reception & Expression):*** Does the resource material contain the essential language components to be treated?

Appendix C

All India Institute of Speech and Hearing, Naimisham Campus, Manasagangothri, Mysore-570006

e- Copy of the consent form

Dissertation on

"Adaptation and validation of bedside western aphasia battery-revised in Hindi for persons with aphasia"

You are invited to participate in the study titled "Adaptation and validation of bedside western aphasia battery-revised in Hindi for persons with aphasia". This study is conducted by Ms. Trupti Lata Baral, a postgraduate student of the All India Institute of Speech and Hearing, under the guidance of Dr. Hema. N., Lecturer & Assistant Professor, Department of Speech-Language Sciences, All India Institute of Speech and Hearing. The study aims to adapt and validate the bedside western aphasia battery- revised and conduct a pilot study to test the utility of the tool. Participants and caregivers will be interviewed to obtain demographic details and necessary medical information prior to confirming eligibility for the study. Once eligible, the participant will be administered using bedside WAB-R via tele-mode, and will be recorded for further analysis. The identity of the participant will not be revealed at any time, and the videos will be maintained confidential. The data obtained from the recording will not be disclosed, and access will be limited to individuals who are working on the project. Participation in this study is voluntary. You can refuse to participate or withdraw at any point in the study without penalty or loss of benefits to which you are otherwise entitled. The procedures of the study are non-invasive, and no risks are associated.

Informed Consent

I have read the foregoing information, or it has been read to me in the language I understand. I have had the opportunity to ask questions about it, and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate in this study.

I, ____, consent to be participant of this investigation/study/program.