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Indian Academy of Neurology

Volume 1

IAN Textbook of Neurology

Complimentary Online Access with Videos & MCQs

Editors
Satish V Khadilkar
Gagandeep Singh

Foreword
Wolfgang Grisold

2nd Edition

JAYPEE

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4

CHAPTER

Testing Aphasia

Apoorva Pauranik

JAYPEE BROTHERS

INTRODUCTION

Why is this Subject Important?

Disorders of speech, communication, and language are many and heterogeneous **(Table 1)**. Aphasia is one of them and involves a deficit in expression (motor), comprehension (sensory), or both. The modes of communication affected could be verbal, written, or both, and other unusual ones such as sign language in deafmutes. At the core of aphasia lies a disturbance in language. The burden of aphasia is larger than the combined populations of individuals with multiple sclerosis, muscular dystrophy, cerebral palsy, and Parkinson's disease. Poststroke aphasia persists as a long-term disability in about 25% of survivors (range from 21 to 38%). A community-based study from Sweden reported an incidence of 4/100,000 per year. The prevalence is around 300 per million **(Table 2)**.[1] We do not yet have a clear picture of the epidemiology of aphasia in India. By rough estimates, the number of persons with aphasia (PWA) in the country will be about three million.

Neurologists and medical practitioners caring for a patient with aphasia should be more knowledgeable about

TABLE 1: Disorder of speech and communication.

Types of disorder	Comment
Disorders of phonation: • Aphonia • Dysphonia	Almost always due to laryngeal dysfunction (local, non-neurogenic, neurogenic paralysis of vocal cord muscles)
Disorders of articulation: • Anarthria • Dysarthria	• *Non-neurological local causes*: Glossitis, tonsillitis, laryngitis, pharyngitis, neoplasia • *Neurological causes*: ○ *Muscles*: Polymyositis ○ *Neuromuscular*: Myasthenia gravis ○ *Neuropathic*: GB syndrome ○ *Brainstem, cerebellum, basal ganglia, and cerebrum*: Many pathologies, CVA, neoplasia, infection, degeneration (Parkinsonism), trauma, developmental
Disorders of fluency: • Stammering (stuttering) • Cluttering	• Usually developmental • No discernible underlying pathology in most
Disorders of language: • Aphasia • Alexia/dyslexia • Agraphia	• In cortical speech areas and subcortical connections, among many pathologies stroke is the most common • *Other less common causes*: ○ *Developmental*: Mental retardation, cerebral palsy ○ *Degenerative*: – *Young age*: Autism, Rett syndrome, leuko- and poliodystrophies – *Old age*: Alzheimer's and other dementias

(CVA: cerebrovascular accident; GB: Guillain–Barré)

TABLE 2: Community burden of aphasia and other disorders of speech and communication.

Disease condition	Overall burden	Proportion with aphasia
Stroke	Prevalence 0.5%	25%
Head injury	Prevalence 1.2%	5–10%
Dementia	10% above the age of 60 years	Almost all have variable impairment of language functions, depending on severity
Mental retardation	• 5% (all) • 1% (severe)	Almost all have variable impairment of language function, depending on severity
Learning disabilities (e.g., dyslexia)	5%	All have a variable handicap in reading and writing skills
Fluency and articulation disorders: • *Stuttering*: Stammering, lisping, cluttering, lalling	1%	Variable handicap in all

BOX 1 Purposes of testing aphasia.

- To diagnose aphasia
- To differentiate it from mimics (differential diagnosis)
- To determine the overall severity of aphasia
- To make a diagnosis of aphasia syndromes
- To get a detailed profile of speech, language, and communication
- To get informed about the goal(s) and type of therapy to be provided
- To make comparative follow-up assessments for recovery and effect of treatment
- To assess psychosocial issues
- To assess associated cognitive functions
- For research purposes

and interested in the subject. They should be aware of the literature on the robust evidence base of the efficacy of speech–language therapy and be convinced that a good clinical assessment is essential for speech therapy to work.[2,3]

A neurologist should be aware of the many purposes of testing, which will guide the approach and scope of the examination **(Box 1)**. It is likely that, more often, the purpose(s) will be limited to a few of the above.

Evidence-based on History and Examination

It is indisputable that any medical treatment and intervention should be based upon robust and high-quality evidence, mainly randomized controlled trials. Similar standards apply to the validity of laboratory diagnostic tests. The clinical methods of history taking and physical examination should be judged on a similar rigorous criterion. Not much literature is available on the evidence-based validity of clinical testing for aphasia.[4]

CLINICAL HISTORY TAKING

The clinical history for probable aphasia and related speech and communication disorders starts right from initial greetings and pleasantries. Some PWA will try to sustain the conversation on their own or with the help of relatives and caregivers. Those with more severe grades of aphasia will mostly remain quiet or speak only a few words. A significant burden of narrating the illness's story will fall upon the caregiver. To begin with, we must urge to let the patient make more effort. Surprisingly, many PWA can convey helpful information despite their severe handicap. Ultimately, a complete history will be obtained with input from relatives.

Back-and-forth Relationship of History with the Physical Examination

It is well known in clinical medicine that history and physical examination are not always linear in that order. They keep shuffling back and forth. Many observations are made while listening to the story, clarifying some symptoms and asking leading questions. It is almost universal that during or at the end of the "examination," the neurologist will go back to questioning some unaddressed issues, which were not covered earlier, but now a need is felt based on some "signs" in the physical examination.

Listen and Encourage

The neurologist should be "all ears" while PWA and significant others (SOs) narrate the story. We must resist the temptations to interrupt on any pretext, be it a clarification, a leading question, or something unrelated. However, we must constantly be encouraging them by saying:
"Well, I understand. Oh, so", "How did it all start?", "What is/are your main problem now?", "I am sorry to learn that", "That was good", "Keep on telling", "What else?", "What next?", "Describe it in detail", "What do you mean by that?", "Is that all?", "Since when?"

While listening, you may scribble some rough notes. Detailed notes must be reserved for later, as they would distract your attention. Give the PWA and SOs ample time. There should not be any hurrying up.

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Checklist Approach to Symptomatology of Aphasia

There is a saying about the clinical physical examination that "your eyes see only that which your mind knows." Paraphrasing it, we may say, "your ears listen to only that which your mind knows."

We must know in somewhat detail the symptomatology of aphasia. Signs will follow during the physical examination, yet that should not be an excuse not to probe them during history.

Symptoms related to speech and communication are many and should be open in the mind's eyes of a neurologist in the form of a checklist and adjoining checkbox. As the history taking proceeds, many boxes will be checked randomly. If you think that even after giving ample time and good encouragement PWA and SOs are not coming up with any more symptoms, then only is the time to start asking leading questions and filling up the remaining unchecked boxes **(Box 2)**.

FEW ISSUES ABOUT TEST BATTERIES

Which Type of Test Battery? Ad Hoc or Standardized and Validated?

What is the criterion of a good test for assessment of aphasia? It should be *standardized*, *reliable*, valid, and discriminatory. Only then will it have precision and accuracy of measurement, which are sine qua non of good science.[5]

A limited number of aphasia language tests exist in most of the world's commonly spoken languages, other than English, European languages, and a few more. Very few have been constructed or adapted into Indian languages with all the rigor of a good test. Only a few have been published, along with normative data. This situation is a serious challenge to clinical practice and research in aphasia. There are many pitfalls of translating an existing test into a new language versus creating a new test. Many factors are to be considered in determining test content. The selection of test items corresponding to different language functions

BOX 2 **A list of possible symptoms which PWA and SOs may complain of.**

- Not talking at all, "no speech output"—mutism
- Reduced speed of talking, speaking fewer words at a time, speaking fewer utterances, hesitating while trying to speak, having pauses while speaking, taking a longer time to initiate the speech act, failing to take a turn while in conversation—nonfluency
- Groping for words, not finding the words, getting stuck up with words—anomia
- Response word differs from target word in the sound structure—phonemic paraphasia
- Response word differs, though the meaning is related—semantic paraphasia
- Uttering a word different than the one intended and which is unrelated to the target word and meaningless in the context—semantic jargon
- Uttering an unrecognizable string of sounds, not a word or phrase—phonemic jargon
- Uttering words which do not exist in the dictionary of the language (*lexicon*) known and used daily by a person with aphasia—nonwords, neologism
- Speech output restricted to a repetitive, meaningless, irrelevant *monosyllable* CV pair (CV recurrent utterance)
- Correct but roundabout description for a target word—circumlocution
- Uttering the same word again in response to different questions and need—preservations
- Speaking correctly but with distorted pronunciations, which remains unchanged each time the given word or sound is uttered—dysarthria
- *Repeating the word* or phrase spoken by others instead of answering—echolalia
- *Distorted pronunciation,* which keeps changing for a given word—apraxia of speech
- *Speaking excessively*, without a sense of completion, but mostly nonunderstandable, jargon-like, talking irrelevantly—fluent aphasia, empty speech
- *Not paying attention to* what others are speaking, not listening properly, not understanding whatever is being said, not following the conversation—defective auditory comprehension. It may appear as if hearing acuity is reduced, but hearing is normal
- *Not being able to repeat a syllable* or word or phrase spoken by others, despite comprehending it well—conduction, Broca's, Wernicke's aphasia
- *Reduced interest and efficiency in reading.* PWA may be holding a newspaper in his hands, but SOs are unsure if he is grasping anything. Unable to read aloud or read with distortions such as phonemic and semantic paraphasia, jargon, and nonwords. It may appear as if vision is reduced, but visual acuity remains normal—acquired alexia
- *Reduced memory*? Maybe the memory is intact, but relatives and caregivers think so because of anomia and paraphasia
- *Total or partial failure of writing*—agraphia
- Difficulties in writing with either hand—distorted handwriting. A similar range of problems in written expression as in oral verbal expressions (nonfluency, anomia, paraphasias, circumlocutions, jargon etc.)

(CV: consonant–vowel; PWA: persons with aphasia; SO: significant other)

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BOX 3 Some tips for a busy neurologist.

- Always carry cards with pictures of objects, actions, scenes, printed words, and sentences in the examination bag
- Better still, carry all the above and more variety of examples on desktop, laptop, or smartphone
- Verbatim records of assessments of aphasia are important. Hence, keep a scoring sheet ready to enter the patient's responses to various subtests. The target answers are preprinted in one column, and a parallel column is left blank to be filled verbatim immediately by the clinician
- Make a video or an audio recording of the clinical assessment to be saved on a computer. An assistant can transcribe it later
- If possible, train a clinical assistant in basic assessment to do the testing, recording, and later writing the notes
- Train a caregiver of PWA to help in follow-up assessments
- Team up with an SLP and clinical (neuro) psychologist long term

(PWA: persons with aphasia; SLP: speech–language pathologist)

with special emphasis on controlling healthy subjects is crucial. Statistical guidance is needed for establishing the psychometric properties of *standardized* assessment tools.[6,7]

Indian versions of a few test batteries have been published but may be difficult to procure as a fully commercial set.[8-16] Tools are also needed for assessing functional communication, caregiver burden, aphasia-related quality of life (QOL), discourse analysis, and pragmatics.

A general neurologist often uses *nonstandardized* and nonvalidated ad hoc assessment, which varies across clinicians, institutions, and occasions. It is not an ideal situation. Formal and published test batteries are essential for planning speech–language therapy, publication, and research.

However, ad hoc testing in outpatient department (OPD) and bedside is a practical necessity for busy general neurologists and residents in training. The methods of testing described in this chapter are *standardized* and validated but not published. A few tips are enumerated in **Box 3** for a busy neurologist.

How Brief, How Detailed?

While a neurologist is most suited for physical examination of a person suffering from a neurological disease, clinical aphasia testing is teamwork. A neurologist may be able to and is expected to conduct a relatively brief and informal assessment.

A full clinical assessment of speech and language communication in a PWA in an ideal condition is time- and labor-intensive and needs expertise and experience. Comprehensive *profiling* is essential for proper and complete diagnosis and therapeutic planning. Speech–language pathologists (SLPs) are primarily suited for this task, but neurologists, neurosurgeons, and internists should also contribute as much as possible. Input from clinical (neuro) psychologists also helps.

Comprehensive popular test batteries are helpful for proper diagnosis, syndromic classification, and labeling. Very elaborate and extensive protocols also exist to create fine-grained profiles about a few or many aspects of speech, language, reading, and writing with the help of many subtests. These test batteries need not be and cannot be administered in toto and certainly not in one go. Based on an initial briefer assessment, the neurologist or SLP must pick and choose which aspect of competence and performance he is interested in **(Box 4)**.

Role of Computers and Digital Technology in Aphasia Testing

Computers and smartphones are proving literally handy in testing aphasia. It has become easy and efficient for audio–video recording of testing and conversation, replay, transcription, and online and offline analysis by artificial intelligence. Clinicians have access to an unlimited number and variety of *stimuli* (pictures, images, graphics, audio, videos) for testing. Computerized testing for aphasia is helpful because it is portable, editable, expandable, interactive, transferable, and participatory, and can be individualized. It is easier to be modified as a *multilingual*, *multiscriptal*, and multimodal tool. Timekeeping and scoring are facilitated. Testing can be done anytime, anywhere. Neurologists should keep themselves updated with new digital tools becoming available.[17]

Screening Tests/Brief Tests

A neurologist/physician can perform a brief clinical assessment of aphasia in the office or at the bedside in 5–10 minutes. All significant aspects of evaluation (as described further) must be covered, at least briefly. It is advisable to follow a set sequence of testing.[18]

The Hindi Aphasia Screening Indore Test (HASIT) is a *standardized* and validated *test battery*, though unpublished, modeled after the Frenchay Aphasia Screening Test (FAST) from the UK.[19]

A more rigorous Indian *adaptation* of FAST was developed as a part of the Indian Council of Medical Research (ICMR) toolbox[20] for cognitive assessment across six languages and different educational levels.[21]

SOME POPULAR COMPREHENSIVE TEST BATTERIES (TABLE 3)[22]

Western Aphasia Battery

The western aphasia battery was designed to assess linguistic skills (writing, reading, *naming* and word finding, repetition, auditory comprehension, fluency, and *information content*) and primary nonlinguistic skills (praxis, calculation, block design, and drawing).[23]

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BOX 4 **Headings and subheadings in clinical examination of aphasia.**

- *Auditory comprehension*:
  - Pointing to objects, pictures
  - Carrying outspoken commands, sentences
  - Answering questions based upon the spoken discourse, paragraphs
- *Articulation*:
  - Recitation, singing
  - Simple words
  - Complex words
  - Sentences
- *Fluency in verbal expression*:
  - *During the conversation, while describing a picture or comic strip*:
    - Phrase length
    - Number of words per minute
    - *Agrammatism*
    - Stereotyped utterance
    - Word-finding difficulty
    - Phonological paraphasias
    - Semantic paraphasias
    - Neologisms
    - Circumlocution
- *Repetition*:
  - *Syllable*
  - *Words*: High frequency and high imageability
  - *Words*: Low frequency, low imageability
  - *Phrases*
- *Naming*:
  - Body parts
  - Real objects
  - Pictures
  - Question-based
  - Effect of *cueing* (phonemic and semantic)
  - Rejection of wrong answers

Acceptance of correct answers

- *Reading*:
  - Matching letters, syllables, words, numerals
  - Pointing to letters, syllables, words, numerals
  - Reading aloud letters, syllables, words, numerals
  - Sorting words and nonwords
  - Word–picture matching
  - Word–sentence matching
  - Filling in the blanks in sentences
  - Reading a paragraph and answering questions
  - Carrying out written commands
- *Writing*:
  - Copying letters, syllables, numerals, words, sentences
  - *Writing to dictation*: Letters, syllables, numerals, words, sentences
  - Signature, name, address, automatic sequences
  - Written naming of objects, pictures
  - Written description of a picture scene

TABLE 3: Current popular tests and methods of aphasia assessment.

Clinical bedside examination	Unstructured variable, as described in various textbooks, including this chapter
Screening test	Frenchay aphasia screening test, 5–10 minutes. *Standardized* and validated
Comprehensive examination	• Boston diagnostic aphasia examination • Western aphasia battery
Tests of specific aspects of language behavior	• Boston *naming* test • Token test (syntactic comprehension) • Tests for reading and writing
Tests based on cognitive neuropsychological approach	• PALPA • PAL • CAT
Assessment for functional communication and quality of life	• ASHA functional assessment • Communication activities of daily living • Quality of life scale in stroke–aphasia
Tests for special population	Infants and children, traumatic brain injury, right-hemisphere lesions, elderly and dementia subjects, *multilingual* subjects

(ASHA: American Speech–Language–Hearing Association; CAT: comprehensive aphasia test; PAL: psycholinguistic abilities in language; PALPA: psycholinguistic assessment of language processing in aphasia)

The scoring provides two key totals besides the subscale scores. These are the cortical quotient (CQ) score and the aphasia quotient (AQ) score. While AQ measures language ability, CQ assesses intellectual ability and entails the subscales. The overall severity of language impairment is represented by the AQ and is the total score.

Boston Naming Test

The Boston naming test assesses confrontational word retrievals in people with aphasia with the help of 60 black-line drawings graded according to difficulty. The patient is shown a picture and asked to respond to each. Approximately 20 seconds are allotted per answer. The examiner then writes down the responses of the patient in detail using codes.[24]

Boston Diagnostic Aphasia Examination

The Boston Diagnostic Aphasia Examination (BDAE) assesses various perceptual modalities (gestural, visual, and auditory), processing functions (analysis, problem-solving, comprehension), and response modalities (manipulation, articulation, and writing). It is used by psychologists, neurologists, occupational therapists, and SLPs.[25]

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AphasiaBank Test

The AphasiaBank test follows standard procedures during a video-recorded session. The steps are as follows:

1. *Free speech samples*, stroke story, and coping and important events
2. Picture descriptions (broken window, cat rescue, refused umbrella)
3. Story narrative (Cinderella)
4. Procedural discourse (peanut butter and jelly sandwich)

These procedures provide researchers with a *standardized* database for studying phonological, *lexical*, semantic, morphological, syntactic, temporal, prosodic, gestural, and discourse features.[26]

Verb Naming Test

The verb naming test examines verb *naming* by showing a picture to the participant, who then names the actions depicted in the picture.[27]

Complex Ideational Material

Complex ideational material is a sentence comprehension task designed to assess receptive language skills via yes/no questions that involve common knowledge information and facts in four short narratives.[28]

Famous People Protocol

The famous people protocol is used for assessing communication in severe aphasia in the case of individuals who cannot provide discourse data.[29]

Comprehensive Aphasia Test

The comprehensive aphasia test is designed to (1) screen for associated cognitive deficits, (2) assess language impairment in people with aphasia, (3) investigate the consequences of aphasia on the individual's lifestyle and emotional well-being, and (4) monitor changes in aphasia and its consequences over time.[30]

Psycholinguistic Assessment of Language Processing in Aphasia

Psycholinguistic assessment of language processing in aphasia (PALPA) is a resource for speech and language therapists and cognitive and clinical neuropsychologists who wish to assess language processing skills in great detail in PWA.[31]

CLINICAL TESTING OF SPEECH AND LANGUAGE FUNCTIONS IN A PERSON WITH APHASIA AND RELATED DISORDERS

Please refer to the link for appendices **(Box 5)** to access various *stimuli* and instructions about their administration and scoring as developed by the present author.[32]

BOX 5 **List of appendices. These appendices are available in detail in http://neurogyan2.arth-dhwani.com/aphasia.**

- *HASIT*: Hindi Aphasia Screening Indore Test
- *HRWIT*: Hindi Reading Writing Indore Test
- *LEAP-Q*: Language Experience and Proficiency Questionnaire
- Handedness questionnaire
- Images for nouns
- Images for verbs
- Scenes and comic strips for picture description and narrative discourse
- Word and nonword list for repetition, reading aloud, and lexicality judgment
- Word–picture matching exercise
- Sentence–picture matching exercise
- Yes–no questions for auditory and reading comprehension
- Short story-based questions for auditory and reading comprehension
- Question for responsive *naming* with a single unambiguous one-word answer
- Scoring proforma
- Glossary of aphasiological terms (italicized in the main text)

Note: The link leads to a website developed by the author for public education and patient education about neurology and other subjects in Hindi. The section on aphasia hosts additional information and tools in English for neurologists and speech–language pathologists.

Verbal Expression

Listen carefully to the patient and ask questions like "Tell me about your illness, your family, the work done by you at your job." Efforts are needed to make patients speak, not merely isolated words or gestures but longer *phrases* and sentences. The patient should be asked to describe the things and actions in a picture. The response should be recorded and transcribed verbatim. In many PWA, it may be incomplete, halting, and sparse, with a failure to grasp the totality of the scene despite repeated hints.

Articulation: Dysarthria and Apraxia of Speech

Defective articulation and phonation are recognized during a conversation, reading aloud, and repetition. A list of target *syllable*s, words, nonwords, and short *phrases* is needed for testing articulation. Instruct the patient, "I am going to say a few words and sentences; listen carefully and repeat them after me. Are you ready?"

The *stimuli* for repetition and reading aloud are chosen based on alphabets, sounds, and *syllable*s of Indian languages, which have a good scientific arrangement of vowels and consonants into different groups according to the place of production. Try to have an audio recording because transcription of dysarthric output may be complex. While listening to dysarthric speech, pay attention to the type of sound distortion (*phonemes*).

The repetition test should be performed twice with the same *stimuli*. In the case of dysarthria, the distortions will

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TABLE 4: Types of dysarthria.

Site of lesion	Disease example	Type of speech	Label
Bilateral upper motor neuron	Bilateral strokes, tumors, primary lateral sclerosis	Harsh voice, slow rate, strain strangle, imprecise consonants	Spastic ++
Unilateral upper motor neuron	Stroke, tumor	Consonant imprecision, harsh voice quality, slow rate	Spastic ++
Lower motor neuron	Bulbar palsy, myasthenia gravis	Breathy, nasal voice, imprecise consonants	Flaccid
Upper and lower motor neurons	Amyotrophic lateral sclerosis, multiple strokes	Strain–strangle, hypernasality, harsh voice, slow rate, imprecise consonants	Spastic and flaccid
Basal ganglia: a	Parkinson's disease	Rapid rate, reduced loudness, monotonous and nonvariable amplitude	Hypokinetic
Basal ganglia: b	Dystonia, Huntington's disease	Prolonged *as*, inappropriate silence, variable rate, voice stoppage	Hyperkinetic
Cerebellum	Stroke, degenerative disease, multiple sclerosis	Irregular articulatory breakdowns are made apparent on rapid repetition of equal *stress*	Ataxic

be the same each time. However, in a condition known as apraxia of speech, the same *stimuli* will yield slightly altered output.

Dysarthria is common in nonfluent aphasias. Pure dysarthria can occur in many disorders other than aphasia **(Table 4)**.

Fluency of Speech

Even healthy people have a wide range of fluency in speech. Some are talkative, verbose, descriptive, and detailed, while others are persons with a few words, precise, and speaking in minimum words, only what is required. Think about how we can quantify verbal fluency.

Many measures have been used in clinical practice and research, e.g., the number of words per minute, the total number of words, the ratio of *content words* and *grammatical or function words*, informativeness of speech, *articulatory agility*, pauses, hesitancies, *prosody, intonation*, and others.

A PWA with nonfluent speech speaks in *monosyllables* or short sentences. Sometimes only a single utterance is repetitively used in every conversation. These verbal stereotypies [consonant–vowel (CV) recurring utterances] are sometimes intoned differently to convey some meaning, as in (yes!), (yes?), (y..y..es?).

There may be a delay in initiating a response, increased effort, apparent strain, pauses between words and sentences, and interruptions. Nonfluent speech, as in Broca aphasia, also exhibits *agrammatism* in which there is an absence or a scarcity of *function words*. The short *phrases* are composed of *content words* only, though the meaning is conveyed somehow in a manner resembling "telegraphic language" as if to economize on words.

The word-finding difficulty is also a measure of fluency. It is encountered in almost all PWA. It is manifested by repetition of determiners (a, an, the), prepositions (this, that, which, so), other functional or grammatical units (and, yes), vocal and gestural mannerisms ("uh", pointing toward something), circumlocution, paraphasia, neologism, and jargon.

Many PWA can fluently recite overlearned lists (automatized sequences) such as counting, alphabets, days of the week, and months of a year, while the rest of the verbal output may be very nonfluent. The same is true for singing and uttering curse words and swear words.

Category fluency test requires the patient to think and speak names or words belonging to one specific *semantic category* within 1 minute, e.g., animals, vegetables, fruits, sweets, instruments, and vehicles. We may ask PWA to alternate between categories, such as clothes and furniture, to make the task more complex.

Another fluency test is to ask the person to think and speak rapidly, words beginning with specific letters within 1 minute, e.g., F or A or S.

Fluent but empty speech: Suppose one listens to the speech of a person with fluent aphasia from a distance, ignoring the actual content; in that case, it appears effortless, with typical melody, *accent*, *prosody*, and mannerisms. However, on close observation, the content is empty and abnormal. *Phrases* and sentences are of average length or sometimes overly lengthy. The patient fails to know when to stop. They may speak excessively (logorrhea), unaware of the abnormality. There are many paraphasias, circumlocutions, and an abundance of function or grammar words whose information load is low. The *content words*, which carry information, are scarce and are used, flouting the rules of grammar. Jargon is common. Such patients have profound defects in auditory and reading comprehension. A classic example is Wernicke's aphasia.

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Discourse Analysis

As per the Merriam–Webster Dictionary, "discourse (noun)" is defined as "the verbal interchange of ideas, especially during conversation, expression of thought on a subject, connected speech or writing."

Discourse is a linguistic unit (such as a conversation or a story) larger than a sentence. It is an intransitive verb, too, meaning "to express oneself, especially in oral discourse", *to talk and converse.*

Spoken discourse is a fundamental form of communication, often disrupted in PWA and other neurogenic communication disorders. Discourse analysis is important for understanding language, its impairments, and language recovery in these populations. However, it is beyond the scope of this chapter. A neurologist should help SLP colleagues with discourse analysis by audio recording testing and conversation.[33]

Discourse analysis is time-consuming with an overwhelming and wide range of measures for the clinicians, such as the number of *T-units* and total words produced or *pragmatic protocol checklists.*[34,35]

Auditory Comprehension

Some ideas about a PWA's capacity to understand whatever is being spoken around him could have been obtained during history taking.

Command Comprehension

If a patient merely shows the tongue on command, nods the head this or that way, or responds to a question, that does not mean normal auditory comprehension. Further testing is needed through several tasks. Each command must be stated only once, at a slow and regular rate and not repeated piecemeal.

While giving a command, the examiner and bystanders must not help by gestures.

At the sentence level, command comprehension can be complicated by involving more than one step, e.g., "*Fold this piece of paper and put it into your pocket*", "*Pick up the piece of cloth, put it into the glass, and then invert the glass on the table.*"

Pointing Test of Auditory Comprehension at the One-word Level

The examiner speaks out the word and asks the patient to point to the corresponding picture, object, or body part. The clinician scores the patient's performance in terms of correct answers, taking into account all the help or *cue*s and time latency. Some patients may perform poorly at the single-word level (identification by pointing) but better in sentence comprehension during day-to-day life, as meanings may be discernible through the context and redundancy of words.

Yes–No Questions

"*Does the stone sink in water?*", "*Is an elephant larger than an ant?*" Not uncommonly, many patients performing reasonably well in daily household communication through gestures fail miserably in these formal testing modes.

Picture–Sentence Matching Tasks

Picture–Sentence matching tasks use one sentence, many picture choices, and vice versa.

Discourse Level Comprehension

The clinician narrates a short story and asks questions based on it.

Repetition

The examiner asks the patient to repeat words, *nonwords*, *phrases*, and sentences after him. Initial *stimuli* are simple, short, and *high frequency*; later, they are long, hard to pronounce, and *low frequency*. The errors may be sound distortions, incomplete responses, deletions, or paraphasias. Some patients may perform well on auditory comprehension tests and do well during daily life but fail miserably on repeating simple words or *phrases* (conduction aphasia). In contrast, patients with transcortical sensory and mixed aphasia repeat long, complex *phrases* mechanically or slavishly. Still, they do not follow or extract a bit of meaning from whatever they are listening to and repeating.

Naming

Naming is not just telling the names of family members and friends. It is a broad concept that entails the ability to generate authentic, correct, and well-pronounced words in response to needs in communication, expression, and writing in daily life.

One begins with *naming* objects, pictures, body parts, or persons. The images used during auditory comprehension serve the purpose again, with a reversal of roles. Now the examiner puts her finger on the object or picture and asks PWA to name it. "Responsive *naming*" involves simple questions with an unambiguous one-word answer like, "*what do we call a person who delivers a letter at home.*" Some PWA may fail, or there may be a delay. Sometimes the *response word* may be altered yet related to the target word by sound (phonemic paraphasia) or meaning (semantic paraphasia). The *response word* may be phonemic jargon (nonword) or semantic jargon (dictionary word but unconnected). Some patients may describe the word in a roundabout way (circumlocution). The clinician should give *cue*s or hints. The phonemic *cue* means uttering the first one or two *phonemes* of the word or producing its rhythm. Semantic *cue* involves indicating synonyms or attributes of that word. In case of persistent failure, the examiner then offers the answer by (1) suggesting a wrong answer and

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asking if it is correct or not and (2) suggesting the correct answer and again looking if the patient accepts it or not.

Reading

The reading tests and, to some degree, those for writing in aphasic alexia and agraphia overlap with tests for developmental dyslexia.[36-38]

The clinician tests the patient's ability to recognize, match, and discriminate the graphic symbols of alphabets. She asks PWA to read aloud words, *phrases*, or paragraphs, not necessarily paying attention to the meaning. Reading comprehension involves word–picture or word–object matching and carrying out some commands printed on a piece of paper (e.g., *touch your hair* and *make a fist*). A somewhat difficult task is to fill in the blanks in progressively complex sentences from amongst a choice of detractors. The PWA reads lengthy paragraphs (unseen passages) and is asked to write answers to questions based on them. The patient can be asked to sort words and nonwords from a mixed list.

Writing

A PWA with reasonably good motor dexterity of a hand should be able to reproduce his premorbid handwriting, at least in such mechanical tasks as copying from written *stimuli*, writing to dictation, and serial writing of automatized sequences (such as name, address, numbers, alphabets, weekdays, and months). However, patients with nonfluent aphasia fail in written expression too. In addition to various aspects of verbal nonfluency (reduced output, laborious start, pauses, and *agrammatism*), the mechanics of writing and calligraphy are also distorted. The writing of persons with fluent aphasia may be legible and well-formed, but the written expression will exhibit deficits of emptiness, paraphasias, jargon, circumlocution, etc. Picture *naming*, object *naming*, and describing events in a painted or sketched scene are further tests of written expression.

WHAT ELSE OTHER THAN SPEECH AND LANGUAGE?

Patient's Educational and Working Status

It is important to document the educational status of the patient in terms of number of years, subjects, degrees, and academic excellence. Working status refers to the type(s) of part and current jobs and occupation or being retired. Such information is necessary to set the goals for therapy.

Language Proficiencies

We in India have an exceptional opportunity to explore the effect of the same lesions on persons who speak structurally distinct languages. Aphasia in *multilingual* speakers poses special challenges. It becomes imperative to assess all the languages used by PWA. The clinical profile of aphasia may vary in the two or more languages used by PWA. Cross-language codeshifting and code-switching (shifting between vocabulary and grammar of different languages) are very common in Indian bi and *multilingual*s with aphasia, making it difficult to compare the performance across languages. A *standardized* assessment in all the languages the PWA uses is an important requirement in its own right and is also crucial for theoretical aspects and therapeutic planning.[39,40] The *bilingual* aphasia test is available in nine Indian languages but is lengthy.[41] Language Experience and Proficiency Questionnaire (LEAP-Q) is an internationally acclaimed objective tool for assessing the efficiency and use of languages in bi- or *multilingual* persons.[42] A Hindi version by the present author has been acknowledged and added to the host website of LEAP-Q.

Handedness

A PWA's handedness affects cerebral dominance of language function between the right and the left hemispheres. Neurologists must use a standard and valid battery to determine right- versus left-handedness degrees.[43] The present author has created a Hindi–English *bilingual* questionnaire for scoring handedness.

Communication in Daily Life

The scores obtained on formal aphasia tests (as measured on popular test batteries) and the actual communicative performance in daily life often vary. To test for the latter, we use a different set of batteries.[44]

Quality of Life and Psychosocial Issues: Aphasia Assessment and the International Classification of Functioning, Disability, and Health

The international classification of functioning, disability, and health (ICF)—developed by the World Health Organization (WHO)—is a framework to address functioning and disability related to a health condition within the context of the individual's activities and participation in everyday life.[45]

Applying ICF to the assessment of PWA and their family/carers leads to addressing all domains of *functioning* and disability and defines the person-centered and family-centered functional goals. The goals identified by the PWA, in partnership with the clinician and family, allow participation in meaningful activities and roles. Person-centered functional goals help in maximizing the outcomes that lead to functional improvements that are important and meaningful to the individual.[46]

It is essential to measure "QOL" in PWA to identify patients' problems, determine treatment priorities, manage interventions, and monitor disease periods. Indian questionnaires have been developed and validated for this

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purpose and should be part of the assessment protocol for aphasia.[47,48]

Anxiety and depression are common in PWA and interfere with therapy and rehabilitation. Simple and valid tools for assessing these mental states should also be part of testing for aphasia.[49]

Caregiver Burden

Caregivers' burden in supporting PWA may sometimes appear trivial and mutually satisfying, particularly in cultures (like India) where family values are held high. However, in the long term, it may be unbearable. Aphasia QOL studies should include "caregiver burden" and "supportive communication strategies" used by SOs and report them separately.[2,50] Caregivers have to double up as facilitators for home-based therapy and during therapy in the clinic.[51] Clinical tales or patient stories written by patients, caregivers, and clinicians may be compiled and published.[52, 53]

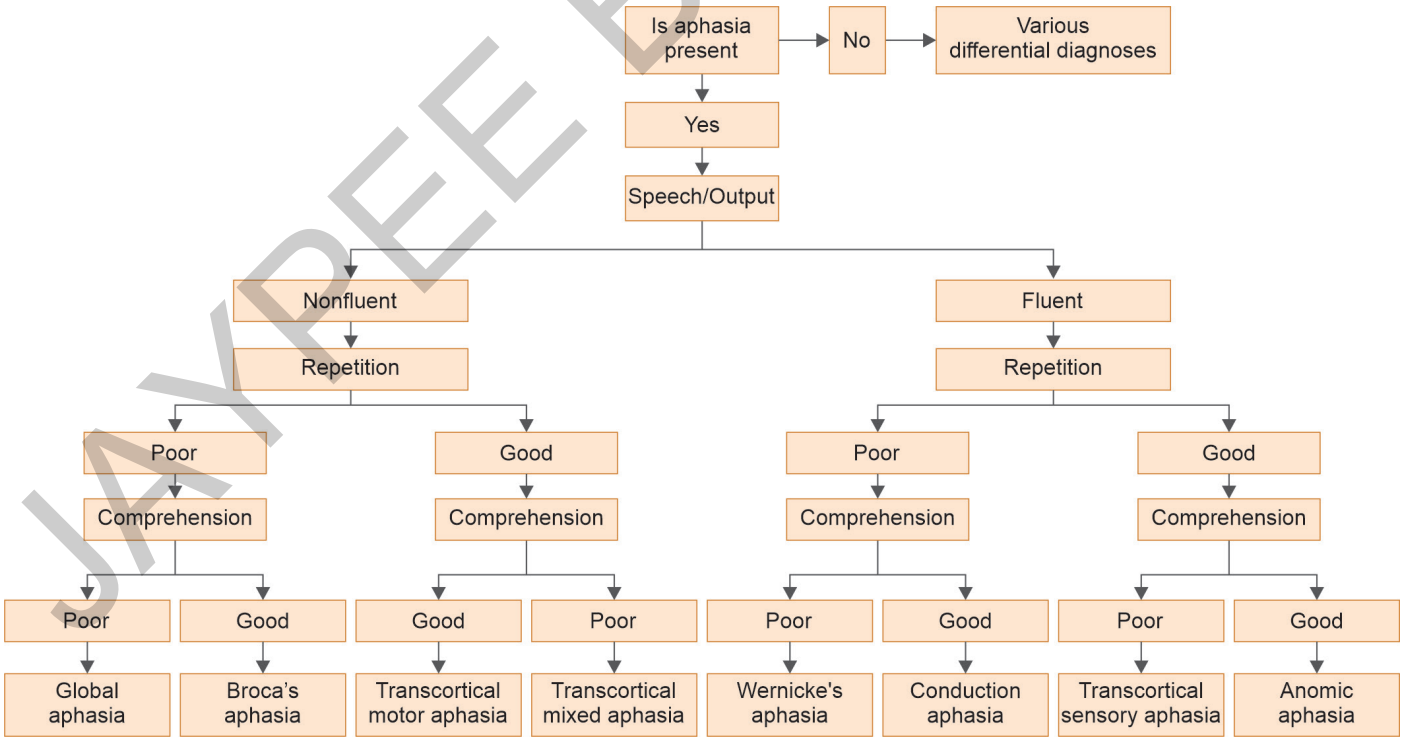
Cognitive Functions

Aphasia is not an exclusively language-related problem.[54] Other cognitive functions, such as working memory, short-term memory, recent memory, attention, executive skills, sensory perception, motor dexterity, apraxia, agnosia, and spatial orientation, are simultaneously affected.[55] Aphasic deficits may be seen as impairments to working memory. It is very challenging to assess impairments in various aspects of cognition in a person whose comprehension and expression are affected.[56]

APHASIA SYNDROMES, THEIR IRREVERENCE, AND NEWER METHODS OF ASSESSMENT

Syndromic classifications **(Flowchart 1)** have been helpful as a shorthand summary of a patient's language disorder. However, syndromes have lost their theoretical and practical relevance.[57] Newer classifications based on *neurolinguistics* and cognitive neuropsychology require modifications in methods of clinical examination. We must adopt a deficit-based approach instead of syndrome based. SLPs and researchers are using ingenious and experimental ways of testing the competence and performance of PWA based on the cognitive neuropsychological model of language **(Flowchart 2)**.

Aphasiologists can take a *cue* from epileptology, wherein the classification of seizures has been revised. More emphasis is on seizure semiology rather than pigeon-holing subjects into a straitjacket of categories. Something like video monitoring has happened in aphasiology. Data from single patients have become the basis for cognitive neuropsychological research and therapy.[58]



FLOWCHART 1: Aphasia syndrome diagnosis. Three dichotomous questions lead to the diagnosis of eight aphasia syndromes: (1) Is the speech fluent or nonfluent? (2) Is repetition good or poor? (3) Is auditory comprehension good or poor?

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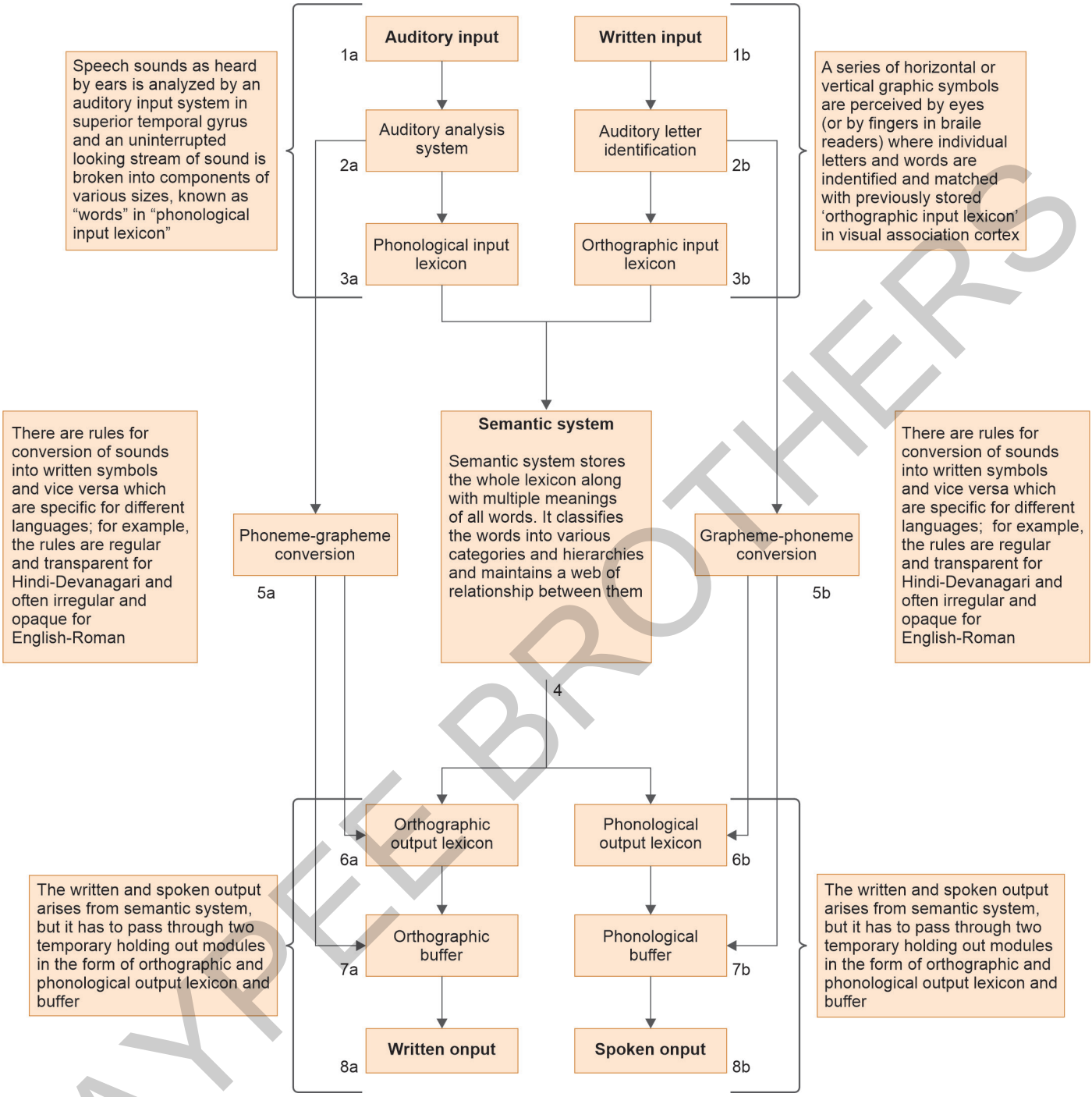

FLOWCHART 2: Cognitive neuropsychological model of language organization in the brain. A general neurologist need not memorize the model but should be aware that such frameworks lead to additional aphasia testing and *profiling* methods. It helps to localize the defect (not lesion on imaging) at one or more of the boxes and arrows in the model, leading to the choice of therapy.

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DIFFERENTIAL DIAGNOSIS

It is beyond the scope of this chapter to discuss the differential diagnosis. However, it is necessary to emphasize that aphasia is a clinical diagnosis, and there are no laboratory tests. The differentiation relies on a more comprehensive and repeated examination and considering the overall picture. While clinically examining a PWA, the neurologist will tailor and modify the assessment methods so as not to make errors in diagnosis **(Table 5)**.

Psychogenic syndromes (conversion or dissociative states, catatonia) can also render a person speechless for a variable period. Impaired fluency during a conversation but not during formal verbal fluency tests following a minor cerebral concussion should raise suspicion about motivation and secondary gains. The same applies if

TABLE 5: Differential diagnosis.

Not to miss the diagnosis of aphasia when presenting a true diagnosis	
True diagnosis	**Mistaken for**
Mild aphasia	Normal variation
Receptive aphasia, mild Wernicke, pure word deafness	Impaired hearing
Anomia	Amnesia
Alexia	Visual impairment
Jargon aphasia	Delirium, psychosis
Not to make a false-positive diagnosis of aphasia when not present	
True diagnosis	**Mistaken for**
Developmental disorders of speech, learning disability	Aphasia, alexia
Developmental suppression of motor fluency, stuttering	Nonfluent aphasia
Hearing impairment, congenital deaf mutism	• Receptive aphasia • Global aphasia
Pure dysarthria	Nonfluent aphasia
Anarthria, mutism	Severe Broca's aphasia
Psychogenic: Mutism, hypophonia, slow speech, atypical halting	Severe Broca's or global aphasia
Schizophrenia: Bizarre and absurd speech, flight of ideas	• Jargon speech • Wernicke's (fluent) aphasia
Delirium, altered sensorium, muttering	Aphasia, anomia, jargon speech
Amnesia, Korsakoff syndrome	Anomia, paraphasia
Apraxia: Fails to comply with the command	Receptive aphasia

speech impairment develops many weeks or months after the event and if it keeps worsening. Another marker is the inconsistency of paraphasic errors for a particular sound. If a nearly mute person can express well in writing, it may indicate a functional disorder.

CONCLUSION

An expert group meeting on aphasia was organized by the present author on behalf of the Indian Academy of Neurology.[59] SLPs, clinical neuropsychologists, linguists, and imaging and computer professionals participated along with neurologists. It was realized that assessment or testing of aphasia in India needs much improvement and joint efforts. There are no shortcuts. It needs time, patience, experience, and commitment from neurologists and colleagues. Practice helps. Repeated drills enhance the quality of testing in lesser time. The PWA and SOs deserve a lot more from neurologists. We must not fail them.

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