THE TIME FACTOR IN APHASIC EVALUATION
- A PILOT STUDY ON THE W.A.B.

Jyothi (S.B)
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With love

To my dearest

Daddy and Mummy

Who are PROUD even of my SMALL achievements

CERTIFICATE

This is to certify that the Dissertation entitled "THE TIME FACTOR IN APHASIC EVALUATION - A PILOT STUDY ON THE W.A.B." is a bonafide work in part fulfilment for the Degree of Master of Science [Speech & Hearing], of the student with the Register Number M-9111.

Mysore
1993

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CERTIFICATE

This is to certify that this Dissertation entitled "THE TIME FACTOR IN APHASIC EVALUATION - A PILOT STUDY ON THE W.A.B." has been prepared under my supervision and guidance.

Mysore
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DECLARATION

This Dissertation titled " THE TIME FACTOR IN APHASIC EVALUATION - A PILOT STUDY ON THE W.A.B." is the result of my own study under the guidance of Dr.Pratibha Karanth, Head of the Department of Speech Pathology, All India Institute of Speech & Hearing, Mysore and has not been submitted earlier at any University for any other Diploma or Degree.

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To The 3 wonder kids in my life Payal, Tanvi & Manjunath.

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INTRODUCTION

'She still could speak
She paused and groped and found
What seemed at first a
Serviceable sound,
But from adjacent cells imposters
took
The place of words she needed,
and her look
Spelt imploration as she sought
in vain
To reason with the monsters
in her brain'

Vladimir Nabokov
in " Pale Fire "

We are all familiar with the frustation attendant upon attempting to communicate in a language that we know but dimly, a feeling that is perhaps a pale shadow of what the aphasic patient must suffer.

Aphasia has been defined as the loss or impairment of language caused by brain damage. Although aphasic disability is complex, many aphasic patients are clinically similar and fall into recurring identifiable groups. Over the years, a bewildering amount of nomenclature has been used to describe and classify the various aphasia syndromes. Regarding classification, Kertesz (1979) says that many of the classifiers describe the same phenomena from a different angle and in fact complement rather than contradict each other.

Definitional problems arise because 'aphasia' has been used to refer to a wide variety of impairments of language which are caused by brain damage or are suspected to be caused by brain damage. However, language impairment is the primary characteristic of aphasia, while in multifaceted disorders such as psychosis or dementia, it may be a secondary characteristic.

Diagnosis and Assessment hold a prominent place in historical and contemporary aphasiology. Diagnostics provide the database for clinicians and researchers.

In Aphasiology, the term 'diagnosis' encompasses matters relating aspects of linguistic impairment to alterations in brain function and the determination of the site of the lesion producing the impairment.

Testing in aphasia has undergone various forms from simple bedside testing without any special testing equipment to complex test batteries. While the bedside testing does provide the busy clinician with a quick guide to the diagnosis, from which an initial series of management steps may be taken, it lacks standardization and objectivity.

In aphasia research, tests designed to probe the many different levels of language processing have become more refined in the past decades. Lexical decision making, monitoring masking and other on-line tasks are continually being improved. Even data from so called 'simple' or classical language tasks such as repetition, spontaneous speech and naming are now being reinterpreted along numerous dimensions.

That automatic processing is affected in brain damaged patients has often been regarded as or linked to one of the general indicators or non-localizing symptoms of focal brain damage, which are so difficult to describe in an adequate manner - For eg. general slowing in performance, longer reaction times, and so on. Although these non-specific symptoms are so difficult to separate from the specific focal, localizing symptoms application of the automatic/controlled distinction is informative in determining and understanding the specific processing deficits (Stark,1984).

Several tests for assessing aphasic problems have been described since 1926. For instance* Head test 1926; Weisenburg & McBride's battery, 1935; Eisenson's Examination for Aphasia, 1954. The language modalities test for Aphasia (LMTA) of Wepman & Jones,1961.

* The Minnesota Test for Differential Diagnosis of Aphasia (MTDDA) - Schuell,1964.
* Porch Index of Communicative Abilities-PICA (Porch,B.E.1967).
* The Neurosensory Center Comprehensive Examination for Aphasia (NCCEA) - Spreen & Benton,1968.
* Functional Communication Profile (FCB) - Sarno M.T. (1969).
* Appraisal of Language Disturbances - ALD (Emerick,L. 1971).
* Token Test by DeRenzi & Vignolo, 1969.
* The Auditory Comprehension Test for Sentences-ACTS (Shewan & Canter,1971)
* The Sklar Aphasic Scale (SAS)- Sklar, 1973.
* Revised Token Test (RTT)- McNeil,M.R. & Prescott,T.E.(1978).
* The Bosten Diagnostic Aphasic Examination BDAE - Goodglass & Kaplan (1982).
* Western Aphasia Battery (WAB) - Kertsz & Poole (1974) & Kertsz A.(1982).
* Bilingual Aphasia Test (BAT)- Paradis,M. (1987,1990).

Table-I gives a summary of some of these tests and the r characteristics.

The proliferation of aphasia tests is similar to that of classifications though not quite to the same extent because of the efforts involved in test construction and standardization. The variety of needs and approaches is reflected in the methods of presentation, the stimuli, the number of items and scoring.

Unusual selection of tests based upon various idiosyncratic concepts of aphasia leads to artifactual diagnostic categories not shared by other clinicians. On the other hand, a mechanical exploration of the endless combination of input and output modalities regardless of clinical emphasis, results in meaningless categories and impractically long batteries.

Obviously, there is no test that satisfies everyone, but the balance between selectivity,and comprehensiveness is probably the key to the value of each test, provided other criteria concerning standardization, grading and validity are satisfied.

Among the list of criteria to be considered is an ideal test, Kertesz (1979) states that it should be practical enough in terms of duration required to administer preferably in one setting.

Most of the tests mentioned earlier are power tests rather than speed test and thus the patient is given as much time as he feels necessary to complete each task. While a bed side screening may be completed in 10-15 minutes, some of the tests require

TABLE-I: Summary of the tests and its characteristics
(Cited from "A survey of adult aphasia": Davis A.G.,1983.)

	ORIENTATION	ADMINISTRATION TIME	COMPREHEN-SIVENESS	NORMS	RELIABILITY	RESEARCH USE
MTDDA	R Planning	2 - 6 hrs	Strong	Aphasics Normals	Undetermined	Occasional
PICA	Measurement & R Planning	1/2 - 2 hrs	Good	Aphasics, Normals, (Right hemisphere & Bilateral brain damaged	Strong	Frequent
BDAE	Classification & R Planning	1 - 4 hsr	Strong	Aphasics, Normals	Undetermined	Frequer.t
SAS	Screening	15-60 mins.	Moderate	None	Undetermined	Rare
ALPS	Screening	20-30 mins.	Minimal	Aphasics Normals	Good	Rare
LMTA	R Planning	1 - 3 hrs.	Good	None	Undetermined	By Wepran
NCCEA	R Planning & mst.	1 - 3 hrs.	Good	Aphasics Normals & nonaphasic brain injured.	Undetermined	Occasional
WAB	Classification & mst.	1 hour	Good	Aphasics, normals, Hon-dominant brain injury.	Strong	By Kertesz

t

administration, time ranging from 30 minutes to 6 hours (see TABLE-1).

Some test batteries like the FCP and (Sarno,1969); ACTS (Shewan & Canter,1971) consider speed/promptness of the response in their scoring system. For example, in the FCP rating system, an item is rated normal when it is estimated that the patient performs the act precisely as he did premorbidly. This means that the ratings take into account (1) speed (2) accuracy (3) consistency (4) voluntary control without benefit of external cues, and (5) compensatory functions for the behaviour.

Some subtests of the BDAE and WAB (for eg. word fluency measure and word discrimination task of BDAE and word fluency task of the WAB) have incorporated the time aspect.

In tests which are not time bound the nonlocalizing symptoms of focal brain damage like general slowing in performance, longer reaction time, etc. highlighted by Stark (1984) may be missed out. This especially holds true in groups of recovered or mild aphasics whose word finding difficulty or the occasional uttered paraphasia would justify regarding them with the aphasic group clinically, though their performance on the test batteries fall in the normal range. This so called normal performance is probably below their usual language ability.

In most, mildly impaired aphasics performance in tasks such as picture naming improves when given extratime i.e. further opportunity for lexical search indicating that their problem is primarily one of slow word retrieval. These individuals exhibit difficulty in processing language in day to day communication and fail to reach the standards of rapid processing which normal individuals are capable of. This implies that time factor contributes significantly in the communication process and needs to be incorporated in the test batteries to facilitate better understanding of the problem as well as in determining recovery. Yet measure of speed of response is not incorporated across allsubtests of clinical test batteries of aphasia.

The W.A.B. is a popular protocol used for the clinical evaluation of aphasia. It intends to help clinician solve the problem of whether a given patient is normal or not. Completion of the WAB yields a total score entitled the AQ which is the weighted composite of 4 major test areas i.e. spontaneous speech, auditory comprehension, repetition and naming.

According to Shewan & Kertesz (1980) the A.Q. is a functional measure of the severity of the spoken language deficit in aphasia. As per WAB, the patient may be considered normal or nonaphasic if the AQ is 93.8 or above which is the mean AQ of the diffuse or subcortic of brain damaged control group.

With the exception of the word fluency test (in which patient has to name as many animals as he can in one minute) and task of object naming (where a maximum of 20 seconds are allowed to name each item, all other tasks are not time bound in that patients are given as much time as they want. While most normals can complete the language subtest of the W.A.B. within short span of time, the aphasias may take about an hour to do so, depending upon the severity.

One may therefore come across recovered or mild aphasics who while scoring high A.Q. may take lesser time than the severe aphasics but much more than the normals.

Also different groups of aphasics may show different time patterns in the subtests depending on their deficit. For example, a conduction aphasic may require much longer time in the task of repetition than in spontaneous speech or object naming. On the other hand, an Anomic aphasic may be slower only on task of naming or spontaneous speech in which he has word finding difficulties, but may be quick in task of auditory word recognition.

In other disorders of language such as Dementia the earliest signs of disturbance may be general slowing. Studies have been conducted using the WAB to compare the language performance of advanced cases of dementia and that of aphasics (Appell, Kertesz & Fisman 1982; Horner, Dawson, Heyman & Fish 1992). Their results show that dementia subjects differed significantly from left hemisphere stroke aphasic subjects in speech fluency and comprehension.

In the early stages, the aphasia quotient of dementia subjects may be normal and speed of the response may be the prime factor differentiating it from normals.

Among the normals too, certain language changes are reported due to aging and language of normal elderly adults is said to differ subtly from that of young adults, one of the aspects on which the two differ being speed of response.

The present study is therefore aimed at evaluating the role of the time factor if any, in differentiateing between normal adults and language disordered patients using the Western Aphasia Battery.

Within the above framework:

* to rule out/identify the effect of age on speed in language processing if any.

* To determine whether the time factor could be an additional factor contributing to the classification andseverity rating of aphasia.

REVIEW OF LITERATURE

Aphasia is a many faceted problem, and has been studied using different frameworks. The realization that the problem is complex has persuaded investigators, of the need for communication across disciplines.

The diversity of opinions among the people concerned with this problem can be seen even at the level of definition.

Several definitions of aphasia have been proposed and have been used (Broca,1861; Jackson,1879; Marie,P.1906; Henry Head,1926; Penfields & Roberts 1959; Eisenson,J.1973; Benson,1970; Schuell,1975; Wepman,1964).

Keeping the multidisciplinary approach in mind Kertesz (1979) defines aphasia as "...... a neurologically central disturbance of language characterized by paraphasias, word finding difficulty and variably impaired comprehension, associated with disturbance of reading and writing, at times with dysarthria, nonverbal constructional, and problem-solving difficulty, and impairment of gesture."

As a consequence of the complexity and variability of aphasia, over the years an extraordinarily large number of systems have been developed to classify the various aphasia syndromes. In general, individual aphasia researchers have tended to develop their own terminology to differentiate the various types of aphasia based on their own idea of the nature of aphasia.

Classifications are a necessary evil. To avoid the confusion associated with a broad classification system, many authors make use of simple dichotomies to classify aphasia. The two most widely used dichotomies are the expressive-receptive division proposed by Weisenberg & McBride(1935) and the motor-sensory division originally introduced by Wernicke (1874). Two additional dichotomies also frequently used in the literature include the fluent-nonfluent (Benson,1967) and anterior-posterior (Goodglass & Kaplan,1972) dichotomies (Murdoch (1990).

Although each of the dichotomies has a validity and a usefulness, none adequately characterizes the distinguishing features of most varieties of aphasia. Therefore, there arose a need to divide the aphasic disturbances into a greater number of types rather than simply being divided into dichotomies mentioned earlier.

The Boston classification system (Benson,1979) identifies eight clinically recognizable aphasia syndromes. These include:

(1) Broca's aphasia - associated with lesion involving the expressive speech centre and characterized by -
   - nonfluent speech output (agrammatics, effortful, often telegraphic)
   - Poor repetition abilities.
   - Auditory comprehension relatively spared.
   - Motor involvement (hemiplegia or hemiparesis) present
   - Writing affected similar to speech
   - Reading aloud poor; reading comprehension better

(2) Wernicke's aphasia - caused by a lesion of the audio-verbal centre, characterised by :

- impairment in language comprehension
- poor naming and poor repetition abilities
- fluent, well articulated speech but lacking in content and contaminated by paraphasias or neologisms
- Rarely have any concomittant motor problem
- Impaired reading and writing.

(3) Conduction aphasia resulting from a lesion involving the pathways connecting the audio-verbal and expressive speech centres; characterized by - disproportionate impairment in repetition relative to spontaneous speech and oral and written comprehension.

- Fluency is variable and may exhibit word finding difficulties, paraphasic errors and slight impairment of articulation.
- Impaired repetition is the most outstanding feature and is most marked for multi-syllabic words and sentences.
- Relatively good reading comprehension abilities.
- Written spontaneous language is impaired similarly to spoken spontaneous language, although the motor aspects of handwriting are usually normal.

(4) Global aphasia is produced by an extensive lesion involving both the audio-verbal centre and the expressive speech centre.

- All major language functions are seriously impaired, including both the expressive and receptive components of language.

- In its most severe form the patient does not communicate and verbal output is limited to expletives or a stereotypic repetitive utterance.
- Global aphasics may exhibit a range of concommitant neurological signs indicative of severe brain damage.

(5) Transcortical Motor Aphasia is associated with disruption of the pathways connecting the concept centre to the expressive speech centre and is characterized by a marked reduction in the quantity and complexity of spontaneous speech in the presence of a retained ability to repeat.

- Speech is nonfluent and described as stumbling, repetitive and 'stuttering -like'.
- Comprehension of spoken and written language is relatively preserved.
- Reading aloud, writing is affected.
- T.M.A.s usually perform poorly in confrontation naming tasks.
- Associated neurological signs exhibited by TMAs are similar to those found in Broca's Aphasia.

(6) Transcortical Sensory Aphasia (T.S.A.) results from lesions of the pathways connecting the audio-verbal centre to the concept centre. Features of T.S.A. are - Impaired conprehension abilities occuring in conjunction with preserved repetition and a fluent speech output.

- Comprehension of spoken language is severely disturbed in T.S.A., often to the point of total non-comprehension.

  Most outstanding feature of T.S.A. is the presence of echolalia.

Spontaneous speech, although fluent, is often contaminated by paraphasic errors, including neologisms, semantic substitutions and by pauses associated with word-finding difficulties.

Reading aloud better preserved than reading for comprehension.

No major neurological deficit - man show mild or transient hemiparesis.

(7) Isolation Aphasia: Rare syndrome caused by lesions which disconnects the concept centre from both the audio-verbal centre and the expressive speech centre, characterized by - preserved repetitional abilities occurring in association with a marked reduction in spontaneous speech and impaired comprehension of language.

(8) Anomic Aphasia probably constitutes the largest group of aphasics and is produced by a lesion involving the pathways which connect the concept centre to the expressive sp. centre or in those cases where comprehension is also disturbed, by a lesion of the concept centre.

- Their speech is fluent, although at times very circumlocutory or empty, occasionally paraphasic and shows obvious word-finding difficulty.
- Their verbal paraphasias are semantic substitutions, rather than phonemic (literal) distortions.
- They have near normal comprehension and repetition, but their naming is most often impaired.

- The degree of word finding difficulties varies, at times, naming on a confrontation test is surprisingly good and word finding difficulty is only evidenced in spontaneous speech or prolonged testing with low frequency items. Other times, spontaneous speech is nearly normal and the main deficit is in naming.

- Anomic aphasia is often the end result of recovery from other aphasic syndromes such as Wernicke's or conduction aphasia.
- Associated neurological findings vary widely in anomic aphasia. Many cases of this disorder exhibit no associated neurological signs at all . On the other hand, hemiparesis, hemiplegia, hemisensory loss and visual field defects may occur in some of these patients.

The proliferation of aphasia tests is similar to that of classifications though not quite to the same extent because of the efforts involved in test construction and standardization. The variety of needs and approaches is reflected in the methods of presentation, the stimuli, the number of items and scoring.

Diagnosis and assessment hold a prominent place in historical and contemporary aphasiology. Diagnostics provide the database for clinicians and researchers.

Historical introduction:

Although some of the earliest medical records refer to language disorder after brain damage (Benton,1964), it was not until the second hald of the 19th century that aphasia was explored more systematically. While some of these examinations were probably standard procedures in certain hospitals, others were invented on the spot to explore the individual features of a specific syndrome of aphasia.

The clinical examination has a number of disadvantages, which gradually led to the development of more generalized assessment instruments. Clinical examinations tend to vary from one place to another, both in content and the manner of administration.

What is considered abnormal remains the subjective judgement of the clinician and the examinations are difficult to replicate and compare. Early attempts to produce a more standardized examination were published by Head (1926) who insisted on a detailed clinical protocol.

Head proposed that aphasic patients should be examined systematically with progressively more difficult tasks so that their impairments would be accurately assessed.

The first comprehensive battery of psychological and educational achievement tests for aphasic patients was used by Weisenberg & McBridge (1935) in a five year study of 60 aphasic patients and was considered a landmark by Schuell (!964) as it was the first to use control subjects, language compare aphasic and nonaphasic brain damaged subjects and to use standardized methodology.

Shortly after World War-II, the Halstead Wepman Aphasic Screening Test (1949) was developed to provide a rapid evaluation of aphasic language behaviour.

At the same time, Eisenson (1946) published a more extensive aphasia test battery.

Both these tests served as the major diagnostic instruments for evaluating adult aphasics until mid 1960s. Although these tests were quickly accepted and used, they however lacked a firm psychometric foundation.

As the decade of the 1950s ended, a marked shift in approach to diagnostic testing began to emerge. There was growing recognition that testing was going to have to become more formalized.

Standardization of administration, scoring and interpretation of responses would become necessary if treatment were to be subjected to critical evaluation. Aphasia tests developed since the early 1960s increasingly reflect this trend.

Tests such as LMTA (Wepman & Jones, 1961); MTDDA (Schuell,1965); NCCEA (Spreen & Benton,1968); ALDS (Emerick, 1971); PICA (Porch,B.E. 1967) intends to provide the examiners with systematic approaches by which to explore various aspects of communicative function which could be impaired by brain damage.

The commonality of these tests were :

(1) testing various modalities to determine areas of strength and weakness

(2) provide the examiner with a severity index and

(3) serve as a prognostic indicator.

The LMTA revolves around the concept that the patient's performance can be probed with respect to transmission deficits at either the input or output levels or at the level of integration and symbol formulation. The patient's effort at spontaneous language, the integrative aspect of symbol formulation, could be subjected to analysis to allow for a classification based on linguistic parameters. Wepman & Jones (1961) have identified 5 classes of aphasic patients based on LMTA.

(1) Syntactic patients whose difficulty are largely with syntactic words.

(2) Semantic patients who have semantic or word finding difficulty.

(3) Pragmatic patients whose comprehension is usually poor and whose speech conveys little meaning. They often use neologisms and inappropriate substantive words.

(4) Jargon patients who produce unintelligible jargon words.

(5) Global patients who often have no speech at all except for a few automatic phrases or meaningless combination of sounds.

The LMTA provides an 8 level self correction and recovery scale as a prognostic indicator of patient's language ability. It however does not offer a formal means by which to establish degree of impairment nor does it cover a wide range of linguistic abilities.

The MTDDA (Shuell,1965) on the other hand provides classification system based on severity and not on syndrome types. The test measures disturbance in the (a) auditory area; (b) speech and language area; (c) visual and reading area; (d) visuomotor and writing area, and (e) numerical relations and airthmetic provess.

The theory and development of the MTDDA reflects the belief of its author that all aphasic disorders involve a unitary loss of language capability which may vary in severity and which may be further complicated by involvement of sensory operations (such as visual perception), Motor functions (such as various forms of dysarthria) or other sequelae of brain damage.

This proposal has fallen out of favour, however, given the current feeling that certain 'syndrome' types notably Broca's & Wernickes aphasias appear to be qualitatively different and certainy do not change into the other as recovery progresses (Leischner 1976; Kertesz & McCabe,1977).

The length of the MTDDA is a major drawback to overcome which a shorter version was devised which includes only those tests that are considered to have a high diagnostic and prognostic values.

The Neurosensory Centre Comprehensive Examination for Aphasia (NCCEA) given by Spreen & Benton (1968) while evaluating language in terms of different modalities has a distinctive feature of provision for the construction of a profile of directly comparable percentile scores for any patient, corrected for age and educational level.

Appraisal of Language Disturbances - ALD (Emerick,L. 1971)

The ALD is a clinical tool designed to permit the clinician to make a systematic inventory of patients communicative abilities both in the modalities of input and output and the central integration process. Tasks are arranged in an ascending order of linguistic complexity within each subtest assessing input and output factors, allowing evaluation of nature and extent of the problem.

The subjects performance is rated on a 5 point rating scale and a summary profile given. Reporting is descriptive. The ALD does not yield a classification system nor does it attempt to place aphasics into various categories.

The Porch Index of Communicative Abilities - PICA (Porch,B.E., 1967).

This test of aphasia was proposed by Porch B.E.(1967) and revised in 1971 and 1981. The test provides items for examining the auditory, visual and graphic modalities in addition to giving a gestural battery where subjects are required to respond nonverbally to instructions.

The highlighting feature of PICA is its multidimensional scoring system. In PICA patients responses are scored on a 16 point scale which indicates the accuracy, completeness, facility, promptness and responsiveness of the patients reaction.

Analysis of test results proceeds from general to specific consideration, first referring to the overall and modality levels, then to the subtest means and finally to the item scores. Additional test interpretation is provided by the use of profiles which when compared with norms are useful in planning treatment, selection of modalities and measures of progress.

While the LMTA, MTDDA, NCCEA, ALDS, PICA measured the aphasic's language abilities in terms of reception and expressive. Using different modalities, tests such as the ACTS (Shewan & Canter,1971); Token test (DeRenzi & Vignolo,1962) and the Revised Token Test (McNeil M.R. & Prescott,T.E. 1978) were developed to test language comprehension in particular.

Auditory Comprehension Tests for Sentences-ACTS

Proposed by Shewan & Canter(1971) is a test which basically tries to assess language ability based on auditory comprehension of the individual. This test contains 42 sentences, which vary systematically in the parameters of length, vocabulary difficulty and syntactic complexity. Scoring uses a weighted system with prompt (0-3 secs), correct (4-10 sec), and delayed (11-30 secs) responses.

Revised Token Test (RTT) by McNeil, M.R., & Prescott,T.E.(1978) designed as a sensitive and quantifiable test battery for the assessment of auditory processing inefficiencies associated with brain damage, aphasia and language and learning disabilities.

It is a reconstruction of the original token test (De Renzi & Vignolo,1962). It includes multidimensional evaluative systems for describing the nature and quantifying the degree of auditory defecits.

A Kannada adaptation of the RTT incorporating principles of the RTT (McNeil & Prescott,1978) and concrete object form to token test (Martino et al 1976) was designed to assess the comprehension ability in normal and disordered adults and children (Veena,N.R., 1982).

Aphasia tests are usually insensitive to the minimal impairments of some patients, whereas severely impaired patients cannot perform any item. The question that arises is - How much real communication is involved in pointing to pictures, naming objects or writing words to dictation? Relatives of aphasics generally report that the person communicates better at home than the examinations reveal (Helmick, Watamori & Palmer,1976). Ideally, a functional measure of language usage in everyday life could be obtained if one could follow a patient in the course of his every day life and make first hand observations of his verbal behaviour.

In an effort to measure functional language performance in aphasic patients, a scale called the Functional Communication Profile (FCP) was designed by Sarno (1969). The profile attempts to measure the functional dimensions of language performance not accounted for in clinical testing. It consists of a list of 48 types of communication behaviour considered common language functions of everyday life.

Rating of each type of behaviour are made on an 8 point scale on the basis of informal interaction with the patient in a conversational situation. On the scale, the rating of 'normal' represents the patients estimated pre-morbid level of language proficiency according to known social, educational and personality factors in his history.

The ratings take into account - (1) speed, (2) accuracy, (3) consistency, (4) voluntary control without benefit of external cues and (5) compensatory functions for the behaviour.

Each rating is assigned a weighted score which is converted into percentages in each of the 5 modalities: speaking, reading, understanding, movement and a miscellaneous category which includes writing and calculations. The overall score can be used as a single measure of an individuals communicative effectiveness in everyday life.

The Boston Diagnostic Aphasia Examination (BDAE) given by Goodglass & Kaplan (1982) is a popular test battery designed to meet 3 major applications that would aid the neurologist, psychologist and speech language pathologist, These are -

(1) Diagnosis of presence and type of aphasic syndrome, leading to inferences concerning cerebral localization.

(2) Measurement of the level of performance over a wide range, for both initial determination and detection of change over time.

(3) Comprehensive assessment of the assets and liabilities of the patient in all language areas as a guide to therapy. The BDAE includes a 5 factor analysis of the patient's performance on the examination.

Factor I relates to reading and writing.

Factor II concerns performance on spatial-quantitative-body parts tests

Factor-III appears to be highly related to speech fluency

Factor-IV is related to auditory comprehension

Factor-V to the presence of paraphasia

The authors, Goodglass & Kaplan, suggest that these factors are useful in identifying major types of aphasia, including Broca's aphasia, Wernicke's aphasia, anomic aphasia, conduction aphasia, and transcortical aphasia. Supplementary language tests explore psycholinguistic factors in comprehension, expression and screen for hemispheric disconnection syndrome.

The BDAE has been adapted or is being adapted and translated into Indian languages like Hindi, Tamil and Telugu. Some amount of clinical data has been compiled in these Indian versions (Puranik,A,1985: Kacker & Pandit,1988).

Western Aphasia Battery (WAB) - Kertesz & Poole (1974) Kertesz,A.(1982).

The Western Aphasia Battery has some of the material from the BDAE of Goodglass & Kaplan(1972) incorporated into it, and has become a popular protocol for the clinical evaluation of aphasia. It is designed for research and clinical use and is an attempt to fulfill the criterias set for an ideal test. Among its advantages are the tests simple yet quantifiable scoring system and relatively short administration time.

The test comprises of four language and three performance domains. Syndrome classification is determined by the pattern of performance on the 4 language subtests, which assess spontaneous speech, comprehension, repetition and naming. Weighted performance on these language subtests yields an overall measure of aphasic severity; the Aphasia Quotient (AQ). when reading, writing, praxis, drawing, block design, calculation and Raven's progressive matrices scores are added, the Performance Quotient (PQ) is obtained and AQ & PQ combined provide the Cortical Quotient (CQ), a summary of the cognitive function.

Test items are selected to provide a wide enough range of difficulty for assessing all grades of severity.

In a more recent report, Shewan(1986) reunited the spoken language section (i.e. AQ tests) with reading and writing as a part of scale called the Languae Quotient (LQ) and provided a detailed account of reliability and validity for this addition to the original WAB format.

Using the LQ to measure the severity of the language deficit in aphasia is more consistent with traditional definitions of aphasia, namely, a language disorder that involves all language modalities including auditory comprehension, oral expression, reading and writing.

If language treatment is to be provided, the LQ can also serve as a baseline measure from which to measure progress in treatment. Since rehabilitation programs generally include treatment of both spoken and written language, it is important that baseline measures include both.

The subscores of 4 times of the test i.e. (1) spontaneous speech, (2) comprehension, (3) repetition and (4) naming - allow a classification of the patient according to the taxonomic principle into one of 8 subtypes of aphasia.

This test has been standardized on aphasic patients with different etiologies as well as using controls.

Global aphasia was found to be the most severe of the categories and mean AQ of globally aphasic patients was found to be 10.5. The mean AQ for Broca's aphasia was 31.7, for Isolation aphasia 34.3, for Wernicke's aphasia the mean AQ was found to be 39.0 while the transcortical motor aphasics had a mean AQ of 54.4 and those with transcortical sensory aphasia had mean AQ of 59.6. The conduction aphasia group had mean AQ of 60.5 and the Anomic aphasic group had a mean AQ of 83.3

Kertesz & Poole (1974) provided a cut off AQ of 93.8 to differentiate between normals and brain damaged. They state that a person may be considered normal or nonaphasic if the AQ is 93.8 or above.

Apart from the English version, Indian adaptation in Hindi, Kannada, Gujarati, Marathi, Tamil & Malayalam are being used extensively for clinical purpose in India.

Most of the clinical tests to date, including the one reviewed here mainly serve as diagnostic tools. These tests attempt to identify and classify aphasia in terms of severity and/or in terms of clear cut syndromes.

Besides these, there are many clinical and theoretical issues to which standard aphasia tests have contributed signficantly and continue to play an important role. Some of the these are the study of lesions, behaviour correlations, cerebral dominance, inter and intrahemispheric language organization, cerebral plasticity, recovery patterns and Alzheimer's disease.

There is now a growing awareness and trend in direction of incorporating newer dimensions in the existing test batteries to differentially diagnose aphasia from normal aging and other disorders involving language as in dementia.

As we progress in aphasiology these finer distinctions become more important particularly since recent literature reveals that there are both similarities and dissimilarities between these groups. Among the normals, certain language changes are reported due to aging and language of normal elderly adults is said to differ subtly from that of young adults (Au , Obler, Albert,1991).

The most consistent behavioural change observed with advanced age is a decline in success with fast paced tasks and a generalised slowness of behaviour (Davis,1984). Well established findings on the aging of the sensory systems, C.N.S. and memory, suggest decline of language function with advancing age.

Determining the areas of linguistic performance whose accuracy and style are affected by central slowing, may be useful in the differentiation of decline and deficit of language function.

Language impairment is also a common feature of dementia - an acquired clinical syndrome resulting in impairment of intellectual function as a consequence of brain dysfunction.

The language behaviour of the dementic patients in various stages mimics different types of aphasic syndromes such as anomic aphasia in early stages, Wernicke's aphasia in the moderate stage and global aphasia in the severe stage.

Due to lack of suitable assessment procedures it is difficult to ascertain whether these patients with suymptoms indicating dementia are truly dysphasic and if so what type of dysphasia is present.

Thompson(1983) has indicated, "the language of stroke and intellectual failure are different species of the same genus".

Walker (1982) suggests the two may differ quantitatively rather than qualitatively. Day to day communication involves rapid processing and number of studies have used this factor in the form of response latency measurement to differentiate brain damaged group from normals (Deal & Darley,1972; Crary & Towne,1988).

While the existing test batteries attempt to meet list of criterias for an ideal test given by different authors such as Goodglass & Kaplan(1982); Kertesz (1979); yet measure of speed of response is not incorporated in them and if present is included in only few subtests.

For example, the Western Aphasia Battery (Kertesz 1982) while being a popular protocol for clinical evaluation of aphasia it fails to incorporate element of speed/time in its items with the exception of object naming and word fluency task. The W.A.B. classifies aphasics in terms of clear cut syndromes like global, broca's, Wernicke's etc. and provides a measure of severity in terms of Aphasia Quotient (AQ). As per the W.A.B. an AQ of 93.8 is the cut off point between aphasic and normals. Despite being a well validated test battery with high reliability the W.A.B. does not provide a 100% discrimination accuracy.

In a fair number of patients presenting with mild or questionable language disorders, a decision that rules out aphasia should be made before proceeding to other questions. Relying solely on cut off points provided by test authors in patients with borderline impairment would, in effect not be much better than random guessing. We also do not know how the normal elderly would perform on a clinical tests like W.A.B.

Incorporation of time factor on to the WAB may provide some information on the aging process in normals as well as give more weightage in conjunction with the AQ for diagnosing milder aphasic forms.

A major rationale for the study of language in normal elderly people is its immediate relevance to the clinical study of pathological language. First, aging is the single greatest risk factor in stroke (Sahs, Hartman & Aronson,1976). Thus, it is extremely important to know which language changes are attributable merely to aging and which are attributable to stroke related pathological alterations. A number of studies have brought evidence of different patterns of aphasic language disruption as a function of age (Holland,1980; Obler & Albert,1981).

Holland (1980); De Renzi et al(1980) have found in their studies on age factors, that Wernicke's & Global aphasias occur predominantly in older patients whereas Broca's aphasia is more common in younger patients.

It has also been documented that some type of errors commonly reported of aphasic language are also represented in the language of the normal elderly (North, Ulatowska, Macaluso-Haynes & Bell 1985). Second aging is the most common factor associated with language changes in diffuse or multi-infarct brain diseases in dementia.

Often in the early stages of dementia there is a delicate boundary between what may be attributed to the disease process itself. Here again careful documentation of language changes in the elderly is of utmost importance.

Early research on language in normal adults reported no age-related differences (Botwinick & Storandt,1974). However, certain qualitative age related differences were found in vocabulary tests (Botwinick, West & Storandt,1975). Younger subjects produced significantly more superior antonyms than did the elderly subjects. Subsequent studies revealed that language of normal elderly adults differs subtly from the language of young adults (Emery,1985;,1986; Obler & Albert,1980; Sandson, Obler & Albert,1987).

In the task of naming (which involves retrieving the word label for a concept whose representation has been activated) significant decline in performance was noted in subjects over 69 years (Borod, Goodglass & Kaplan,1980).

Cohen & Faulkner (1986) found that old subjects produced signficantly more responses that contained conceptual information about the target word than did young or middle aged subjects.

Also the responses of the elderly were less likely to contain phonological information that correspond to the target word. Cohen & Faulkner concluded that the decline found in naming in normal aging could be attributed to retrieval failure rather than to a loss in representational memory.

Bowles & Poon (1985) found that the naming deficit evidenced in elderly subjects (66-80 years) was maximized in the absence of orthographic-phonological information, and naming deficit was minimal when orthographic-phonological information was provided. Bowles & Poon concluded that elderly subjects were able to activate the correct semantic representation elicited from the definition, but had difficulty retrieving the correct name from the lexicon.

Age-related changes in language do not necessarily imply impairment Sandson et al(1987) were able to demonstrate ways in which elderly (60-79 years) adults produced more elaborate speech than younger (30 to 39 year old and 50 to 59 year old) adults.

Analysis of the oral descriptions revealed that older subjects used more words per content unit than did younger subjects, and the 'elaborate' speech was qualitatively characterized by filler phrases "you know" deictic references "this, that" comments (eg. Isn't that funny) modifiers and circumlocutions.

In terms of comprehension while some studies report no age-related differences (LeDoux, Blum & Hirst,1983; Light & Burke, 1988; Meyer & Rice,1981; Sasanuma et al 1985), others report a decline in comprehension abilities with increasing age (Cohen,1979; Davis & Ball,1989; Obler,Nicholas,Albert & Woodward,1985). Light & Burke (1988) and Hasher & Zacks (1988) suggested that comprehension deficits in normal aging may be evidenced when working memory demands are high. They claimed that when memory demands are minimized, no age related differences in comprehension will occur. Reaction time measures have been used to estimate working memory demands. Increases in reaction times are often assumed to reflect greater involvement of working memory processes.

Stern et al (1991) addressed the issue of cognitive slowing in the elderly by examining the time course of automatic lexical access. Automatic processing is defined as activation of a learned sequence of elements in long term memory, initiated by appropriate inputs and proceeding automatically without subject control, without stress on the capacity limitations of the system and without necessarily demand for attention (Schneider and Shiffrin,1977). Controlled processing is defined as temporary activation of a sequence of elements that can be set up, modified and utilized quickly and easily in new situations but that requires attention in capacity limited (i.e. uses up short-term capacity) and is controlled by the subject (Schneider & Shiffrin,1977).

In their study, Stern et al(1991) examined whether there are changes in rapid, automatized access routines with age. Elderly and college aged subjects performed a lexical decision task wherein semantically related words embedded in a continuous list were presented one at a time with a varying (300 - 1500 ms) inter-word interval. The use of a continuous list, a repeated word and a very short inter-stimulus interval allowed automatic lexical access to be straight forwardly examined. The elderly subjects showed an onset of automatic lexical access that was similar in time frame to that for college age subjects.

Although automatic processing is considered to operate unconsciously, whereas controlled processing is considered to operate intentionally with conscious awareness, Stark,J.A.(1988) assumes that the overall speed of language processing-even subsequent to braindamage - indicates that the awareness aspect of controlled processing is a matter of degree, which means an overall slowing down of processing is also relative. In other words, the entire process of producing/perceiving language has become so automatized over time in development and due to constant use, that the automaticity of the separate processing types reduces the differences between them with reference to speed of processing and amount of awareness necessary to operate.

A variety of communication problems are reported by the aphasics and their family members. Family members using lengthy sentences pose a problem for communication. Aphasics report fast speech is difficult to understand fewer questions at one time is better and more time is needed to formulate and produce responses. (Rohnick & Hoops,1969; Skelly,1975).

It can be assumed that the adult aphasic premorbidly possessed a complete linguistic system in which explicitly defined relationships were available to conscious access. Under normal conditions, a great deal of the average healthy speakers language processing is more or less automatic.

Aside from the necessity of controlled processing in the phase of formulating a thought/idea, more controlled processing becomes necessary when the speaker/hearer runs into difficulties or when the speaker is dealing with complex topics or semantically processing at a "deeper level" of interpretation. For the aphasic, automatic processing is either reduced, inhibited or disinhibited in characteristic ways.

The interaction/integration between automatic and controlled processing is thus qualitatively different in the various aphasia types, resulting in specific processing deficits.

That automatic processing is affected in brain-damaged patients has often been regarded as or linked to one of the general indicators or non-localizing symptoms of focal brain damage which are so difficult to describe in an adequate manner - For example general slowing in performance, longer reaction times and so on. Although these nonspecific symptoms are so difficult to separate from the specific focal, localizing symptoms, application of the automatic controlled distinction is informative in determining and understanding the specific processing deficits.

The relationship between linguistic processes and memory has been emphasized by a number of information theorists (Atkinson & Shiffrin 1967; Craik & Lockhart,1972; Cermak,1975). These theorists have all proposed that verbal information and in particular a single isolated, is remembered on the basis of its distinctive phonemic, semantic and conceptual features.

If the individual is given only a very limited amount of time, or when he expects not to have to retain the information beyond immediate recall, may analyze only the phonemic feature of the information (Craik & Lockhart,1972). Given more time to view the stimulus, the normal subject will analyze and encode as many distinctive semantic features of the information as he can.

Cermak & Youtz (1974) developed a test which requires that the patient utilizes his phonemic and semantic analysis in detecting similar feature of other words.

Briefly, the test requires that the subject listen to a list of words read at a constant rate (eg. 2 sec rate) and detect when a word is repeated (repeated condition) or when a word rhyme with a previous word (phonemic condition), or when a word belongs to the same category as a preceding word (semantic condition). The subject has to indicate when the target word has occurred. Five different groups of patients (aphasics, alcoholic Korsakoffs, nondominant hemisphere patients, alcoholics and control patients) were taken as subjects. It was discovered that the number of intervening words had a greater effect on the aphasics for all conditions than it did for other groups.

Another impressive feature was the improvement in performance when the rate of presentation is slowed. There was improvement in performance of semantic comparisons and detection of repetition such that it approached normal performance but very little improvement in performance on phonemic task was found.

The performance of Korsakoff patients was quite good relative to the aphasics and not that much below the controls. The Korsakoff patients were impaired only on the semantic task and did not improve at the slower presentation rate. The authors conclude that Korsakoff patients retentive ability does not improve even when given more time because they do not use that time effectively.

Aphasics on the other hand are more likely than Korsakoffs to be able to learn new information because they can improve their analytic abilities when the experimenter, or therapist, gives them enough time. It is the aphasics speed of processing that seems to be impaired and not their potential to analyze the semantic properties of words.

In a study of temporal discrimination in brain-damaged patients, Van Allen, Benton & Goodglass (1966) described the "time sense" as a "collective term used to designate all aspects of the perception and appreciation of time". They added that "there is little doubt that the "time sense" is a pluralistic rather than a unitary concept".

Albert & Bear (1974) studied a patient with word deafness and found that comprehension improved dramatically when spoken to at an abnormally slow rate.

It thus appears that atleast some aphasic individuals might better comprehend everyday spoken messages if the speaker would simply slowdown, thus providing more time for the aphasic individual's system to process the incoming signal.

It is not clear from these observations however, if the advantage is due to the extra time for processing syntactic relations between words or whether the aphasics need more time to grasp the semantic reference of the individual word.

Baker.E & Goodglass (1979) investigated the relation between the time required for word processing and the functional auditory comprehension of aphasics, as assessed independently. They also obtained an estimate of the actual time required for the comprehension of object names. The results indicated that the decoding times for Broca's aphasics are normal (approximately 200ms)while the time required to extract meaning from an auditory signal for Wernicke's aphasics are grossly disturbed (approximately 650ms). Moreover, a significant correlation was found between the number of failed identifications and the decoding time for correctly identified target.

Liles,B.Z., & Brookshire,R.(1975) studied the effects of pause time on Auditory Comprehension of Aphasic subjects and found that inserting additional pause time into spoken messages facilitates aphasic patient's comprehension of those messages.

The hypothesis that aphasics might be aided in comprehending speech sounds by a method called interpolated silences, was studied by Sheehan,J.G., Aseltine,S., & Edwards,A.E. (1973). The aphasics were divided into two groups according to age i.e. 51years and 50 years. These were then compared on a listening test under 3 conditions:

- normal enunciation
- interpolated silences and
- Accumulated time

Interpolated silence surrounded every phoneme with 150ms of silence. The accumulated time condition inserted the same amount of silences, but after each word. With the younger group, interpolated silences resulted in improved performance, but the improvement was not noted in the older group. Though the younger and older groups differed somewhat in their degrees of deficit, the factor of age emerged from this study as being of great significance in evaluating the aphasics probable responsiveness to interpolated silences.

Delay in terms of expression:- Crary,M.A. & Towne,R.L. (1988) using electromyoghy conducted the verbal reaction time task to measure motor speech performances in selected anterior and posterior left hemisphere lesioned patients.

The stimulus word was presented under an imposed response delay condition of either '0' or '2' seconds. Subjects task were to read the words aloud in response to a tonal cue presented either simultaneously with the presentation of a visual stimuli (0 sec. or no planning condition)

Total reaction time (TRT) was considered to be the latency between the onset of the audio tape and the onset of the subject's first visible attempt at a verbal response. Premotor time (PMT) was defined as the latency between tone onset and the initiation of response EMG.

Motor Time (MT) was defined as the latency from initial EMG activity to the initiation of a verbal response. The relationship was such that PMT + MT = TRT.

In general, the reaction time performances of the subjects suggest that anterior and posterior lesioned patients differ in motor speech efficiency.

Major differences in the performances were as follows :

(1) Mean TRT demonstrated by the anterior lesioned subject for correct verbal responses was much slower than those for the posterior lesioned subjects and the normal group. These

longer reaction times were the result of a longer mean PMT component, while MT did not differ between the subjects.

(2) Multiple response attempt errors made by anterior lesioned subject in both planning time conditions were accompanied by mean TRT which were 2 to 3 times slower than for correct verbal responses. Further these longer reaction times were seen to have been a function of much longer motor time components.

(3) Phonemic response errors made by posterior lesion subject were accompanied by reaction time latency patterns which were similar to those seen for correct verbal responses. This was true in both the number planning time and planning time conditions.

Although the above study is a single subject design and involved only three cases it can be inferred that different reaction time patterns may be demonstrated among the different classes either in terms of anterior-posterior dichotomies or in classical syndromes.

Studies of naming in aphasia present a paradox: aphasic patients often have tip of the tongue (TOT) information that includes the initial sound of the word. Aphasic patients often benefit from cueing with the first sound of the word (phonemic cueing). Most of these studies have not compared the effects of phonemic cues with the appropriate control condition - i.e. the opportunity of having extra time for word retrieval.

Goodglass et al(1984) have found that even in young subjects with no brain damage, there can be very long latencies in picture naming. In their study on aphasics, they found that only half the patients with Broca's aphasia were helped more by phonemic cues than they were by additional time to retrieve the picture name.

Mildly impaired Broca's aphasics can find a very high proportion of correct picture names given a further opportunity for lexical search, their problem is primarily one of slow word retrieval rather than inadequate information addressing an output lexicon.

In another study involving the agrammatic component of Broca's aphasics, Zurif et al(1982) investigated the ability of the Brocas aphasic to process articles. When the instructions were delivered orally at a normal speaking rate, the patients showed no evidence whatsoever of processing the article. However on presenting the instructions in a written form, giving the patients unlimited time to read the sentences, the 3 Brocas aphasics tested clearly recognized when an article has been inappropriately placed.

Strub & Gardner (1974) investigated a patient with conduction aphasia, whose performance was improved with longer intervals between stimuli. Recalling the stimuli was superior to ordering them. The repetition of single nonsense words and the production of paraphasias could not be attributed to memory defects. They considered that impaired repetition derives from a difficulty in producing a target word with precision rather than from failure to recall it.

Marshall (1975) & Farmer (1975) analysed word retrieval strategies in the aphasic subjects and found that 'delay' is among the most frequently used strategy. In Delay .... the patient takes or requests extraprocessing or formulation time to let the listener knows he is not ready to relinguish the conversational ball'. Delay was found to be used in nearly all the subgroups of aphasia.

At a clinical Aphasiology Conference, Yorkston & Beukelman (1977) introduced a method of measuring subtle expressive deficit in mild and moderate aphasia for the purpose of documenting change. This method focuses on the rate of verbal expression. Yorksten & Beukelman (1980) investigated whether their measure is sensitive to expressive deficits in aphasic patients defined as mild (81 to 99 percentile from the PICA); high moderate (66 to 80 percentile) and low moderate (50 to 65 percentile).

Spontaneous speech was elicited by description of the Boston exams cookie theft pitcutre and each sample was tape recorded. The clinician recorded the time of verbal description, the number of syllables produced and the number of content units produced.

Three measures were employed:

(1) Number of content units as an indication of amount of information.

(2) Syllables per minute as a measure of speaking rate, and

(3) Content units per minute as a measure of efficiency in conveying ideas.

Speaking rate (syllables/min) and communicative efficiency (content units/min) were the most discriminating parameter.

The two normal groups (older adult sample - mean age 73 years and younger adult sample mean age 31 years) spoke at a faster rate than the 3 aphasic groups.

Mild aphasia was also separated from normal performance with respect to communicative efficiency.

Golper (1980) found that the occurrence of revisions, sequence interrupters and grammatical errors was minimal in the non-aphasic subjects while they occurred frequently in the mildly impaired aphasic patients. These measures may then be added to the paramters of syllable and content rate as indicators of mild aphasia and as measures of recovery.

In view of the above an attempt is made in the current study to superimpose the factor of time on a clinical tool such as WAB in order to evaluate whether the dimension of time would further sensitize these tools to differentiate between aphasic and normals on the one hand and to further differentiate between the subtypes and severity of aphasia on the other.

METHODOLOGY

This investigation was conducted in two parts:

The first was to determine whether aging plays a signficant role in speed of responses on the W.A.B.

For this purpose, normal healthy adults were tested in two groups.

(1) Group-I comprised of young adults i.e. ranging from 20 to 40 years.

(2) Group-II comprised of the elderly i.e. from 60 to 80 years range.

Total number of subjects were 9 in each group.

TABLE-II: Summarising information on subjects

Group-I (Normals 20-40 years)

AGE YEARS	SEX	HANDEDNESS	LITERACY	MOTHER TONGUE	LANGUAGE TESTED
21.8	Female	Right	Literate	Malayalam	English
23.0	Female	Right	Literate	Marathi	English
24.3	Male	Right	Literate	Kutchi	English
24.10	Male	Right	Literate	Malayalam	English
30.17	Female	Right	Literate	Sindhi	English
31.10	Male	Right	Literate	Mythili	Hindi
32.10	Female	Right	Literate	Malayalam	English
32.3	Male	Right	Literate	Marathi	Marathi
38.0	Male	Right	Literate	Malayalam	English

Mean age: 28.53 years

Group-II (Normals 60-80 years)

AGE YEARS	SEX	HANDEDNESS	LITERACY	MOTHER TONGUE	LANGUAGE TESTED
60.0	Female	Right	Literate	Sindhi	Hindi
61.1	Female	Right	Literate	Konkani	Marathi
62.3	Female	Right	Literate	Konkani	Marathi
64.0	Female	Right	Literate	Marathi	Marathi
66.10	Male	Right	Literate	Konkani	English
67.0	Male	Right	Literate	English	English
70.0	Male	Right	Literate	Marathi	English
74.0	Male	Right	Literate	English	English
63.0	Male	Right	Literate	Marathi	English

Mean age: 65.3 years

Subjects were required to have functional hearing and vision and no specific communicative difficulties.

All subjects included in the testing were literates, although literacy was not a criteria in subject selection, as only the oral language section of the W.A.B. was administered.

All subjects were tested by the same investigator, in either of the 3 languages namely English, Hindi and Marathi.

The investigator is familiar and well versed in all 3 languages.

Subjects were tested in the language they preferred. The Hindi version of the original W.A.B. is standardized.

The Marathi version of the W.A.B. although not standardized has been routinely used for testing in various centers in Maharashtra.

Procedure: Subjects were seated comfortably in a quiet, non-distracting environment. The procedure of testing was explained to them and the evaluation i.e. conversational sample recorded.

Instrument used: All audio recording of the evaluation was recorded on Philips AM125 cassette recorder. The conversation beginning from investigators instruction till the end of patients response were timed for each sub item using a stop watch. The timings were later verified by listening to the recorded material.

The investigator monitored her speech during testing to a self determined level and continued at that rate irrespective of the quickness of the subject's response.

The second part of the study was to assess different aphasics on the Western Aphasia Battery.

Subjects were selected from the inpatient unit of the B.Y.L. Nair Charitable Hospital, Bombay as well as Outpatients referred for Speech Therapy at the All India Institute of Speech and Hearing, Mysore.

Among the Inpatients, only those subjects were selected, whose medical condition had stabilised and could be administered the W.A.B. in one setting.

All subjects were diagnosed as having Aphasia by a Neurologist and tested independently by a speech-language Pathologist other than the investigator, prior to this study.

TABLE-III gives brief identification of each subject in terms of etiology, age, sex, literacy, handedness and period post onset during this study.

TABLE-III:

SL. NO.	AGE YEARS	SEX	HANDEDNESS	LITERACY	ETIOLOGY/SITE	NO.OF DAYS POST ONSET WHEN WAB ADMINISTERED	ASSOCIATED PROBLEMS
A.S.	55	F	Right	Illiterate	? Old MCA territory stroke	2 months	
S.S.	55	M	Right	Semiliterate	Temporal lobe infarction foll stroke	25 days	
R.K.	50	F	Ambi-dextrous	Illiterate	Stroke leading to left MCA infarction; Mass effect in temporal lobe	20 days	Right homonemous hemianopia
H.C.	55	M	Right	Literate	Stroke-Old right cerebral? Left MCA infarction + subcortical-Infarction	7 days	Right homonemous hemianopia

S.M.	52	M	Right	Literate	Head injury Left MCA infarct + age related cortical atrophy	10 months	Hearing loss
Sh.	39	M	Right	Literate	Stroke left MCA infarction	6 months	-
P.U.	35	M	Right	Literate	Head injury Left temporo parietal contusion with SDH	28 days	
Sh.	25	M	Right	Literate	Road accident	7 months	-
M.A.	38	M	Right	Semi-literate	Right cerebral stroke sub-cortica/MCA territory infarct.	7 days	Left hemiparesis

MEAN AGE = 44.89 years

Procedure: Subjects were seated comfortably in a quiet room. Through casual talking, the subjects were made to feel at ease and the procedure explained before the evaluation and recording began. Here too, each sub item was timed using a stop watch beginning from investigators instructions to end of subjects response.

The Aphasia Quotient and time taken was calculated for each subject.

Analysis of the conversational sample help determine the aphasic syndrome which were confirmed by the W.A.B. scoring system for the 4 oral language test namely spontaneous speech, auditory verbal comprehension, repetition and naming.

RESULTS AND DISCUSSION

This study was aimed at evaluating the role of the time factor if any, in differentiating between normal adults and aphasics on the Western Aphasia Battery. The aim was also to highlight subtle deficits in terms of speed in milder forms of aphasic syndromes.

To rule out the effect of age on the speed in carrying out the WAB, normal adults were studied in two groups. One comprising the young adult group in the age range of 20-40 years and the other of the aged i.e. 60-80 years age.

The total time taken for completion of the language portion of the WAB for the two groups is presented below:

All subjects irrespective of age scored above the normal cut off AQ score of 93.8.

Mean age in years of Group- I (20-40 years) is 28.5

Mean age in years of Group-II (60-80 years) is 65.3

NORMAL SUBJECTS

	Group-I (20-40 years)		Group-II (60-80 years)	
	Time (in secs.)	A.Q.	Time (in secs.)	A.Q.
	765	96.1	722	95.0
	617	97.6	730	94.6
	626	95.0	742	97.4
	692	97.4	660	96.0
	630	98.0	861	95.7
	702	96.2	615	97.2
	790	97.6	717	95.2
	735	99.4	714	96.8
	730	96.6	634	98.2
MEAN	698.5	97.1	710.5	96.23

Comparison between the two age groups in normals with respect to time taken for administration of the WAB shows that the elderly take slightly longer time than the younger age group. Also a comparison between the 2 groups in terms of AQ shows a superior performance by the younger subjects.

To test whether this difference is statistically significant or not, two way ANOVA was carried out.

No significant difference was observed between the subjects or between the two age groups (younger adults and elderly) with respect to time in completion of the oral language portion of the W.A.B. at 5% level of significance. Also no significant difference was observed between the subjects and between the two age groups on Aphasia Quotient at 5% level of significance.

Generalised slowness of behaviour is considered as a part of behavioural change in advanced age (Davis,1984).

Botwinick, West & Storandt (1975) found qualitative age related difference between younger subjects .(20-59 years) and elderly (60-79 years) for performance on WAIS vocabulary subtest. They report that elderly subjects responses contained more words than those of young subjects.

Sandson et al(1987) in their study reported that elderly (60 to 79 year old) adults produced more "elaborate speech" qualitatively characterized by filler phrases (eg. "you know"), deictic reference ("this", "that"), comments ("Isn't that funny") modifiers and circumlocutions than younger adults (30 to 39 year old and 50 to 59 year old).

These studies if evaluated in terms of time may have implied that the elderly take a longer time in completion of a task in comparison to the younger group.

The results of the present study however do not show any significant difference in speed of response between the young adults and the aged.

As no qualitative analysis between the two age groups on the WAB was done in this study the results cannot be directly compared to the previous studies cited above.

Kaplan, Goodglass & Weintraub (1976) found a performance decline on the Boston Naming Test among subjects in the 6th decade of life.

Burke, Worthley & Martin (1988) examined naming deficits in elderly and found that the elderly subjects experienced significantly more TOTs than younger subjects.

In the present study, on task of object naming, the older group (60 to 80 year old) did demonstrate tip of tongue phenomenon and 3 of the 9 subjects had atleast one instance when they needed phonemic cue from the tester. This was not observed among the younger group (20 to 40 year old).

The lack of any significant differnce between the normals and the aged on timing characteristics could be because the demands on memory are not too high on the WAB and studies have shown that when memory demands are minimized, no age related differences occur (Light, Burke 1988, Hasher & Zacks 1988).

In the present study, all the normal subjects completed the oral language subtests within 15 minutes. While Kertesz (1979) reports that administration time in aphasics may extend upto one hour, which implies that aphasics in general may take about four times the time taken by the normals.

TABLE-IV: Indicates time taken by the different Aphasics on the various subtests of WAB.

	55/F BROCA's	55/M WERNICKE's	50/F WERNICKE's	55/M T.S.A.	39/M CONDUCTION	25/M ANOMIC	52/M ANOMIC	35/M ANOMIC	38/M R.B.D.
Spontaneous speech	257	445	315	388	184	81	140	114	132
Auditory verbal comprehension	864	950	892	704	650	370	516	485	433
Repetition	194	284	125	146	147	95	113	83	99
Naming	624	993	693	364	954	187	450	316	201
TOTAL TIME (in secs)	1939	2672	2025	1602	1935	733	1219	998	865
A.Q.	47.3	46.3	70.8	73.4	69.1	86.4	80.3	86.6	93.3

Mean of time : 1554.22 secs
Mean of AQ : 72.61

As there is no significant difference between the two age groups among normals, either of the group can be used to compare performance with aphasics.

Here Group II i.e. 60 to 80 year old age group is used for comparing performance with aphasics as aphasia is generally seen among older adults.

As the aphasic sample is small, all the varieties of aphasia are clubbed together.

Results of the 2-way ANOVA administered on the normals and the aphasics reflects:

(1) No significant difference between normal subjects

(2) Significant difference between the aphasics and normals with respect to timing on the W.A.B. at 5% level of significance.

This result is in agreement with most studies on aphasia which state that slowness in processing orincreased latency of response is a common feature among all aphasics and may be the only indication of underlying deficits in milder aphasic forms. The question that now arises is - Are there any significant difference in the timing aspect among the different aphasic syndromes?

Analysis of variance of the different aphasic subjects on the 4 major oral subtests with respect to time shows significant difference at 5% level of significance.

In this study due to lack of enough sample in various groups, comparison between normals and each of the aphasic group has not been carried out.

GRAPH-1 Showing total time required to carry out each of the 4 oral subtests for the aphasic subjects indicates that severity of the aphasic syndrome is linked to time.

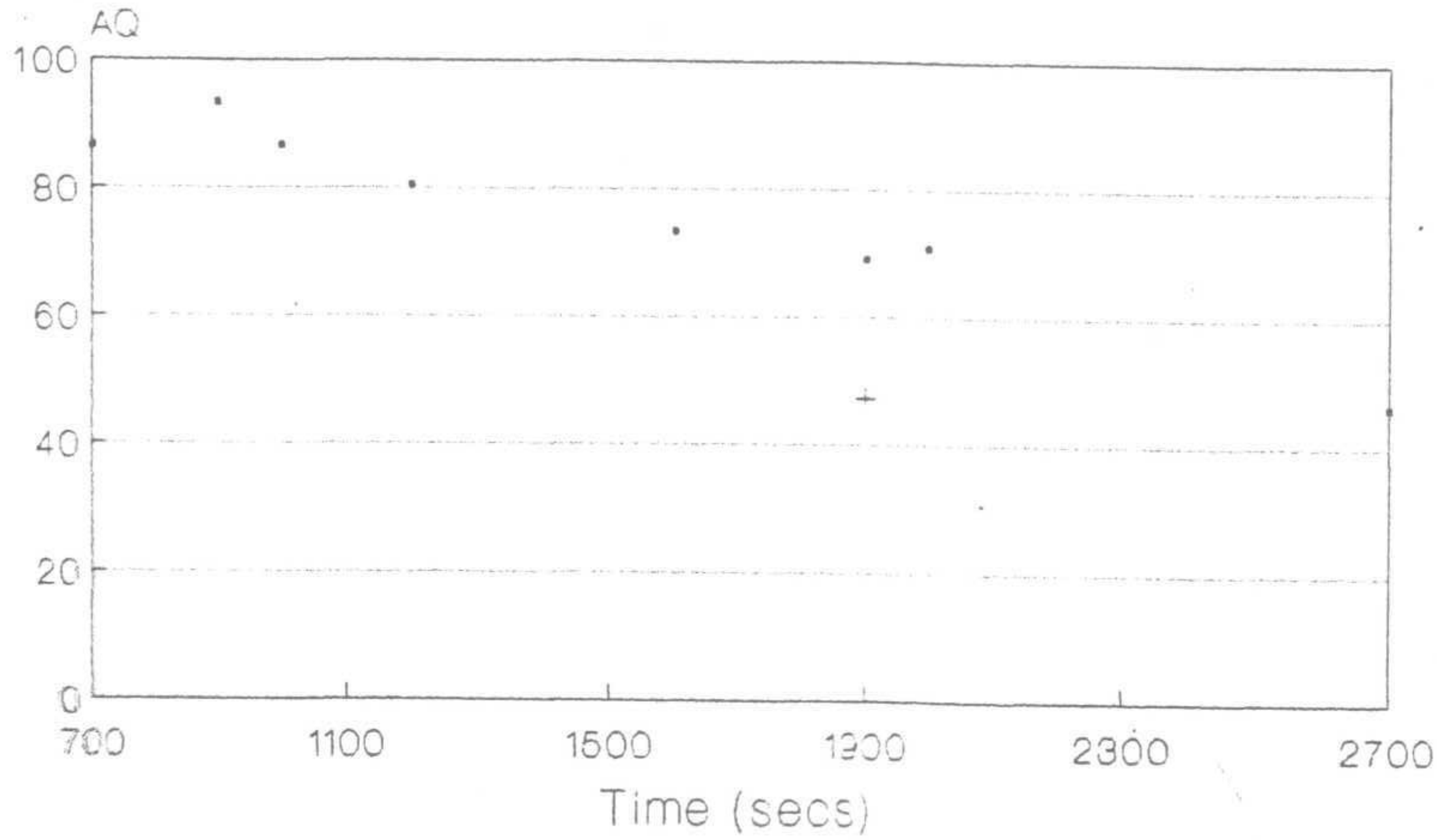
The Wernicke's which exhibit comprehension deficit clearly show greater time in responding to task of auditory comprehension and naming while the less severe aphasic syndromes take relatively lesser time with the anomic group approaching more towards normal range.

Karl Pearson's correlational analysis was carried out to determine whether any correlation exists between Aphasia Quotient and overall time taken for completion of the W.A.B.

Result shows a high negative correlation ($r= -0.74$) which implies that higher the AQ or less severe the aphasia, lower is response latency and overall time taken for completion of the test.

The relation between AQ and time is however not a linear one as seen on the GRAPH-1. While the nonlinearity is seen in the severe form of aphasia i.e. Broca's and Wernicke's, the relationship between AQ and time is fairly linear in milder forms of language disturbance as in anomia as well as in the right brain damaged subject, indicating that time rather than errors is the major deficit. Comparison of the aphasics within a group was

GRAPH I



done using the 3 anomic subjects and on the 2 Wernicke's subjects.

Even within the subgroup, there was significant difference in the time taken by the subjects on the different subtests namely spontaneous speech, Auditory verbal comprehension, repetition and naming. While the 3 anomics did not differ much in terms of severity as given by A.Q. they do differ in terms of overall time taken.

The cases "sh" and "Pu" both anomic cases having similar etiology (head injury) and nearly same AQ (86.4 & 86.6) do differ in terms of time taken with the younger subject taking 733 secs, while "Pu" took 998 secs.

In this case although the number of errors are same, we cannot say that both subjects have equal degree of difficulty. The longer time required by "Pu" indicates that he may face more difficulty in day to day communication which requires rapid processing.

In such cases time aspect in conjunction with AQ scores gives better insight and more weightage to the severity measures. Therapy implications for these two cases would then not be identical and for case "Pu" therapy would be directed not just at naming ability but also for rapid processing, or promptness in response.

Inter group comparison among the aphasics in the present study gives meaningful insight of how incorporation of time factor along with other measures like AQ help us in the understanding of severity of the problem.

If AQ was the sole criteria of severity measure then it would suffice to rank order them according to their scores to predict their communication difficulties. In this study however, we find that this criteria does not always hold true.

Comparison of the two Wernicke's aphasic show that although the two differ markedly in terms of AQ (Wernicke No.1 has a score of 46.3, while the other obtained score of 70.8) the time taken by the two far exceeds the time taken by the other syndrome types, with the lower AQ subject taking slightly longer time (2672 secs) than the higher AQ Wernicke's subject (2025 sec). Comparison among the Brocas and the two Wernicke's subject also provide interesting information. While the Broca's and Wernicke's subject No.l have nearly same AQ, they cannot be considered as having equal severity as time taken by the Wernicke's No.l is much greater than that taken by the Broca's subject. If we now weight AQ and time factor together, then the Wernicke's subject appears to be having more communicative problems than the Broca's. Also comparison between Broca's and Wernicke's subject No.2 reveals a higher AQ (70.8) of the Wernicke's in comparison with the Broca's subject (47.3). But consideration of timing shows that here too, the second Wernicke's subject takes much longer time (2025 secs) than the Broca's (1939 secs) to complete the test which means that in day to day communication, the Wernicke's subject might fail to carry out rapid processing and thereby hamper communication. This implies that his problem is nearly equal if not more than the Broca's subject despite having a higher AQ.

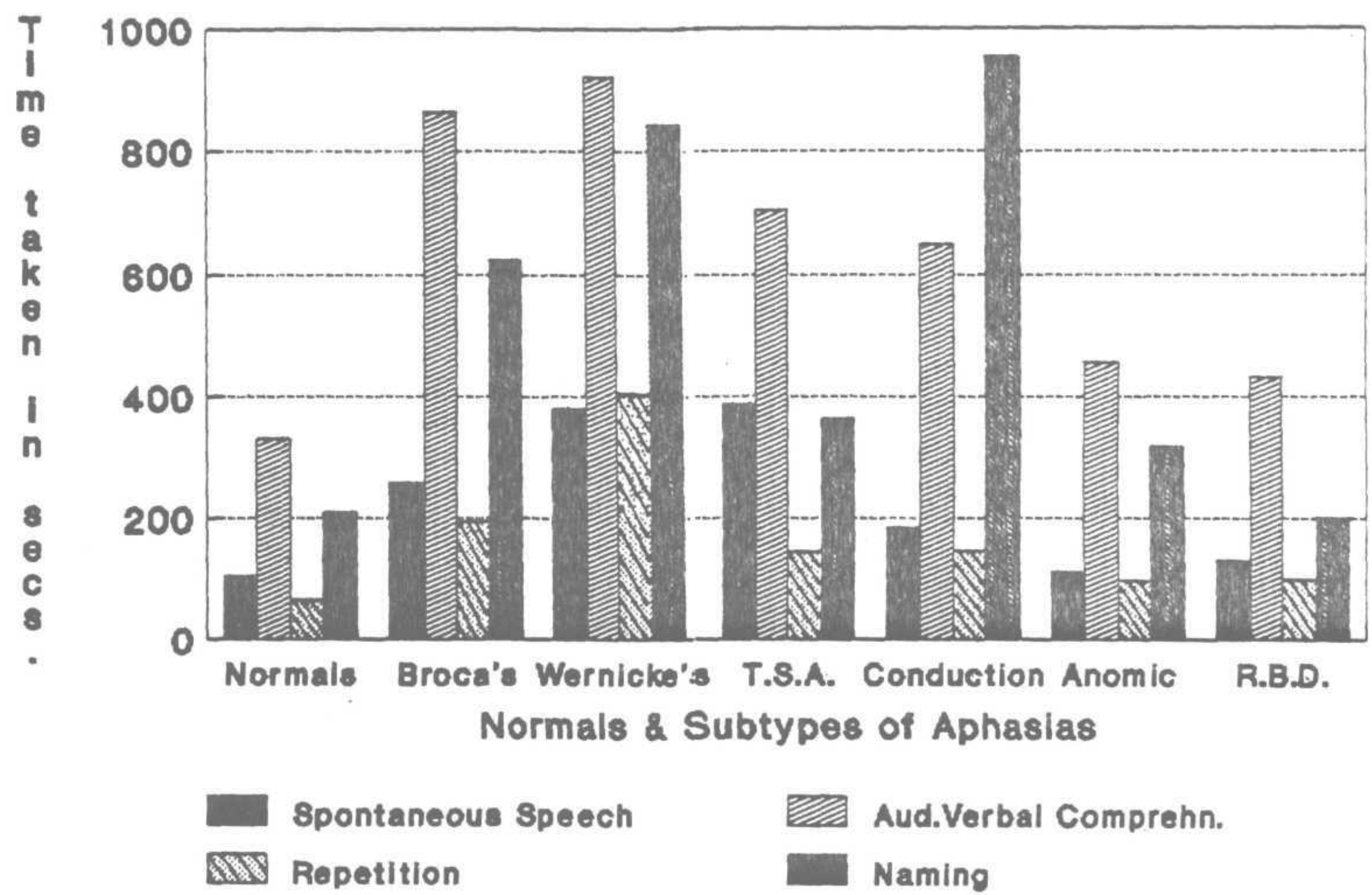
This factor once again strengthens onurneed to incorporate time aspect in our test batteries.

Graphs 2 and 3 show how the various aphasic subjects perform on the various subtests in the W.A.B. with respect to time. The Wernicke's group appears to take longer time in all the 4 subtests with respect to other groups.

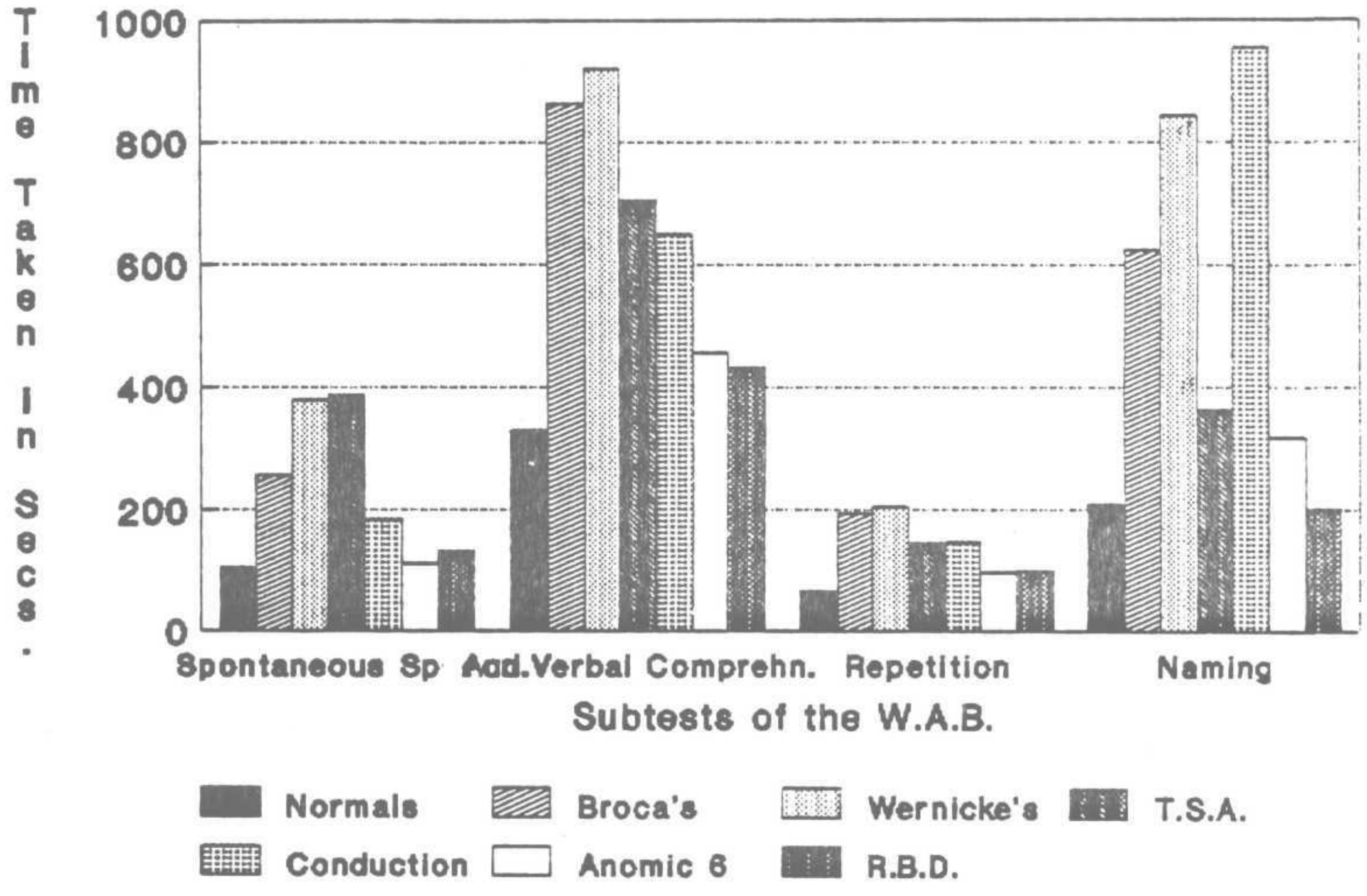
A common feature among all the aphasic subjects is an increase in timing on task of auditory verbal comprehension and naming. While this may be a feature of posterior lesion cases, a sole case of anterior lesion in this study also presented with increased timing on comprehension task.

While task of auditory verbal comprehension appears to be maximally affected with respect to timing in all grups of brain damaged subjects in this study, other subtests also seem to be affected to various extent in comparison to normals which implies that aphasia does bring about a general language deficit that crosses all language modalities as stated by Schuell et al (1964).

GRAPH II


Time taken in secs.
1000
800
600
400
200
0
Normals
Broca's
Wernicke's
T.S.A.
Conduction
Anomic
R.B.D.
Normals & Subtypes of Aphasias
Spontaneous Speech
Aud.Verbal Comprehn.
Repetition
Naming

GRAPH-III


Time Taken in Secs.
1000
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Spontaneous Sp
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Repetition
Naming
Subtests of the W.A.B.
Normals
Broca's
Wernicke's
T.S.A.
Conduction
Anomic 6
R.B.D.

The transcortical sensory aphasic patient with fairly intact repetition ability performs the repetition task more rapidly than the other aphasic groups although not in par with the normals.

The Anomic and right brain damaged subject also appear to take lesser time in spontaneous speech and repetition in comparison with other groups.

The timing factor in all these cases appears to substantiate their abilities/deficits in various subtests.

Exception being the conduction aphasia. In conduction aphasia, it is the repetition which is mainly affected and hence it would be appropriate to assume that timing feature would be markedly increased in this task. However the conduction aphasic in this study needed much greater time in naming giving the impression of being anomic.

The reason could be that the conduction aphasic was tested for this study 4 months post onset and while he did present with marked difficulty in repetion in the initial stages, some amount of spontaneous recovery could have taken place and the condition may be slowing resolving towards anomia.

Analysis of the conversational sample of the different aphasics provide insight into the nature of delay or increase in time taken for each subtest.

The main source of increased timing in the Wernicke's subjects in this study was circumlocutory speech with abundant grammatical words eg. subject S.S. frequently used words like "h "(this), "ha", "əni (and) interspersed with the automatic phrases eg. 'hɛ əsə hot̪ə məd̪hɛ' (meaning - This is what happens in between). Another area of increase in timing is in task of verbal comprehension, where both Wernicke's subject failed to limit their response to either "Yes" or "No". They would either repeat the instruction given by the investigator or add a neologist phrases to their response.

In object naming time factor increased as they frequently failed to name objects presented visually and extra time was needed to provide for tactual cueing and/or phonemic cueing.

The Broca's and transcortical aphasic showed response delay in the form of silent rehearsals before coming up with the answer.

The Broca's subject in this study spoke in a low volume and hence was asked frequent repetition of response to judge its accuracy.

The transcortical aphasic tended to make lot of paraphasic errors Eg (sotiʃi) for (tʃot̪iʃi) as well as errors of metathesis eg. (rɪmər) for (mɪrər). Subject would realise that the spoken word is incorrect and would attempt various self correction until he got the right word. In this case increase in time factor was mainly due to hesitations, pauses and rehearsals in attempt to self correct the errored response.

The Anomics as a group took longer time in responding to task of naming while performance on task of spontaneous speech and verbal comprehension was towards normal values.

The word finding difficulties of the anomic in the naming task were characterised by providing description of the object, talking about its function or just hesitations and pauses until the word was said.

Following is the transcript of patient S.M. a case of anomic aphasia following head injury. When shown a measuring tape - he responded as follows.

" I know that Madam, I am not able to explain . . . .Pause .... Scale .... all types, plastic, I know that Madam, I will tell you in 1 minute. Scale .... Pause ... Scale ..." Investigator then provided the phonemic cue "t " following which subject promptly came up with the word "tape".

The single right brain damaged case reported in this study although gave fairly accurate response, had a tendency to repeat each instruction of the examiner as though confirming that, that is what was asked before coming out with the right answer which brought about increase in the time factor.

We can conclude from this study that it may be possible to identify subtle deficits in communication is the mild aphasics by incorporating time aspect in the test battery. Frequently one may come across cases who following spontaneous recovery or with therapy do score above the cut off value between aphasia and normals on the W.A.B. It would however be inaccurate to consider them normal as they may continue to report some sort of communication difficulties encountered in the rapid processing in day to day situations. This feature while being missed out by just noting the A.Q. will be of immense help if their response latencies are timed and compared with normals.

By determining the nature of deficit thereby also helps in working on the therapy goals where clinician can gradually build up patient's ability at rapid processing in terms of both reception and expression. Not only does incorporation of timing feature help in identifying problems of the milder group of aphasics, but significant information can also be obtained in severe categories of aphasia and this has implications in both counselling as well as in rehabilitation strategies.

Critical look at each subtest in terms of accuracy and promptness of response can help determine where the major problem lies. For example, if two aphasics score the same number of points on a particular subtest, the timing characteristic can resolve the dilemma as to who has the major problem.

Although the present study has been incorporated on a small sample, clear cut information may be obtained in future using larger sample and different subgroups, to determine whether timing aspect can be made a part and parcel of existing batteries and give further weightage to the determinatin of severity as well as in differentially diagnosing the brain damaged aphasics from brain damaged nonaphasics, normals and dementias.

SUMMARY

In aphasia research tests designed to probe the "many different levels" of language processing have become more refined in the past decades. Lexical decision making, monitoring masking and other on-line tasks are continually being improved. Even data from so called "simple" or classical language tasks such as repetition, spontaneous speech and naming are now being reinterpreted along numerous dimensions.

Here is one such attempt by introducing the aspect of timing in the Western Aphasia Battery.

The aim of the study was as follows:

(1) To determine whether slowing of performance attributed to normal aging is evident on the W.A.B. or not,

(2) To compare normals with aphasics to determine whether the aphasics require extra time,

(3) To determine whether severity of aphasia is correlated to the timing aspect.

Results of this pilot study reveal:

(1) No significant difference in timing characteristics as a function of age on the W.A.B.

(2) Significant difference between the normals and aphasics on the total time required.

(3) A negative correlation was found to exist between severity of aphasia determined in terms of Aphasia Quotient (A.Q.) and timing aspect.

The less severe syndromes like the conduction aphasics, anomic aphasics and the right brain damaged subject took lesser time for test completion in comparison to the severe group of Broca's and Wernicke's.

Although the sample selected is small in number and further research is required in this area, it appears that introduction of time factor may aid in identifying subtle deficits in the milder forms of aphasia as well as in determing therapeutic aspects and in measuring recovery.

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