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Normative and Clinical Data on the Kannada Version of Western Aphasia Battery (WAB-K)

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Abstract

The present study aimed to standardize the Kannada version of Western Aphasia Battery (hereinafter K-WAB) and to present the normative data of normal individuals and patients with aphasia. The K-WAB contains the same test contents and structure as the original WAB (Kertesz and Poole, 1974) which is a commonly used assessment tool by Speech Language Pathologists (SLP) for aphasia. The test is modified with the cultural and linguistic adaptations and the general test administration method was maintained. The K-WAB was administered on 22 normal (16 males and 6 females) and 90 aphasics in the age range of 30 –70 years. The Aphasia Quotient (AQ) was evaluated for different ages and gender groups. Based on the AQ., cut-off scores to optimally differentiate between the normal and aphasic individuals were provided. The present study revealed that there was no significant effect with respect to age and gender .But significant variation was found in normal and different categories of aphasics within themselves in all parameters of WAB (AQ, Spont.speech, repetition, comprehension, and naming). It is proved beyond doubt that WAB differentiates normal and aphasic performance, finding support from the well established trend in literature. Finer details however need to be studied in depth with larger data from our sample.

Keywords: Western Aphasia Battery, South Indian &Dravidian language of Kannada, Aphasia type.

Introduction

Human beings have the most elaborate, sophisticated, versatile and creative means of communication, made possible by their complex neurophysiologic mechanism. Language is a set of symbols and code, employed by human beings who are capable of making association between essential arbitrary representations and events to express their thought, their wishes, and their feelings.

Aphasia is defined as " the loss or deterioration of verbal communication due to an acquired lesion of the nervous system involving one or more aspects of the processes of comprehending and producing verbal messages"(Basso & Cubelli, 1999). Related disorders of articulation, reading and writing are usually included in the description of aphasia. Furthermore, it is a multimodality disorder (Helm- Estabrooks & Holland, 1998).

A number of methods have been used to classify language deficits of language – impaired groups. Goodglass and Kaplan (1972) outlined the major classification used for assessing adults with aphasia which can be seen in Table 1.

Table- 1: Classification of Aphasia (Goodglass & Kaplan, 1972)

SYNDROME	Major Characteristics
Broca's Aphasia	Non-fluent aphasia, restricted vocabulary & grammar, articulation affected well-preserved auditory comprehension.
Wernicke's Aphasia	Fluent aphasia, impaired auditory comprehension, paraphasic speech & word-finding difficulty.
Anomia	Severe word-finding problems, Fluent speech with few paraphasias.
Global Aphasia	Severe verbal comprehension deficit, vocabulary & grammar with speech restricted to stereotyped utterances.
Conduction Aphasia	Fluent Aphasia, sentence repetition selectively impaired in relation to auditory comprehension.
Transcortical sensory Aphasia	Severe verbal comprehension deficit, near-normal or normal sentence repetition, impaired naming with paraphasias, perseverations & little extended expressive language
Pure word deafness/ Verbal auditory agnosia	No verbal comprehension.
Mixed non-fluent Aphasia	Non-fluent speech, moderate verbal comprehension problems but some expressive language.

Assessment is defined as an organized, goal-directed evaluation of the variety of cognitive, linguistic and pragmatic components of language. Such an assessment is carried out to determine each patient's language strengths and weaknesses and the degree to which language weaknesses can be modified (Chapey, 1994; Lahey, 1988). Ideally, it explores "the nature of language impairment and indicates what aspects of language performance are most appropriate for treatment" (Byng et al. 1990). The language assessment is actually, highly structured observations based upon the use of bedside and screening assessment tools, comprehensive aphasia battery, and/or tests of specific language functions.

There are several standardized and frequently used aphasia screening tests such as Acute Aphasia Screening Test (Crary et al., 1989), Aphasia Language Performance Scales (Keenan & Brassell, 1975), Aphasia Screening Test (Reitan, 1991) and Quick Assessment for Aphasia (Tanner & Culbertson, 1999) but, in many instances, clinicians rely upon comprehensive

aphasia batteries to provide for the major portion of their highly structured observations. There are many comprehensive aphasia batteries, each of which is associated with particular administration and interpretation strengths and weaknesses. Five tests commonly used in both clinical and research settings in United States and Canada include the Minnesota test for Differential Diagnosis of Aphasia (Schuell, 1965b), the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1983), the Western Aphasia Battery (Kertesz, 1982), the Aphasia Diagnostic Profiles (Helm-Estabrooks, 1992), and the Porch Index of Communicative Ability (Porch, 1981).

The Western Aphasia Battery (Kertesz, 1982) is a close relative of Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1972) and it provides the diagnostic goals of classifying aphasia subtypes and rating the severity of aphasic impairment. This test is designed for clinical and research use, comprising of four language and three performance domains. Syndrome classification is determined by the pattern of performances on the four oral/language-domain subtests, assessing spontaneous speech, comprehension, repetition and naming.

The WAB is designed to assess clinical aspects of language function in aphasic patients and to provide the data needed to establish a prognosis for therapy. The procedure is based on the neuro-anatomical model and the principle of modern neurolinguistics. The WAB comprises eight (8) subtests namely spontaneous speech, auditory verbal comprehension, repetition, naming, reading, writing, apraxia, constructional, visuo-spatial and calculation tasks. The scoring system provides the following overall measures of severity: The Aphasia quotient (A.Q) which comprises the Spontaneous speech(S), Auditory verbal Comprehension(C), Repetition(R) and Naming(N) uses the oral portion of the language assessment and the Cortical quotient (C.Q) which includes the Nonverbal scores on reading, writing, apraxia and constructional tasks yield Performance quotient (P.Q)

$$C.Q. = A.Q. + P.Q.$$

A.Q. < 93.8 indicates Aphasia which is used in research studies (Kertesz, 1979). In normal clients, A.Q. is considered as 98.4 (or) 99.6 (mean A.Q). Based on these four parameters:- Spontaneous speech, comprehension, repetition and naming – types of aphasia are recognized. They can be classified under Broca's, Wernicke's, Transcortical sensory (TCS), Transcortical motor (TCM), conduction, Anomic, Isolation and Global aphasia.

Languages in contact, bilingualism/multilingualism, is an integral product of globalization and social mobility. Definition ranges from a native - like competence in two languages to a minimal proficiency in a second language, raising a number of theoretical and methodological issues. India has been a multilingual country right from earliest times and English bilingualism has become an integral part of India's consciousness. Bloomfield, (1933) defined bilingualism as "native-like control of two languages" whereas on the other end Haugen,(1950) takes a lax view by observing that bilingualism begins when the speaker of one language can produce complete meaningful utterances in the other language. Aphasia in bilinguals can affect their languages equally or differentially. Bilingual aphasia has been a

widely researched area as it provides insight into the brain functioning of a bilingual and effect of the lesion on this functioning.

Need of the study

Although there are many tests that assess one or more aspects of language disturbances of brain damaged aphasic individuals, the numbers that have been adequately standardized is relatively few. WAB is one of the tests which are most frequently used in clinic for assessment of aphasia and allied disorders. We are presently following Western norms and no Indian norms are obtained so far.

Aim of the study

The present study aimed at obtaining norms for WAB in Kannada for monolingual (Kannada) and bilingual (Kannada-English) population.

Different languages use different devices to mark certain features (e.g., word order, pre/post positions, affixes, or a combination of these), the same underlying deficit may cause different surface manifestations in different languages (Paradis, 1987). Therefore, it is essential for clinicians and researchers to be aware of cross-linguistic symptoms, for at least three basic reasons: (1) in the countries of the world where English is not a national language, patient ought not to be diagnosed on the basis of data derived from English; (2) or even in the countries where bilingualism and multilingualism is inherent as in India; (3) in order to determine whether one of the languages of a bilingual or polyglot patient is recovered to a greater or lesser extent than the other language(s), once one becomes aware that the same underlying deficit may cause different manifestations in different languages, one must be able to interpret the patient's behavior pattern in terms of its significance for each language.

Aphasic groups in non-English population have to be studied for their language symptoms /deficits and recovery patterns in each bi/multilingual combination in the Indian subcontinent (Chengappa, 2001). It is well established now that language specific impairments and recoveries take place as evidenced by growing literature on Agrammatism (Paradis, 1987). Aphasic severity is mainly measured by Aphasia Quotient (AQ).

According to Shewan and Kertesz (1980), "the Aphasia Quotient (A.Q) is a functional measure of severity of the spoken language deficit in aphasia." Each individual subtest contributes different percentage to the calculation of the A.Q. Information content; fluency and repetition each contribute 20%. Object naming contributes 12%. Sequential commands contribute 8%. Yes-No Questions and auditory word recognition each contribute 6%.Word fluency contributes 4%. Finally, sentence completion and responsive speech each contribute 2%. These percentages demonstrate that the WAB aphasia quotient is weighted heavily towards expressive tasks (80% of the A.Q.). Because the AQ is weighted heavily by scores from expressive tasks, it might be interpreted predominantly to represent a patient's expressive language ability. This weightage questions about the relative contributions of the various expressive tasks to the prediction of the AQ. Given that information content, fluency,

and repetition scores contribute most to the calculation of the AQ, they might be expected to be the best predictors of severity as measured by the AQ.

Kertesz, (1979) stated that the score for information content has the highest correlation with the AQ; however, he presented no data to substantiate this claim. Thus, although the AQ is presented as an index of the severity of aphasic impairment, the relationship between it and the 10 individual subtests of the WAB have not been investigated.

Crary and Kertesz (1988) reported changes in expressive language errors in a patient who was followed for 12 months with the WAB. Some patients, specifically those presenting global or severe Broca aphasia, demonstrated changes in the type of expressive errors noted on naming and repetition tasks in the absence of change in the AQ. Such results suggests that patients' communication abilities and/or the form of language errors may change over time without change in the overall severity of aphasia as measured by a total score like the AQ.

Crary and Rothi (1989) reported that information content was the best predictor of the severity of the aphasic impairment as measured by the AQ. The information content score reflects several dimensions of a patient' communicative abilities and contributes a high percentage to the calculation of the Aphasia Quotient. Time postonset had no influence on the relationships among the subtests or between the 10 subtests and AQ. Kertesz (1979) suggested that the information content score represents a measure of functional communication means that patient must possess some degree of both comprehension and expression abilities to respond appropriately in the task.

From the above review, we can conclude that the language content and expressive ability of an aphasic patient determines the severity of the problem. Thus, structure of the language and the nature of the use of the language(s) by the native speakers are crucial in devising a test material for assessment of any language disability, especially in the area of aphasia.

Few studies have been carried out in different languages other than English. Kim & Duk (2004) studied the Normative Data on the Korean Version of the Western Aphasia Battery which aimed to describe the properties of the Korean version of the Western Aphasia Battery (hereinafter Kn-WAB) presented the data of normal individuals and patients. The Kn-WAB contained the same test contents and structure as the original WAB and the general test administration method was maintained. Kn-WAB was administered to 224 normal adults in seven age groups (15-24, 25-34, 35-44, 45-54, 55-64, 65-74, and 75 years or older), in five educational levels (0, 1-6, 7-9, 10-12, and 13 years or more) and by gender. The age and educational levels were influential to the Kn-WAB performance. Accordingly, they formed six subgroups of the normal: two age groups (15-74, and 75 years or older groups) by three educational groups (0, 1-6, and 7 years or more). Two hundred thirty-eight patients were also evaluated using the Kn-WAB. The highest aphasia quotient (AQ), language quotient (LQ), and cortical quotient (CQ) were achieved by 15-74 age group with 7 or more years of education (M=97.11, M=95.51, M=95.57, respectively).

Lomas and Kertesz (1978) reported that most aphasic patients demonstrated change in communication abilities over time. However, in some patients the degree of change was

similar across language performance areas, whereas in other patients changes in some areas of performance were disproportionate to changes in others.

Bates et al. (1987) noted that grammatical morphology was preserved in Italian and German speaking agrammatics. Miceli and Caramazza (1988) noted derivational errors while repeating derived words; there were no errors while repeating nonderived words. Bates et al. (1991) concluded that overuse of SVO word-order was noted only in languages that permitted pragmatic word-order variations. It could be detected in rigid word-order languages like English. The extent to which noncanonical word-order patterns were impaired was dependent on the frequency with which these forms appeared in the normal language. Comprehension seems preserved in sentences that can be understood without analysis of the syntactic structure. For example, agrammatic patients tend to err by omission in English and by substitution in richly inflected languages. As a result, English agrammatics appear much more severely impaired than their non English speaking counterparts. These qualitative and quantitative differences need to be further explored as already glimpsed in several Indian Languages like Telugu (Usharani, 1998), Kannada (Rangamani, 1991), Tamil (Srividya, 1990), by Faroqui and Chengappa (1998), (Chengappa, 2001).

Even in the use of English, there are variations as to how it is spoken in different states of India. So, one can think of having region-based English norms when studies in English are done in India either singly or as a part of bilingual groups. While there may be similarities, there could be variations too, across mono- and bilingual language acquisition/learning/relearning in individuals with or without brain insult. These need to be explored with the help of cross-linguistic studies (Chengappa, 2001).

Trudeau, Goulet, and Joanetta (1993) investigated the age difference between Broca's and Wernicke's aphasics while achieving better control over potentially confounding variables. The subjects (9 Broca's and 14 Wernicke's) were selected from a data base according to the following selection criteria: aphasia type, handedness, localization of lesion and etiology. The two groups revealed to be equivalent for sex distribution and schooling. Results showed that the distribution of age between Broca’s and Wernicke’s group was significantly different: there was a small representation of Broca's aphasics in older subjects while Wernicke's aphasia occurred at all ages.

Bhatnagar, et al. (2002) examined the clinical profile of Hindi-speaking stroke patients with aphasia from northern India. They studied the interactional effect between age and gender with aphasia type in 97 Hindi-speaking right-handed individuals, the majority of them with a confirmed diagnosis of a cerebrovascular accident also evaluating the interaction between literacy and aphasia type since the subjects had varied education (total illiteracy to professional/university education).The subjects included in the study ranged from 3 weeks to two years post – onset with a diagnosis of a common classical aphasia (Broca’s, Wernicke’s, anomic, global, conduction and trancortical) types involving both males and females. While the data reported about Hindi-speaking aphasics is relatively in agreement with the age-aphasia type patterns discussed in western countries, some differences were also observed. The mean age of Indian patients with aphasia was significantly lower. Also, in addition to some gender and literacy related differences, an outstanding difference was that

many clinical symptoms that are known to co-occur with aphasia were not readily reported by subjects with stroke.

Method

The present study was a retrospective study which aimed to establish normative and clinical data on the Kannada Version of Western Aphasia Battery (WAB-K). Ninety clients with different types of aphasia (Broca's/Anomic/Wernicke/Global) participated in the study. Kannada Version of Western Aphasia Battery (WAB-K) was administered on aphasics as well as 22 normal subjects in different age groups who were native speakers of Kannada with or without the knowledge of English, Hindi or any other language. In order to review the available records, the following criteria were used. The available clinical data was classified on 4 categories of aphasia: (1) Broca's aphasia (2) Anomic aphasia (3) Wernicke's aphasia and (4) Global aphasia

Criteria used for the selection of case records

- The cases who reported to AIISH with the history of loss of language due to brain insult in the age range of 30-70 years, registered between 1st January 2003 to 31st December 2006 were reviewed.
- Subjects of all the groups diagnosed as aphasia (of various types) by the neurologists and speech language pathologists at AIISH were considered for the study.
- Each case file was separately analyzed for the demographic information like age, gender, education (0 years, 1-6 years, and 7 years or more), although the latter was not focused in the study. No associated disorders like dementia and other psychological illnesses were found.

Kannada version of WAB was administered on 22 normal subjects who were native speakers of Kannada and were also able to read and write Kannada. All these subjects also had formal education in English. The scores (Aphasia Quotient, A.Q.) obtained by the subjects on WAB and from aphasic case files (administered previously by SLP) were considered for interpretation.

RESULTS AND DISCUSSION

The Clinical data was a retrospective study involving 90 aphasics' case files which were reviewed during the period of 1st January 2003 to 31st December 2006. Modified version of Kannada- WAB was also administered on twenty-two normal individuals who were Kannada (a Dravidian language) native speakers in the age range of 30 – 70 years with different educational background (0, 1-6years, and 7 years or more, although this was not studied as a variable in this portion of the study).

In order to collect the data from the case files retrospectively, a data sheet was prepared in SPSS 14.0 version in which all the variables were entered. A numerical value was assigned to each variable for the presence or absence of the problem. The data was extracted from the case files fed in this program. The following effects were analyzed:

Effect of age, Clients/Subject groups and interaction between age and groups

The following table shows the performance of Clients/Subject groups across age and their interaction.

Table 2: Mean and standard deviation of WAB-K with respect to age, clients/subject groups in aphasics and normal:

Clients/ Subject Groups	Age (in years)	No. of Subjects(N)	Mean	SD
Normal	30-40	4	99.2000	1.3466
	41-50	5	97.5600	2.1571
	51-60	7	98.1286	1.5457
	61-70	6	94.4667	6.1171
	Total	22	97.1955	3.7352
Aphasics	30-40	18	27.5417	30.7056
	41-50	38	30.4626	28.6230
	51-60	16	46.2625	28.1559
	61-70	18	35.4333	32.1747
	Total	90	33.6814	29.8858

A Two-way ANOVA was carried out to check the effect of age, clients/subject groups and interaction between age and client-groups. It shows that there was a significant difference between client-groups in all parameters (AQ, Spont. speech, Comp., Repetition, and Naming i.e. $p < 0.001$) and there was no significant difference between different ages ($p > 0.05$) and no significant interaction between ages and client-groups ($p > 0.05$). The present study does not find support from a similar previous study in the Indian context. Bhatnagar, et al. (2002) found the mean age of Indian patients with aphasia was significantly lower. A bigger sample and a further detailed different statistical analysis probably are necessitated for more conclusive findings.

Effect of age within the groups

Separate analysis was carried out in normal subjects and aphasics to check the effect of age.

a. In Normal subjects, Kruskal-Wallis H –test was administered to check the difference between different ages. Results indicated that there was no significant differences between ages ($p > 0.05$) in different parameters.

b. In Aphasics, One-Way ANOVA was administered to check the difference between different ages. Results indicated that there was no significant differences between ages ($p > 0.05$) in different parameters.

Trudeau, Goulet, Joanetta (1993) investigated the age difference between Broca's and Wernicke's aphasics while achieving better control over potentially confounding variables.

The subjects (9 Broca's and 14 Wernicke's) were selected from a data base according to the following selection criteria: aphasia type, handedness, localization of lesion and etiology (first CVA). The two groups revealed to be equivalent for sex distribution and schooling; post onset time was superior to three weeks for all subjects but one. Results showed that the distribution of age between Broca's and Wernicke's group was significantly different: there was a small representation of Broca's aphasia in older subjects while Wernicke's aphasia occurred at all ages.

Kim & Duk (2004) in their Korean version of WAB also found that age to be one of the influential variables in WAB performance but the current study did not find the same. One possible reason could be that present study was a cross sectional study. AQ also didn't alter with respect to age.

Effect of gender within the client-groups:

Independent t-test was administered to check the difference between males and females in normal subjects and aphasics. Results showed that no significant difference between males and females in the different parameters ($p>0.05$) while the general overall male to female ratio supported the notion of greater aphasic impediment in males than females.

Bhatnagar, et al. (2002) reported similar gender differences found in the aphasia (Broca's, Wernicke's, anomic, global, conduction and transcortical) types which were more in males than females.

Comparison of sub-categories of aphasics and normal subjects

From the above results, it is evident that there was no effect of age and gender on K-WAB performance. The variable which is affecting the performance was grouping in sub-categories of aphasia. The aphasic groups were further divided into four sub categories (Broca's, Anomic, Wernicke's, and Global). These categories were compared within themselves and with normal subjects in all parameters.

The table 3 shows the mean and SD of WAB-K performance of normal subjects and aphasics for different parameters.

Table 3: Mean and Standard deviation of WAB-K performance in normal subjects and all sub-categories of aphasics for different parameters:

Parameters	**Clients/Subject groups**	**No. of Subjects(N)**	**Mean**	**SD**
Spont. speech	Normal	22	19.5455	1.3707
	Brocas	33	2.4242	3.4098
	Anomic	19	16.0000	2.9439
	Wernickes	12	10.0000	3.5162
	Global	26	0.8077	1.3570
	Total	**112**	8.5268	8.1018
Comprehension	Normal	22	9.7295	0.4151

	Brocas	33	7.1758	1.7411
	Anomic	19	9.1763	0.9214
	Wernickes	12	4.8367	2.3342
	Global	26	2.4048	1.3691
	Total	**112**	6.6586	3.1044
Repetition	Normal	22	9.4591	0.4827
	Brocas	33	1.0333	1.8428
	Anomic	19	8.7263	0.8818
	Wernickes	12	3.3500	2.0002
	Global	26	4.615	0.1174
	Total	**112**	4.0125	4.1956
Naming	Normal	22	9.8636	0.2060
	Brocas	33	1.4758	2.5297
	Anomic	19	7.3000	2.1406
	Wernickes	12	2.9917	2.2769
	Global	26	5.385	0.1860
	Total	**112**	3.9438	4.1767
A.Q.	Normal	22	97.1955	3.7352
	Brocas	33	24.2333	14.7352
	Anomic	19	82.3947	8.3252
	Wernickes	12	41.1567	16.9939
	Global	26	6.6250	3.9360
	Total	**112**	46.1574	36.8953

One-way ANOVA was carried out to compare the normal subjects and different categories of aphasics (Broca's, Anomic, Wernicke's and Global). It shows that there was a significant difference between groups ($p<0.001$) in all parameters.

Duncan's test was administered to check the pair wise differences. Results show that all the client-groups (normal subjects and different categories of aphasics) are significantly different from one another in AQ and naming ($p< 0.001$). In Comprehension and Repetition there is no significant difference between anomic and normal subjects ($p>0.05$) whereas significant difference exists in all other pairs ($p< 0.001$). In Spontaneous speech, there is no significant difference between global and broca's aphasia and other pairs are significantly different at 5% level of significance. This is in agreement with the major characteristics of the disorders of global and Broca's aphasia where the verbal output may be limited.

Normal subjects and aphasics were well differentiated by WAB scores in the current study.

The table 4 shows the mean scores on WAB-K for normal subjects and different aphasic groups.

Table 4: Mean scores on WAB-K for normal subjects and different aphasic client-groups:

Subjects/Clients-groups	**A.Q.**	**Spon. speech**	**Repetition**	**Naming**
Normal Subjects	97.20	19.50	9.50	9.86

Anomic aphasics	82.40	16.00	8.70	7.30
Wernicke's aphasics	41.20	10.00	3.40	2.99
Broca's aphasics	24.20	2.00	1.00	1.47
Global aphasics	6.60	0.80	0.05	0.54

It is evident from table 4 that mean scores of AQ are highly variable. The normal subjects had higher AQ while Global aphasics had the lowest AQ. In the descending order of AQ, the subjects/client-groups can be placed as Normal subjects, Anomic, Brocas and Global aphasics.

These findings find support from all the previously listed studies of WAB, with respect to different parameters. Comprehension ability also is commensurate with the previous findings of the literature.

The table 5 shows the mean scores of Comprehension task on WAB-K for normal subjects and different aphasic client-groups.

Table 5: Mean scores of Comprehension tasks on WAB-K for normal subjects and different aphasic client-groups:

Subjects/Clients-groups	**Comprehension**
Normal Subjects	9.73
Anomic aphasics	9.17
Broca's aphasics	7.17
Wernicke's aphasics	4.83
Global aphasics	2.40

It is evident from table 5 that normal subjects had higher scores on Comprehension tasks while Wernicke's and Global aphasics had the lowest scores. In the descending order of Comprehension task, the subjects/client groups can be placed as Normal subjects, Anomic, Brocas, Wernickes and Global aphasics.

Conclusions

The present study reports an ongoing attempt at Standardization of WAB in Kannada (WAB-K) for South Indian monolingual Kannada and bilingual Kannada-English population. The present study revealed that there was no significant effect with respect to age and gender but significant effect was found in normal subjects and different categories of aphasics within themselves for different parameters. It is proved beyond doubt that WAB differentiates normal and aphasic performance, finding support from the well established trend in literature. Finer details however need to be studied in depth with larger data than our sample.

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