ADAPTATION OF MISSISSIPPI APHASIA SCREENING TEST TO TELUGU LANGUAGE

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Abstract

Aphasia is an acquired language disorder seen in adults which results from stroke or cerebral injury. Most of these patients with severe language disabilities are difficult to assess and may not also be cooperative for lengthy aphasia test batteries like WAB, BDAE etc., hence the need to develop a screening test. Mississippi Aphasia Screening Test is one such instrument developed by Nakase-Thompson (2005) for this purpose. Very few aphasia screening tests have been developed in the Indian context and none for Telugu. Therefore the present study aimed at adaptation of Mississippi Aphasia Screening Test to Telugu (MAST –T). MAST- T consists of Expressive and Receptive indices, under 9 subtests, with a total of 46 items. It was administered on three groups – Neuro-typical group (NT, n=50), Left Hemisphere Damage group (LHD; n=25) and Right Hemisphere Damage group (RHD; n=05). The test displayed good construct, very good criterion validity (r =0.84), and high inter-rater reliability (r=0.993). Overall, LHD group showed more impairment than RHD group on both the subtests. Also the results showed that neuro-typical performed better than both the groups on all the 46 items, except object recognition task which had almost same score for all three groups. Thus, MAST-T is a reliable and valid screening tool for the detection of aphasia for Telugu speaking persons with aphasia.

Key words: *Assessment, Screening, Aphasia, Telugu*

The communication impairment in Post stroke aphasia is manifested as listening, speaking, reading, and writing-although not necessarily to the same degree in each. It is a major source of disability, leading to impaired language, reduced social activity, depression, and a lower probability of resuming work. Assessment of communication skills and language functions, to provide information to guide medical and rehabilitation interventions, to detect improvement or decline in clinical status, to provide feedback to the family, (Wright, 2000), and so on are important. The standard aphasia assessments (like MTDDA, PICA, BDAE, and WAB) are able to evaluate the presence, type and severity of a language disability (Chapey, 1994), while screening tests like The Aphasia Screening Test (AST, Whurr, 1974), Mississippi Aphasia Screening Test (MAST, Nakase-Thompson, 2005), Frenchay Aphasia Screening Test (FAST, Enderby, et al., 1987) etc., are done to detect the presence or absence of aphasia. Both come with their advantages and disadvantages. Adaptation of aphasia tests into Indian languages with appropriate social, cultural and linguistic modifications have also been done. Some of the recently developed tests are: Malayalam version of Boston Diagnostic Aphasia Examination-3 (Sona, 2004)**;** Telugu version of Western Aphasia Battery (Sripallavi, 2010) etc.

The domains of assessment vary based on the purpose, for e.g. MTDDA or WAB can be used for differential diagnosis, functional communication can be obtained by PICA etc. The purpose of a screening test would be to identify the presence or absence of aphasia (Chapey, 1994). To assess the components of production and expression of language: Naming, Automatic Speech, Repetition, Yes/No Responses, Object Recognition, Following Verbal Instructions, Reading Instructions, Writing and Verbal Fluency are commonly used.

According to Moore, et al (1996) naming is located in left temporal extrasylvian regions, left anterior insula and right cerebellum. Study conducted by Bookheimer, et al. (2000) showed that automatic speech is located in posterior superior temporal lobe (Wernicke's area) and in Broca's area, while repetition is located in the anterior insula, a localized region in the lateral premotor cortex, and the posterior palladium (Wise, et al. 1999**)**.

Studies found that left inferior frontal gyrus was involved both for verbal fluency (Gaillard, et al., 2003) and lexical decision making (Wright, et al., 2010), while object recognition was located in lateral and ventral occipito-temporal areas (Grill, 2003). Writing was located in the left

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posterior inferior temporal cortex (Nakamura, et al., 2000). Roux, et al. (2004) found that reading was located in the lower part of the pre- and postcentral gyri, angular and the posterior part of the superior temporal gyri, the inferior and middle frontal gyri and the posterior part of middle temporal gyrus of the dominant hemisphere. Thus, it can be seen that the whole brain is involved in the processing of different components of language and these need to be assessed to obtain an overall view about the breakdown.

Assessment for patients with severe language impairments, by using formal diagnostic batteries could have various disadvantages; however, a short screening test might be a better option. It will also be useful to predict prognosis and measure patients' progress. There are now considerable number of tests for aphasia available in English and other Indian languages; however, there are no aphasia screening tests available for Telugu, one of the four major Dravidian languages widely spoken in Andhra Pradesh of southern part of India.

Therefore the present study attempts to design an Aphasia Screening Test in Telugu. Such a screening test would help in bedside evaluation in hospital setup in identifying the persons with aphasia, describing the aphasia for the purpose of early diagnosis, therapy and prognosis.

The aim of this study was to adapt and develop Telugu version of the Mississippi Aphasia Screening Test. The specific objectives were: 1) to translate MAST to Telugu, 2) to obtain the criterion and construct validity, 3) to obtain inter-rater reliability and 4) to administer it on a group of Telugu speaking persons with aphasia.

Method

Study was done in two phases. In the first phase, the translation of English version into Telugu was done and in the second phase the test (MAST-T) was administered. The adaptation of the MAST-T was undertaken after obtaining approval from the author, Nakase-Thompson.

Participants

A total of 80 Telugu speaking participants took part in the current study. They were distributed into three groups: Neuro-typical (NT), persons with aphasia with left hemisphere damage (LHD) and persons with aphasia with right hemisphere damage (RHD). The purpose of administering on the neuro-typical group was to standardize test while difference in performance across subtests, if any, was to be obtained by administering on different aphasic groups.

The neuro-typical group consisted of 50 adults(divided into 5 groups, with 10yrs interval, having 10 persons in each group) in the age range of 18-68 years (mean: 43.9 yrs, SD:3.2), while the LHD group consisted of 25 participants (mean:50.6 yrs, SD:11.4) and the RHD consisted of 5 participants (mean:54 yrs, SD:12.4). The inclusive criteria for both the aphasic groups were: stoke due to CVA either in LH or RH, right handed, preferably not attending speech therapy and having no other associated problem.

Procedure

The test used in the current study was developed by Nakase-Thompson, et al. (2005). It consists of nine subtests categorized under two main indexes - Expressive language index and Receptive language index. The Expressive Language Index included 5 subtests: a) Naming, b) Automatic speech, c) Repetition, d) Verbal fluency and e) Writing. The Receptive Language Index included 4 subtests: a) Yes/ No Responses, b) Object recognition, c) Following instructions and d) Reading instructions. The former has 21 test items, while the latter has 25; a score of 50 for each could be obtained, both these indices added up to a total of 100.

All the of nine subtests categorized under two main indices -Expressive language index and Receptive language index of the English version were translated to Telugu and adapted keeping in view the linguistic, social and cultural factors in the first phase. The translated version was reviewed by a Linguist to obtain content validity and suggested modifications were incorporated.

In the second phase, data collection from 30 persons with aphasia was done at various hospitals and for a few at home, while for forming the neuro-typical group 30 participants (age, education and gender matched) were taken from the 50 neuro-typical group, on whom the standardization of the test was done . All responses of the participants were audio-recorded. Scoring and appropriate statistical analyses of samples were done. A score of '1' was given for correct response and '0' for incorrect or any type of errors. All subtests put together had 46 test items and a total score of 100 could be obtained.

Data was also collated from the patient files, interviews and from caretakers to obtain the medical and demographic information for the aphasic group which included age, gender,

educational level, handedness, neuroimaging findings and duration of time since stroke, while for the neuro-typical the demographic data was collected through interviews.

Results and Discussion

In the present study, the aim was to adapt and develop Telugu version of Mississippi Aphasia Screening Test (MAST-T) which was administered on 50 neuro-typical persons and 30 persons with aphasia.

Adaptation of the test

The translated Telugu version of MAST had the same number of subtests, same number of items and same scoring method as English version. The test took about 10 to 15 minutes to administer. The performance of neuro-typical group is depicted in the following table.

Table-I: *Scores on all subtests of MAST-T version for the neuro-typical group*

Subtest	Max. Score	Age groups									
		18-28yrs (N=10)		29-38yrs (N=10)		39-48yrs (N=10)		49-58yrs (N=10)		59-68yrs (N=10)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
EI	50	49	1.05	46.7	2.71	46.2	2.9	43.8	4.08	44.6	4.27
RI	50	50	0	49.6	0.84	49.4	0.97	49.2	1.4	48.2	1.48
TS	100	99	1.05	96.3	2.63	95.6	3.03	93	4.94	92.8	4.64

Note: EI: Expressive Index, RI: Receptive Index and TS: Total Score.

From the above table it can be noted that (a) as the age increased, there was a decrease in overall performance on MAST-T, (b) the expressive index (EI) showed gradual decline in the performance, however (c) the receptive index (RI) was almost constant. This decline in the scores may be attributed to probable decrease in the cognitive capacities as age increases. These norms will help the clinician to judge whether a persons with aphasia deviates from the expected (typical) performance levels or not.

Validity and reliability measures of MAST-T

Construct validity was obtained by a Linguist and while the criterion validity were obtained by administering both English and Telugu version of MAST on 10 bilingual speakers of Telugu and English. High degree of correlation was obtained using Pearson correlation (0.84) between the two versions. The inter-rater reliability was good and test-retest reliability was high (r=0.993). This reveals that the developed test consistently measured the attributes that they were intended to measure.

Demographic variables and MAST-T findings

A summary of findings on the demographic variables studied in the current study are presented in Table-II.

Table-II: *Findings on Demographic variables*

Sl. No	Variable	NT gp (n=30)	LHD gp (n=25)	RHD gp (n=5)	Sig(*p*)
1	Age* M (SD)	51.06 (11.39)	50.5 (11.41)	54 (12.42)	Not Sig
2	Education* M (SD)	14.43 (2.6)	14.48 (3.2)	9 (4.94)	<0.001 (LHD & NT) <0.001 (RHD & LHD)
3	Duration** M (SD)	–	39.24 (13.28)	37.6 (18.2)	Not Sig
4	Gender Male Female	53.30% 46.60%	84% 16%	40% 60%	<0.05 (LHD)
5	Handedness Right Left	100% 0%	100% 0%	100% 0%	Not Sig

* in years; **in months post onset

Significant difference was not found in terms of age for the three groups. However, in the English version Nakase-Thompson (2005) found significant difference between the aphasic and control group in terms of age i.e. the control group were much younger. In the current study, a possible reason for not finding a significant

difference could be due to matching of the participants in terms of age hence no difference.

There was no significant difference in terms of educational level between the NT group and LHD group, but there was a significant difference between the NT & RHD group ($p<0.001$), and LHD & RHD group ($p<0.001$). This suggested that the RHD group participants had less years of education than the other two groups. There was no significant difference in terms of duration ($p= 0.814$) between the two patient groups. As all right handed participants were selected, there was no difference between the three groups, for handedness variable. One-way ANOVA suggested that there was a significant difference in terms of gender in LHD group ($p<0.05$) i.e. more number of male participants were observed but no such differences were found in NT and RHD groups. Expressive Index and Total Score were found to be significantly associated with age, education and handedness, while for the Receptive Index; gender was significantly associated, in the English version of MAST.

Performance on MAST-T

Performances of the three groups on MAST-T are summarized in Table-III. Between groups comparisons were done using ANOVA and t-test and the results of post-hoc pair wise comparisons revealed that, overall mean scores of both LHD group and RHD group were qualitatively reduced when compared to the Neuro-typical group. Thus, it can be seen that MAST-T could differentiate the aphasic group from the neuro-typical group.

The LHD group's performance was markedly poorer than NT & RHD group on all the 12 subtests of MAST-T version. Performance of RHD group was similar to neuro-typical group for all the nine tasks except verbal fluency and reading instructions, in which lower performances were seen. Ceiling effect was seen in the neuro-typical group for only two of the nine tasks i.e. naming and object recognition task and lowest score was obtained for verbal fluency.

Performance on expressive index indicated that RHD and NT groups had similar performance while the LHD group was poorer when compared to both the groups. Performance on receptive index indicated that both the LHD and RHD groups had poorer score when compared to NT group.

Performance on the English version, showed: (i) LHD group performed significantly poorer than non patient group on all 12 MAST subtests, (ii) LHD group performed significantly poorer than RHD on 10 of the 12 subtests and (iii) RHD group performed significantly poorer than Non Patient group on 7 of the 12 subtests (Nakase-Thompson, 2005).

Table-III: *Performances on MAST-T by the three groups*

Group/ Task	LHD		RHD		Neuro-typical		Sig*
	Mean	SD	Mean	SD	Mean	SD	
Naming	4.32	3.5	8.8	1.1	10	0	0.001(a,c)
Automatic Speech	5.04	3.3	8.4	0.9	9.33	0.9	0.001(a) and 0.005(c)
Repetition	6.32	3.7	8.4	0.9	9.4	1.2	0.001(a)
Writing	0.56	1.5	8.4	1.7	8.6	1.4	0.001(a,c)
Verbal Fluency	1.6	2.4	5	0	7.67	2.5	0.001(a) and 0.005(c)
Yes/ No Responses	13.84	4.8	17.2	1.1	19.47	0.9	0.001(a) and 0.005(c)
Object Recognition	9.76	0.9	9.6	0.9	10	0	-
Following Instructions	5.92	2.6	8.8	1.1	9.8	0.6	0.001(a) and 0.005(c)
Reading Instructions	3.12	3.2	7.6	1.7	9.73	0.7	0.001(a,c)

** a=LHD group poorer than neuro-typical group, b= LHD group poorer than RHD group and c= RHD group poorer than neuro-typical group*

Comparison of performance between the LHD group and NT in MAST-T revealed marked poor performance on writing and verbal fluency, poor performance on naming, automatic speech, following instructions & reading instructions and comparable performance for repetition and yes-no questions. Comparison of performance between the RHD group and NT revealed comparable performances on 6 of 12 subtests and slightly poor performance for 3 i.e. on yes-no

questions, following instructions and reading instructions.

Because writing to dictation requires motor performance and left hemisphere was dominant for this task in a right handed person, the LHD group performed poorer on this task. Poor performance for verbal fluency is supported by Gaillard (2003), who found that left inferior frontal gyrus and left middle frontal gyrus of the brain were responsible for the verbal fluency; hence it was a left hemisphere dominant task.

Poor performance on naming subtest can also be noted as naming is one of the language dependent tasks and the left hemisphere was dominant for this function, hence, the LHD group performed poorer than RHD and NT groups. This finding is supported by Willem (1998) and Moore (1996), who found that naming was located in the left posterior temporal lobe, left posterior basal temporal lobe, left temporal extrasylvian regions and left anterior insula. Performance on automatic speech subtest indicated that RHD and NT groups had similar performance while the LHD group was poorer when compared to both the groups. Bookheimer (2000), reported that left posterior superior temporal lobe (Wernicke's area) and Broca's area of the brain were responsible for the automatic speech task, hence the poor performance.

Performance on object recognition subtest indicated that the three groups i.e., NT, RHD and LHD groups had similar performances, possibly indicating that both the hemispheres are involved in this task. Performance on writing subtest indicated that RHD and NT groups had similar performance while the LHD group was poorer when compared to both the groups. Object recognition and following written instructions subtests depend on visual-perceptual abilities. Since these types of tasks are difficult for patients with left neglect, hence the low score in performance. These findings are supported by Grill (2003), and Nakamura (2000). Thus, as noted by Nakase-Thompson (2005) visual analysis task may partially explain sensitivity to right hemisphere injury.

Following verbal instructions subtest comprises following instructions that increase in length. This task was poorly performed by LHD group. As this task requires higher language functions like language comprehension, attention, left/right discrimination and body schema, which are associated with left hemisphere. Performance on repetition subtest indicated that both the LHD and RHD groups had poorer performance when compared to NT group. According to Hagenbeek (2007), both anterior and posterior cingulate cortices and the left middle frontal gyrus of the brain are responsible for word repetition. While Wise (1999**),** noted that repetition was located in the anterior insula.

To summarize, comparable scores were obtained for all the 9 subtests of MAST English and Telugu versions except for the repetition task, in which the difference in performance between the LHD and RHD was greater in the English version. Overall in both the versions the LHD performed poorer than RHD in naming, automatic speech, Following Instructions and Reading instructions. The LHD performed markedly lower than RHD on writing and verbal fluency task. Equal performances were seen for repetition, yes-no questions and object recognition.

Conclusions

The findings of this study indicate evidence of high validity and reliability of MAST Telugu version. The scores could differentiate the aphasic group from the neuro-typical group and also the LHD from the RHD group. Overall it can be concluded that as the left hemisphere is dominant for the language and cognitive functions, hence in this test the LHD group got poor scores than RHD group. The test also showed good construct and criterion validity along with good test-retest and inter-ratter reliability. However, correlation with other screening tests of aphasia and testing on larger population needs to be done. Thus, MAST-T provides an objective screening tool for assessing aphasia in Telugu language**.** It can also be used to measure the prognosis and plan therapy. It can also be useful in counseling the family members regarding the patient's language abilities and disabilities.

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