DEVELOPMENT OF BOSTON NAMING TEST IN TELUGU: PERFORMANCE OF TYPICAL INDIVIDUALS AND INDIVIDUALS WITH APHASIA

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Abstract

The Boston Naming test (BNT) (Kaplan, Goodglass, & Weintraub, 1983) is extensively used in the assessment of naming deficits in both typical and disordered population. This test has been adapted and translated into many languages and cultures across the world. The assessment of language deficits in individuals with acquired neurogenic language disorders has been very difficult due to lack of linguistically and culturally sensitive test batteries in Indian context. The present study aimed at adapting the BNT into Telugu language, widely spoken by 75 million people in southern part of India. A total of 20 items from the original 60 items on the test were retained based on ratings of speech language pathologists (SLP) and linguists and another 37 linguistically and culturally appropriate were added to make a total of 57 item test. Normative data were collected on a total of 100 typical individuals in the age ranges of 20–40 years, 40–60 years and 60+ years. A small group of individuals with aphasia (n=20) were also included to study the naming deficits in them. Initial normative data was measured across three age groups and 20 individuals with aphasia. Although results indicated a significant difference across age groups, age related decline in naming abilities was not found in the present study. The factors such as education and bilingualism and their effects on naming are discussed. This test could be a good tool to assess naming deficits in Telugu speaking individuals with language and cognitive deficits.

Key words: *Boston naming test, aphasia, Telugu, naming deficits, normative.*

Introduction

Aphasia, in general refers to the loss of language abilities following damage to brain. These impairments can be in the form of lack of fluent production, poor auditory verbal comprehension, poor repetition and/or naming skills, difficulty in reading and writing, and apraxia. These language impairments vary from person to person depending upon the site of lesion and extent of lesion. Besides these impairments, individuals with aphasia may also exhibit specific deficits in various language components such as phonological deficits, syntactic deficits, semantic/ lexical deficits, and so on.

Naming is an integral part of human language by which we represent different people, objects or events with different labels. The storage of different names associated with different objects is done through various processes with the help of memory components, which comprises the lexical system. The process of acquisition of semantics or lexical system starts from birth when the child is exposed to human language in the form of verbal and/or nonverbal modes. Naming is an automatic process which is strengthened by the exposure levels. However, these naming abilities are affected in disordered populations such as aphasia (either as a standalone deficit or as an associated deficit), dementia, and so on and also in some of the typical individuals with increase in age (Albert, Heller, & Milberg, 1988; Borod, Goodglass, & Kaplan, 1980; Nicholas, Obler, Albert, & Goodglass, 1985). Several studies on typical individuals reported that word finding problems are seen in most of the geriatric population in day to day activities of life (Lezak, 2004; Schmitter-Edgecombe, Vesneski, & Jones, 2000).

A commonly seen problem in most of the typical individuals both young and geriatric is tip-of-tongue phenomenon (Burke, MacKay, Worthley, & Wade, 1991; Cohen & Faulkner, 1986), which is considered as a normal aspect. This phenomenon is also reported to be more in older adults than that of younger adults (Burke et al., 1991; Maylor, 1990). However, in some of the geriatric people, significant increase in the amount of naming difficulties is seen as the age increases. Recent studies indicate that naming problems can be an early indication of severe degenerative diseases such as dementia, primary progressive aphasia and tumors (Calero, Arnedo, Ruiz-Pedrosa, & Carnero, 2002; Goodglass, Kaplan, & Barresi, 2001). Apart from the typical individuals, naming impairments are seen in individuals with various types of cortical and subcortical dysfunction or damage. Along with the effect of age on naming, the effect of other factors such as education (Henderson, Frank,

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Pigatt, Abramson, & Houston, 1998; Kim & Na, 1999; Tallberg, 2005), IQ (Van Gorp, Satz, Klersch, & Henry, 1986) level on naming have been widely studied.

The naming abilities are measured by tasks such as confrontation naming, generative naming, etc, in both typical individuals and in individuals with brain damage. Confrontation naming task is considered as the best task to measure word-finding abilities (Gordon, 1997; Lezak, 2004; Lopez, Arias, Hunter, Charter, & Scott, 2003). Confrontation naming is measured through picture naming of a given person, object, place or action. Boston Naming Test (BNT) (Kaplan, Goodglass, & Weintraub, 1976, 1983) is the most frequently used test for confrontation naming in typical and pathological individuals. This test consists of a set of 60 line drawings of common objects with varying difficulty range. The subject's task is to name the picture appropriately. The test also includes a feature of providing either phonemic or semantic cues to the subjects when the subjects have not named the picture correctly.

BNT has been modified by several authors as per the requirements of various target populations since its inception. The initial test battery consists of 85 line drawings and the normative data was collected by Borod et al. 1980. Kaplan et al. (1983) have introduced the present version of BNT with 60 line drawings which is most widely used now. Later on shorter editions with 30 or 15 items have been developed to aid the examination of patients with neurological disorders (Calero et al., 2002; del Toro, Bislick, Comer, Velozo, Romero, Gonzalez Rothi, & Kendall, 2011; Fastenau, Denburg, & Mauer, 1998; Fisher, Tierney, Snow, & Szalai, 1999; Graves, Bezeau, Fogarty, & Blair, 2004; Lansing, Ivnik, Cullum, & Randolph, 1999; Mack, Freed, Williams, & Henderson, 1992; Saxton, Ratcliff, Munro, Coffey, Beckers, Fried, & Kuller, 2000). Some of these short versions have been standardized on typical individuals, and/or individuals with aphasia, and/or individuals with dementia.

BNT has been recognized as a good test to tap the naming/ word finding abilities in both typical and pathological population. Hence, normative data was obtained from the other English speaking countries such as Australia (Cruice, Worrall, & Hickson, 2000), Canada (Roberts, Garcia, Desrochers, & Hernandez, 2002), and New Zealand (Barker-Collo, 2001), and the test has been developed in several languages all over the world. Currently the test is available in languages such as Korean (Kim & Na, 1999), Swedish (Tallberg, 2005), Dutch (Marien, Mampaey, Vervaet, Saerens, & DeDeyn, 1998), French (Colombo & Assal, 1992), Spanish (Allegri, Mangone, Villavicencio, Rymberg, & Baumann, 1997; Quinones-Ubeda, Pena-Casanova, Bohm, Gramunt-Fombuena, & Comas, 2004), Malaysia (Dort, Vong, Razak, Kamal, & Meng, 2007), Greek (Patricacou, Psallida, Pring, & Dipper, 2007) and Chinese (Cheung, Cheung, & Chan, 2004). Many researchers have given normative data for BNT across the globe with consideration of factors such as age, education, culture specific and so on. As the results of these studies vary from language to language and reports of cultural bias in various countries, there is a greater need to develop language and culture specific test batteries in different languages in India. Normative data needs to be measured for different languages, age groups, educations levels, and cultures within the context of India.

India has 22 constitutionally accepted languages with four languages having classical language status, while there are about 1652 languages/ dialects spoken in and around the country. The major language families in India include Indo-Aryan (74.3%), Dravidian (23.9%), Austro-Asiatic (1.2%) and Tibeto-Burman (0.6%). Telugu is one of the four major Dravidian languages and it is widely spoken by 75 million people in the states of Andhra Pradesh, Tamil Nadu and Karnataka of southern India. With an increase in the geriatric population in Indian context, there is an increase in the population with adult language disorders following neurological diseases. Hence, language and culture specific language test batteries are the need of the hour in the Indian context. The present study is aimed at developing and obtaining normative data for population of various age groups in Telugu language.

Method

Development of the test: Eight speech language pathologists and two clinical linguists who were native speakers of Telugu adjudged 20 items out of 60 items of original BNT as culturally and linguistically appropriate. These 20 items were retained for the final test in Telugu. Both speech language pathologists and linguists made a list of 80 linguistically and culturally appropriate words in Telugu language which were rated for both familiarity and ambiguity. A total 37 items were selected based on the highest ratings on both familiarity and least ambiguity. Hence, a total set of 57 items were finalized for the Boston naming test in Telugu. After finalizing the list of words, line drawings were drawn for all the items on a 4'x6' inch cards. A stimulus cue for each of the stimuli was also formulated and added to the test

material. These items were tested on 100 typical individuals and 20 individuals with aphasia.

Administration and scoring: The subjects seated in a comfortable position were shown one picture at a time and were asked to name the picture. If no response was received in the first 20 seconds, a semantic cue was given. If no response or incorrect response was elicited with semantic cue, subjects were given a phonemic cue. A score of '2' is given to all the correct items with or without semantic cue, whereas correct responses with phonemic cue received a score of '1' and incorrect responses were given a score of '0'. The total score of the subject is summed up and subjected to further statistical analysis. The test was not curtailed when the subject made seven incorrect responses in a row, unlike in original BNT.

Participants: A total of 100 neurologically healthy individuals (typical group) and 20 individuals with aphasia (clinical group) were tested. All were native speakers of Telugu language and typical individuals were divided into three age groups: 20-40, 40-60, and 60+ years. All of the participants had minimum of 10 years of education. None of the typical participants had any history of communication disorders, neurological and/or psychiatric illness. In clinical group, 20 right handed individuals who had suffered a cerebral vascular accident or stroke in left hemisphere were taken into the study after seen by a speech – language pathologist and neurologist who diagnosed the patients as having aphasia based on speech and language examination and medical records. All the individuals were administered Western Aphasia Battery – Telugu (Sripallavi & Shyamala, 2011) to diagnose them as aphasia and to identify the type of aphasia. Participants with aphasia quotient (AQ) < 93.8 and with minimum of 6 months post onset were selected for the present study. The demographic details of clinical group are given in Table 1.

Table 1: Participant demographics of clinical and typical groups.

Variable	Clinical group M (SD)	Typical group		
		20-40 yrs	40-60 yrs	60+ yrs
Mean Age	51.6 (± 9.3)	33.2 (± 4.1)	52.3 (± 3.9)	69.3 (± 2.7)
Education	14.1 (± 2.6)	16.5 (± 1.8)	15.9 (± 2.2)	15.2 (± 1.2)
Months post onset	10.2 (± 3.5)			
WAB AQ	56.7 (± 30.6)			
Aphasia type based on WAB				
Anomic	2			
Broca's	9			
Global	1			
Subcortical aphasia	2			
Transcortical motor	2			
Transcortical sensory	1			
Wernicke's	3			

Results

Performance of typical group: Data summary from the 100 Telugu speaking adults in the current study are presented in Table 2. The overall sample mean (N=100) score in Telugu was 105.33 and the standard deviation is 4.10. The mean score of Telugu young adults in the age range 20 – 40 years is 104.20 and S.D. is 3.54; mean score of typical adults in the age range 40-60 years is 107.11 and the S.D. is 4.17. The mean score of typical geriatric group with age above 60 years is 104.56 and the S.D is 4.03.

One way ANOVA was done to find out the significant differences between the three groups and the analysis revealed significant difference ($F(2, 97)=5.641$, $p<0.05$) between the three groups and on Bonferri post hoc analysis, significant difference was found between young adults and middle aged adult groups ($p<0.05$); middle aged adults and geriatrics ($p<0.05$). However, there was no significant difference ($p>0.05$) found between typical young and geriatric groups.

Table 2: Mean and S.D of the three groups on BNT.

	20-40 yrs group	40-60 yrs group	60+ yrs group	Total
N	35	35	30	100
Mean	104.20	107.11	104.56	105.33
S.D	3.54	4.17	4.03	4.10

The graphical representation of mean and S.D of all the three groups are represented in figure 1.

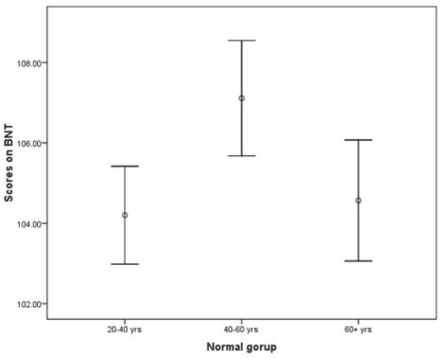

Figure 1 : Graphical representation of mean and S.D of three age groups

Performance of individuals with aphasia: Data summary from the 20 Telugu speaking individuals with aphasia in the current study are presented in Table 3. The overall sample mean (N=20) score in Telugu is 59.85 and the standard deviation is 38.19. The mean score of anomic aphasic group (n=2) is 59.00 and the S.D. is 30.71; the mean score of Broca's aphasic group is 72.11 and the S.D is 33.75; for global aphasics (n=1), the mean score is zero; for Subcortical aphasic (SCA) group (n=2), the mean score is 42.50 and the standard deviation is 36.06. For Transcortical motor aphasics (TMA), the mean score is 98.50 and the S.D is 0.70. The mean of Transcortical Sensory Aphasia (TSA) (n=1) is 63.00. The mean and S.D. of Wernicke's aphasics (WA) group (n=3) are 28.33 and 19.85 respectively.

Table 3: Mean and S.D of the aphasic groups on BNT.

Sl. No	Type of aphasia	Number of subjects (N)	Mean (M)	Standard Deviation (SD)
1	Anomic	2	59.0	30.71
2	Broca's	9	72.11	33.75
3	Global	1	0	0
4	Subcortical aphasia	2	42.5	36.06
5	Transcortical motor	2	98.5	0.70
6	Transcortical sensoy	1	63	-
7	Wernicke's aphasia	3	28.33	19.85
	Aphasia group	20	59.85	38.19

Performance of different groups on each stimulus – item analysis: Along with the normative data, item analysis in terms of percentage of correct responses was done each of the 57 items. Percentage correct per item in Telugu across three age groups is presented in Table 4.

Table 4: *Percentage correct per item in Telugu.*

Sl No	BNT item in Telugu	English word	20-40 yrs N=35	40-60 yrs N=35	60+ yrs N=30	Average N=100
1	pu:vu	Flower	100	100	100	100
2	pensilu	Pencil	100	100	100	100
3	illu	House	100	100	100	100
4	maṁtʃamu	Bed	100	100	100	100
5	pusţakamu	Book	100	100	100	100
6	kitiki	Window	100	100	100	100
7	i:la	Whistle	97	100	100	99
8	duvvɛna	Comb	100	100	100	100
9	bassu	Bus	100	100	100	100
10	bæt	Bat	100	100	100	100
11	pillana gro:vi	Flute	77	100	81	86
12	gurramu	Horse	100	100	100	100
13	vaṁka:ji	Brinjal	100	100	100	100
14	railu	Train	100	100	100	100
15	tʃevi	Ear	100	100	100	100
16	padava	Boat	100	100	100	100
17	tʃokka:	Shirt	100	100	100	100
18	kaṇṇu	Eye	100	100	100	100
19	gɑʊnu	Frock	100	100	100	100
20	tʃettu	Tree	100	100	100	100
21	kaţţera	Scissor	100	100	100	100
22	na:gata: ļi poda	Cactus	0	77	40	39
23	muggu	Rangoli	100	100	100	100
24	kaiva:ramu	Compass	40	71	100	70.3
25	go:da	Wall	100	100	100	100
26	ta:be:lu	Tortoise	100	97	100	99
27	sa:ks	Socks	100	97	100	99
28	saikilu	Bicycle	100	100	100	100
29	oṁtɛ	Camel	100	100	100	100
30	tʃakra:la kurtʃi	Wheel chair	94	94	91	93
31	tabala	Drum	94	100	100	98
32	steţasko:pu	Stethoscope	100	82	100	94
33	pa:mu	Snake	100	100	100	100
34	rampaṁ	Saw	97	100	100	99
35	khadgamRugaṁ	Rhinoceros	29	88	100	72.3
36	mosali	Crocodile	100	100	100	100
37	pu:la ma:la	Garland	100	100	100	100
38	nɛmali	Peacock	100	100	100	100
39	a:pilu	Apple	100	100	100	100
40	kaṁtʃaṁ	Plate	100	100	100	100
41	tʃi:piri	Broom stick	100	100	100	100
42	ḍra:kʃa	Grapes	100	100	100	100
43	vima:naṁ	Airplane	100	100	100	100
44	gadija:raṁ	Clock	100	97	100	99
45	ba:ṇaṁ	Arrow	100	100	100	100
46	koļa:ji/ pampu	Tap	97	100	100	99
47	ka:lu	Leg	100	100	100	100
48	kalam	Pen	100	100	100	100
49	tʃɛ:pa	Fish	100	100	100	100
50	st^{h}aṁbaṁ	Pillar	100	100	100	100
51	dī:paṁ	Lamp	100	100	100	100
52	vɛllulli	Garlic	100	97	100	99
53	bhū:gōļamu	Globe	51	48	100	66.3
54	tʃilaka	Parrot	100	100	100	100
55	sabbu	Soap	100	100	100	100
56	paļla braʃ	Brush	97	100	100	99
57	kōṇamāni	Protractor	43	40	100	61

In Telugu, all the participants of the study correctly named 40 items. Around 11 items were correctly named by 95% of the participants. Four items were correctly named only by 60-70% of the participants. 'Cactus' was named only by 39% of the participants.

Discussion

The present paper adapted the BNT to Telugu language for assessing naming deficits and presents norms for participants at different age groups and also data on performance of individuals with aphasia. Significant main effects of age were found with differences between different age groups. The results of the present study did not show the typical decline in naming with increase in age as seen in several studies (Albert et al., 1988; Borod et al., 1980; Lezak, 2004; Nicholas et al., 1985; Schmitter-Edgecombe et al., 2000). The present study only showed significant difference between young and middle aged groups as well as middle aged and geriatric groups only. The mean scores are higher in middle aged group (M = 107.11, SD = 4.17) than that of younger group (M = 104.2, SD = 3.54) and geriatric group (M = 104.56, SD = 4.03). It is likely that the factor of education played a major role in the results of present study similar to that of the study done by Van Gorp et al. 1986, while Farmer (1990) did not report age related decline in individuals with higher education levels.

The second major reason for the variations in performance in three groups is probably bilingualism. The effect of bilingualism was observed in young and middle aged groups during the testing where, many of them could name the picture in English (L2) language even though they were not able to name in Telugu language (L1). A good number of subjects have named the words *cactus, protractor,* and *rhinoceros* in English but not in Telugu which is depicted in item analysis. However, the older or geriatric group have named these words in Telugu more accurately because of the high exposure to the Telugu language than that of English language.

Indian educational system has seen recent (2–3 decades) changes where there is introduction of three language system in school education lasting for 10 years. This rule of having three languages in school education is a major factor in enhancing bilingualism and multilingualism in India. In this system, all the children have to study their native (mother tongue) language as first language, English language as second language or medium of instruction and Hindi (national language of India) as third language till 10th standard. There is a rise in the number of people studying with English as medium of instruction, in which children get more exposed to English language than that of native or third language. This exposure to English (L2) may be the possible reason for poor performance of younger group on Telugu task. As the subjects in the present study were with higher educational levels (above 15 years) only, the interaction between age and different education levels on naming could not be studied in this study.

The results of the clinical group indicate significant naming deficits in individuals with aphasia as shown in other studies (Kohn & Goodglass, 1985). Individuals with TMA performed well (M = 98.50, SD = 0.70) followed by Broca's (M = 72.11, SD = 33.75) and TSA (M = 63.00). The other groups of aphasics, anomic, Wernicke's, global and subcortical aphasics performed poorly on naming test. These results indicate that the BNT in Telugu is sensitive in tapping the naming deficits in individuals with aphasia. The error analysis of the responses revealed presence of both semantic and phonemic paraphasias. However, more studies on large group of aphasic subjects with varying severity and etiology are needed to generalize the results of the present study.

Conclusion

This study provides Boston Naming Test in Telugu language with age-wise norms, which may be useful to clinicians working with Telugu speaking individuals with neurogenic language disorders such as aphasia, dementia, PPA and so on. The study also examined the naming deficits in individuals with aphasia and found that this can be used to tap the naming difficulties in individuals with aphasia. However, as the subjects in the present study were only of higher education, further studies are required to study the effect of educational levels on naming in typical individuals and in individuals with aphasia. Also the usefulness of this BNT – Telugu on various groups of disordered population needs to be established with more studies.

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