Original Research Paper

Clinical Research

THE BOSTON DIAGNOSTIC APHASIA EXAMINATION (SHORT FORM TEST) : IN HINDI VERSION- A PILOT STUDY FOR VALIDATION TO USE IN CLINICAL POPULATION.

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ABSTRACT   The Boston Diagnostic Aphasia Examination Battery (BDAE) is one of the most widely used aphasia tests. Information about general population performance, however, is limited in Indian context due linguistic variability. This paper analyzes the effects of gender, age, socioeconomic status (SES), academic achievement, and occupation for short form BDAE on Hindi population by translating few items of subtests. The BDAE was administered to a randomized sample of 150, occupationally active 30 to 70 year old participants (70 male and 80 female) from two SES groups. Gender and age had a significant effect on some reading and writing subtests. Body-part naming and mechanics of writing scores were significantly decreased in the low SES group. Education had a significant impact over most of the BDAE subtests.. ANOVA was done for the total variance in BDAE III ® test.

Summary
 Results were significantly represented a difference in few subtests, however language has no variance on BDAE III (R).

KEYWORDS : Boston Diagnostic Aphasia Examination, Language testing

INTRODUCTION
The Boston Diagnostic Aphasia Examination (BDAE; Good-glass & Kaplan, 1972, 1983) is one of the most widely used aphasia test batteries. This battery assesses different aspects of language performance. BDAE test is studied in abnormal populations and its validity has been extensively studied in aphasic individuals (Borod et al., 1980; Goodglass & Kaplan, 1986). Recently, BDAE has been used to analyze the normal aging effect on language (Emery, 1986) and in Alzheimer's disease patients (Jacobs et al., 1995; Osterweil et al., 1994).

Few studies, however, have focused on BDAE performance in normal populations (Rosselli et al., 1996). Study by Borod et al. (1980) on normative of BDAE among English speaking populations of 25 years to 85 years with levels of education ranging from zero years to college found that age showed significant differences less frequently than education . However effect of gender, SES, or occupation was not analyzed in that study. Heaton et al. (1991) studied the effects of age, gender, and level of education for the Complex Ideational Material subtest in 186 normal individuals (included mainly males (82%) with a mean age of 57.3 (SD 5 16.1) years, and a mean level of education of 13.0 (SD 5 2.7) years) and found 0% percentage of variance accounted for age and gender and 9% for education.

The BDAE has been translated and adapted to different languages and was first translated into Spanish and published in Argentina in 1979 (Goodglass & Kaplan, 1979). Marked differences were observed with respect to age groups and educational levels. However influence of gender was minimal to one subtest.

In brief, the BDAE is a commonly used language test in many languages including English. However not very popularised tool in Hindi for clinical population. Research has shown few normative data with demographic variables. The aim of the present study was to use linguistically normalised and translated (short Form) BDAE III rd ed. in Hindi and analyze it's effects on age, education, gender, SES, and type of occupation on variability of scores .

METHODS
Research Participants
The BDAE was administered to 150, from the Age ranging from 30 to 70 year old normal (70 male, 80 female) Hindi speaking participants living in Metropolitan city of India. Participants were randomly selected from an official list of registered in the various occupational Department of Hospital administration, Teachers, Ministry and other set ups. At the time of the study all participants were healthy and had active. Persons with antecedents of any neurological or psychiatric disorders were excluded from the sample.

Table 1 shows the demographic characteristics of the sample. Three age groups (ages ±35, 36±50, and 51± 70 years) and three academic achievement groups (defined by years of education: 1±9,10 ±12, and more than 12 years of education) are shown.

Table 1. Demographic characteristics of the sample

Variable (N 5 150) Age (years)		Frequency	Percentage
1.	(>±35)	60	42.9
2.	(36±50)	33	49.4
3.	(51± 70)	42	7.7
Gender			
M		70	48.0
F		80	52.0
Academic achievement (years of education)			
1.	Basic (1±9)	25	16.0
2.	Technical (10 ±12)	72	47.4
3.	University (more than 12)	53	36.5
SES			
Low		109	69.9
High		41	30.1
Occupation			
1.	Administrator/Teachers/Doctors / Clerks	150	-

The sample was stratified into two socioeconomic status i.e. groups low and high (BPL card holders   and APL card holder)., and five occupations i.e. manual workers, technicians, office employees, and two professional groups.

Instruments and Procedures
The BDAE IIIrd Ed, short version (Goodglass & Kaplan, 1986) was adapted to the linguistic idiosyncrasies of Hindi Spoken language. Those items in which all participants performed perfectly i.e. sentence length, oral agility, and verbal agility were not included in further analyses. Testing was performed by advanced speech pathology students who received 20 hours of clinical exposure in the administration of the BDAE under supervision before starting to test the research participants. The evaluators did not know the hypothesis and purpose of the research. Each participant was individually tested in 60-min sessions.

Statistical Analyses
SPSS 8.0 software was used in order to analyse statistical measures. A multifactor analysis of variance (MANOVA). A Spearman's Rho correlation analysis for categorical and normal distributed numerical variables was done in order to define which independent variables should be included in a multiple regression analysis, and which of them

were related to the Test i.e. BDAE continuous variables. A stepwise regression analysis was developed in order to define the prediction capability of several independent categorical variables on the variance of each dependent numeric continuous variable

Table 2. Performance on different BDAE subtests in 150 normal participants

BDAE Variables	M	SD	Range
Comprehension			
Word Discrimination	70.54	2.67	56±72
Body Part Identification	18.65	2.07	15±20
Commands	14.39	1.15	7±15
Complex Material	9.05	1.66	4 ±12
Automatic Speech			
Automatized Sentences	13.68	0.86	8±14
Singing & Rhythm	1.87	0.49	0 ±2
Repetition			
Words	9.98	0.11	9±10
High Probability	7.80	0.48	5±8
Low Probability	7.82	0.41	6±8
Oral Reading			
Words	29.87	1.22	15±30
Oral Sentences	9.87	0.78	1±10
Naming			
Responsive Naming	29.32	3.64	10 ±30
Confrontation Naming	94.93	2.67	80 ±96
Body-Part Naming	27.64	2.34	21±30
Animal Naming	25.88	6.45	10 ± 45

Reading Comprehension			
Symbol Discrimination	9.71	1.21	6±10
Word Recognition	7.89	0.63	1±8
Oral Spelling	6.58	1.68	1±8
Word±Picture Matching	9.98	0.13	9±10
Sentences±Paragraphs	9.41	0.90	6±10
Writing			
Mechanics	4.94	0.42	0 ±5
Serial Writing	46.27	5.08	1±50
Primer-Level Dictation	13.66	1.57	1±14
Written Confrontation Naming	9.80	0.97	1±10
Spelling to Dictation	9.80	0.99	1±10
Sentences to Dictation	11.78	1.36	0 ±12
Narrative Writing	4.86	0.65	0 ±5

RESULTS

Table 2 presents the means, standard deviations and ranges obtained by the whole sample, and Table 3 shows the performance on the subtests by different age groups. In general, differences were small. The two groups (30 and 36±50 years) performed significantly higher in the Word Picture Matching and Serial Writing subtests than the oldest group (age 51± 70 years).

Academic achievement (years of education) had a significant effect in 10 out of the 25 analyzed BDAE subtests (Table 4). Statistically significant differences were observed in most subtests when the group with the lowest level of education (1±9 years) was compared to the other two groups (10 ±12 and more than 16 years of schooling). Groups 2 (10 ±12 years) and 3 (more than 16 years) differed significantly in Animal Naming and Oral Spelling subtests. The last age group becomes too small when divided into three education ranges.

Table 3. Performance on the BDAE by age groups

Group (N 5 156)									
	19±35 yrs		36±50 yrs		51± 60 yrs				
	n 5 67		n 5 77		n 5 12				
Variable	M	(SD)	M	(SD)	M	(SD)	F*	P	Group differ.
Comprehension									
Word Discrimination	70.7	-2.2	70.6	-2.4	68.4	-4.7	1.221	0.296	Đ
Body-Part Identification	18.7	-1.4	18.9	-1.4	18	-2.2	0.448	0.64	Đ
Commands	14.3	-1	14.4	-1.3	14.4	-0.6	0.65	0.523	Đ
Complex Material	8.9	-1.5		-1.7	8.5	-1.6	0.226	0.798	Đ
Naming									
Responsive Naming	29.3	-3.4		-2.3	29.4	-1.1	0.382	0.683	Đ
Confrontation	95.4	-1.5		-3.3	94.5	-2.7	3.201	0.044	Đ
Animal Naming	26.8	-6	26.01	-6.5	19.75	-5.5	2.232	0.111	Đ
Body-Part Naming	27.3	-2.3	27.8	-2.2	27.5	-2.6	0.522	0.594	Đ
Oral Reading									
Word Reading	29.7	-1.8	29.9	-0.1	29.7	-0.8	1.134	0.325	Đ
Oral Sentence	9.8	-1.1	9.9	-0.1	9.5	-1	0.856	0.427	Đ
Repetition									
Words	9.9	-0.1	10	0	10	0	0.767	0.466	Đ
High-Probability	7.8	-0.3	7.8	-0.4	7.4	-0.9	1.492	0.228	Đ
Low-Probability	7.8	-0.3	7.8	-0.4	7.5	-0.5	4.549	0.012	1±3 & 2±3
Reading Comprehension									
Symbol Discrimination	29.7	-1.8	29.9	-0.1	29.7	-0.8	1.456	0.237	Đ
Word Recognition	7.8	-0.8	7.9	-0.1	7.7	-0.8	1.287	0.279	Đ
Oral Spelling	6.7	-1.6	6.6	-1.4	5.3	-2.7	0.205	0.84	
Word Picture Matching	9.9	-0.1	9.4	-0.8	9.1	-1.1	3.232	0.042	1±3 & 2±3
Sentences Paragraphs	9.3	-0.9	9.4	-0.8	9.1	-1.1	0.174	0.84	Đ
Writing									
Mechanics	4.9	-0.1	4.9	-0.1	5	0	0.001	0.999	Đ
Serial Writing	46.9	-2.9	46.7	-3.2	39.4	-13.2	5.808	0.004	1±3 & 2±3
Primer-Level Dictation	13.7	-1.2	13.7	-1.1	12.9	-3.4	0.526	0.592	Đ
Written Confrontation	9.8	-0.9	9.8	-0.3	9.3	-2.3	0.198	0.821	Đ
Spelling to Dictation	9.8	-0.8	9.8	-0.4	9	-2.3	0.844	0.432	Đ
Sentences to Dictation	11.8	-1.3	11.9	-0.4	8.9	-2.9	1.437	0.241	Đ
Narrative Writing	4.8	-0.3	4.9	-0.4	4.6	-0.8	0.827	0.439	Đ

Table 4. Performance on the BDAE by academic achievement

Group (N 5 156)									
	Basic		Middle		High				
	n 5 17		n 5 82		n 5 57				
Variable	M	(SD)	M	(SD)	M	(SD)	F*	P	Group differ.
Comprehension									
Word Discrimination	67.8	-4.4	70.6	-2.4	71.2	-1.6	2.476	0.088	-

Body-Part Identification	17.3	-1.9	18.8	-1.2	19.2	-1.4	1.3	0.276	-
Commands	13.7	-1.3	14.4	-1.2	14.4	-0.8	2.515	0.084	-
Complex Material	7.8	-1.8	9	-1.5	9.4	-1.5	1.155	0.318	-
Naming									
Responsive Naming	28.4	-4.8	29.6	-2.2	29.5	-2.6	1.742	0.179	-
Confrontation	92.5	-4.4	95	-2.4	95.5	-1.8	2.913	0.057	-
Animal Naming	19.4	-5.6	25.1	-5.9	28.9	-5.6	9.822	0	1±2, 1±3 & 2±3
Oral Reading									
Body-Part Naming	26.4	-2	27.4	-2.4	28.2	-2	1.397	0.251	-
Word Reading	28.8	-3.6	29.9	-0.1	30	0	4.388	0.014	1±2 & 1±3
Oral Sentence	9.1	-2.2	9.9	-0.1	9.9	-0.1	4.852	0.009	1±2 & 1±3
Repetition									
Words	10	0	9.9	-0.1	10	0	1.124	0.328	-
High Probability	7.2	-0.8	7.8	-0.4	7.9	-0.2	2.459	0.089	-
Low Probability	7.6	-0.4	7.8	-0.4	7.8	-0.3	0.367	0.693	-
Reading Comprehension									
Symbol Discrimination	8.2	-3	9.8	-0.5	9.9	-0.2	10.407	0	1±2 & 1±3
Word Recognition	7.7	-0.7	7.8	-0.7	7.9	-0.2	0.517	0.598	-
Oral Spelling	4.2	-2.3	6.5	-1.4	7.2	-1	8.484	0	1±2, 1±3 & 2±3
Word±Picture Matching	9.8	-0.3	10	0	10	0	5.031	0	1±2 & 1±3
Sentences Paragraphs	8.6	-1.3	9.3	-0.9	9.7	-0.4	2.371	0.097	-
Writing									
Mechanic	5	0	4.9	-0.1	4.9	-0.2	1.735	0.18	-
Serial Writing	38.5	-11.9	47.1	-2.1	47.2	-1.5	9.996	0	1±2 & 1±3
Primer-Level Dictation	12.8	-2.9	13.7	-1.1	13.7	-1.3	0.938	0.394	-
Written Confrontation	8.8	-2.6	9.9	-0.2	9.9	-0.4	5.763	0.004	1±2 & 1±3
Spelling to Dictation	8.7	-2.5	9.9	-0.2	9.9	-0.2	5.356	0.006	1±2 & 1±3
Sentences to Dictation	10.4	-3.5	11.9	-0.1	11.9	-0.4	4.743	0.01	1±2 & 1±3
Narrative Writing	4.6	-0.8	4.9	-0.1	4.8	-0.5	2.012	0.137	-

Gender differences did not show any significant differences between any of the BDAE variables. Few significant interactions between demographic variables were observed. Gender and level of occupation significantly interacted in the Word Reading sub tests (F 5 3.92, p 5.006), better scores were observed in female participants with higher occupational levels. A significant interaction between Gender 3 Age was observed on High (F 5 3.41, p 5.03) and Low Probability Repetition subtests (F 5 4.66, p 5.01). In Older group Male participants scored lower than Female participants.

Only one statistically significant SES difference was found i.e in Body Part Naming scores were superior in the high SES participants. Raw scores across the different occupational groups were rather similar however highest score differences across groups were found in Serial Writing and Animal Naming subtests. When comparing the occupational groups, how-ever, no statistically significant differences were observed.

On Spearman's Rho correlation coefficient, a low but significantly negative correlation seen between gender, academic achievement, and occupational level. Female participants in our sample had a mild tendency to have lower education and hold lower-level jobs. Academic achievement was moderately but significantly correlated with the participants' SES (r 5.39) and occupational level ® 5.44).

On Confrontation Naming and Reading Comprehension of sentences and paragraphs result showed a significant but low correlation with gender. A modest negative, but significant correlation with age was seen on Word Discrimination, Animal Naming, High Probability Repetition, Low Probability Repetition, and Serial Writing (p,.05). In general it was found that the younger the participants; the better their performance. Fifteen of the BDAE variables presented positive and significant correlations with education and 16 subtest scores significantly correlated with occupation model, using an F test to assess statistical significance (p,.05), and adjusted R^2 for predicting each BDAE continuous numeric variable, was performed. It was found that aca-demic achievement was a significant predictor (p,.01), accounting for a small portion (,15%) of the variance in the scores of Word Discrimination, Complex Material, Oral Reading, Symbol Discrimination, Word Picture Matching, Sentence and Paragraphs Reading, Written Confrontation, Spelling to Dictation, and Sentences to Dictation . Academic achievement represented moderate significant (.17%) capability of predicting the variance in Oral Spelling. Occupation had a low but significant predictive power (,15%) on Confrontation Naming scores. Age and education were found to predict 21% of the variance in Animal Naming scores, and 18% of the variance in Serial Writing. In this study age and occupation were significant predictors of the variance in Low Probability Repetition. SES also had low but significant predictive power on the variance of Commands Comprehension and Body-Part Naming. fluency factor and is integrated by Animal Naming.

DISCUSSION
The results of this study demonstrate that there is high variability in few subtests of the BDAE among normal participants. The subtest score ranges were rather wide. Some participants scored more than 3 standard deviations below the mean on few items.

The heterogeneity of the BDAE scores was determined by the participants' level of education and to a lesser degree to age. Gender did not have any significant effect. However, gender interacted with age and education; although, the direction of the interaction was determined by education (the highest level, the highest scores) and age (the old-est group, the lowest scores) in both genders. Socioeconomic status and type of occupation did not have an important effect over the BDAE subtests, but they significantly correlated with education level. SES differences may be significant just as a result of the correlation between SES and education. The most important educational differences were observed between the lowest-educated group (1±9 years of education, M 6.4 6 2.4) and the other two groups (10 ±15, and more than 16).

.According to our data, BDAE heterogeneity was caused by education. When age groups were compared, significant differences were observed between the oldest and the youngest groups on only three variables. Most reading subtests and writing sub-tests were significantly influenced by the participant's level of education; however the level of education did not significantly influence language comprehension. Word generation turned out to be one of the most sensitive subtests to level of education. Age, on the other hand, had a significant effect on just a few of the BDAE subtests. Albert and Heaton (1988) suggested that, when education is controlled, no significant changes on verbal intelligence would be observed among elderly populations.

SES had a minimal effect over the BDAE subtests, only in Body Part Naming high SES individuals outscore low SES participants.

In conclusion the results from this study support the significant influence of demographic variables, particularly education, on the BDAE. Even simple language abilities such as repetition may be significantly affected by education. The external validity of a neuropsychological test increases when variables such as education are considered in the normalization process.

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