Test-Retest Reliability of Mtdda: Indian Adapted

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Abstract- **This study was designed to assess the test-retest reliability of the adapted and standardized short version of Minnesota test for the differential diagnosis of aphasia (MTDDA) for Indian population. MTDDA was administered on 21 brain-damaged subjects and 11 normal subjects in the age group 30-55 years. The results show acceptable score stability for the overall test as well as its five subtests**

I.   INTRODUCTION

The applications of diagnostic tests developed in other countries create difficulties in the interpretation of the results due to cultural, demographic and linguistic differences, especially in the countries with great contrasts like India. Thus, many Indian researchers and health professionals working in speech and languages have adopted, translated and standardized the tests developed in foreign languages in order to make them suitable for application on Indian population. Clinical and experimental decisions in India regarding the brain-damaged individuals come from the descriptions of mainly two tests namely Minnesota test for differential diagnosis (MTDDA) [1] and Western aphasia test battery (WAB) [2]. It is important to note that the variations in the scores assigned under either of these tests in successive trials are assumed to be true variations   and that there are no variations due to unpredictable session's instability (also referred as temporal in-stability) if the clinical decisions are to be based on the devi-ations of these scores. In such a situation, test- retest reliabil-ity measure can be viewed as an ability of the test to yield stable results from one set of measurements to another. Variations in the scores that arise from the temporal instability reduce the predictive value of the test from one administration to the other and thus, it should be the endeavor of the clinician to control all factors responsible for such instabil-ity. Nunnally [3] suggested that a reliability (Karl Pearson's Correlation coefficient) of .800 is adequate in research areas where major concern is the degree of relationship between the scores in successive trials under a specific test rather than the crucial decisions based on the specific test scores. Kertesz [2] and his associates report the reliability and validity characteristics for WAB. Past studies advocate the stability of

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MTDDA because of its high test – reteseliability and that the parts (subtests) of this test contribute to the total score with minimum variability due to temporal factors. These facts motivate us to study the reliability characteristics of the Indian standardized version of Schuell's test (MTDDA), proposed by Nehra on Indian population. The lay out of the present study is as follows:In Section 2, we present material. Section three deals with the procedure of the Indian version of the test. In Section 4, data and statistical methodology are discussed. The results, discussion and conclusion are presented in Sections 5, 6 and 7 respectively.

II.   MATERIAL

The study was carried out in the Speech and Hearing Unit of the Department of Otolaryngology (in the sequel referred to as our department) at Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh. In all 32 adults, comprising of two groups, were included in the study. One group consisted of 21 brain-damaged adults in the age range 30-55 years with the mean age 48 years. All these patients were referred to our Department by the Department of Neurology (PGIMER) for speech intervention .The other group consisted of 11 normal subjects with the same age range. In the brain-damaged group, 14 subjects were native speakers of Punjabi while seven were native Hindi speakers. The information regarding their Education levels (the number of years of formal education) revealed that seven patients had less than 12 years of education, four had 12 years of education and 10 patients had completed 16 or more years of education. In this group of 21 patients, 11 were evaluated after four months of onset of brain injury, two were evaluated after five months and eight subjects were evaluated after six months. The etiolo-gies of aphasia in 10 cases were cerebro vascular accident, 2 tumors, 2 traumas and 6 hemorrhages and 1 aneurysm. The normal (control) group included 11 subjects of 25-45 years of age with the mean age 40 years. Of these 11, 9 had completed 16 years of education while two had 12 years of education. They were all native Hindi speakers. Normal subjects were non-institutionalized adults with no history of any neurological, speech, language or psychiatric impairment.

III.   PROCEDURE

A brief account of the adopted and standardized version of MTDDA (HINDI) is presented here to acquaint the readers with its construction. It includes the assessment of functioning of five areas namely auditory disturbances, speech and language disturbances, disturbances of numer-ical relations and arithmetic processes, vasomotor and writing disturbances, and Visual and reading disturbances.

The test uses the clinical and the neuro-linguistic principle of aphasia. For many of its subtests, objective plus minus scores are used while for others qualitative performance is considered and partial scores are assigned according to a scoring criteria. This adopted and standardized version of MTDDA (HINDI) can easily be administered to the subjects and is designed for best clinical and research purposes on Indian population.

Table 1: Mean scores and correlation coefficient value for Test- retest reliability in study and control group

Subtests	Trial 1	Tril 2	Pearson correlation Coefficient(r)
Brain damaged group	130.4	128.5	0.977936*
Normal group	2.545455	2.727273	0.969996*

Comprehensive case history was taken for all the individuals followed by administration of the MTDDA. The patients in the brain-damaged group were included only after they were judged by their clinicians to be stable, i.e., after the recovery phase since acute aphasic subjects in the recovery phase from cerebral insult can and do change with in two - three weeks' time. Test was conducted twice (labeled as trial 1 and trial 2) with an interval of 1-3 weeks under identical conditions. It was conducted on all the individuals of brain-damaged group as well as on the individuals of control group to assess the five areas of functioning, using five subtests scores of MTDDA Karl Pearson's correlation coefficients. The relevant average scores were computed for both the groups (brain- damaged and control) in the following situations: (i) between the pairs of average scores of five subtests of trial 1 and trial 2 of all the individuals in both the groups (Table 2); (ii) between the pairs of scores of trial 1 and trial 2 of all the individuals of both the groups separately for all the subtests (Tables 3 and 4); (iii) between the pairs of scores of trial 1 and trial 2 for the five subtests with respect to each individual of both the groups (Table 5).

Table 2: Mean scores and correlation coefficient value (r) for the subtests in the brain damaged group.

Subtests	Trial 1	Tril 2	ABSOLUTE DIFFERANCE	Pearson correlation Coefficient(r)
Auditory disturbance	11.7	12.65	0.95	0.930283*
Speech and language disturbances	52.6	51.90	0.70	0.980468*
Disturbances of numerical relations and arithmetic processes	11.4	11.45	0.05	0.825916*
Visuomotor and writing disturbances	26.85	26.2	0.65	0.944404*
Visual and reading disturbances	20.25	19.85	0.40	0.940402*

Table 3: Mean scores and correlation coefficient value (r) for the subtests in the normal group.

Subtests	Trial 2	Trial 1	ABSOLUTE DIFFERANCE	Pearson correlation Coefficient(r)
Auditory disturbance	0.18	0.27	0.09	0.88*
Speech and language disturbances	0.32	0.27	0.05	0.83*
Disturbances of numerical relations and arithmetic processes	0.55	0.55	0	1*
Visuomotor and writing disturbances	0.73	0.64	0.09	0.82*
Visual and reading disturbances	0.45	0.82	0.37	0.93*

IV.   DATA AND STATISTICAL METHODOLOGY

Data consist of scores assigned to all the individuals of both groups under MTDDA test with respect to five areas of functioning (scores of five subtests) in both the trials. To explain methodology we use the following variables:

X_{ij} (y_{ij}) = first (second) trial score under the ith subtest of jth brain- damaged individual, i = 1, ..., 5; j = 1,...,21

$u_{ij}(v_{ij})$ = first (second) trial score under the ith subtest of jth individual of normal group, i = 1, ..., 5; j = 1,...,11.

$$X_j^-(y_j^-) = \frac{1}{5}\sum_{i=1}^{5} x_{ij} \left(\frac{1}{5}\sum_{i=1}^{5} y_{ij}\right) \text{ and } u_j^-(v_j^-) = \frac{1}{5}\sum_{i=1}^{5} u_{ij} \left(\frac{1}{5}\sum_{i=1}^{5} v_{ij}\right).$$

Table 4 depicts the Karl Pearson's correlation coefficients between the pairs (i) (x_{1j}, y_{1j}), (x_{5j}, y_{5j}) associated with the five subtests scores of jth individual in the brain damaged group, j = 1, ..., 21 and (ii) (u_{1j}, v_{1j}), ..., (u_{5j}, v_{5j}) associated with the five subtests scores of jth individual in the normal (control) group, j = 1, ..., 11. Table 2 shows Karl Pearson's correlation coefficients between the pairs: (i) (x_j^-, y_j^-), j = 1, 21 for the brain damaged group and their respective averages and (ii) (u_j^-, v_j^-) , j = 1,..., 11 for the normal group and their respective averages. Table 3 shows the correlation coefficients between the pairs (x_{i1}, y_{i1}), $(x_{i,21}, y_{i,21})$ under subtest i , i= 1,..., 5. This table also includes the average score of all the 21 individuals of brain-damaged group under each subtest in both the trials. Table 4 has been produced analogous to Table 3 for the normal group.

Table 4: Pearson's Correlation coefficient(r) of individual subjects of the study and control group.

Subjects	Brain damaged group	Normal group
1	0.953024*	0.87451*
2	**0.645961**	0.887379*
3	0.962568*	0.870572*
4	**0.690849**	0.819665*
5	0.973822*	0.972568*
6	0.923972*	0.817492*
7	0.861744*	0.872883*
8	0.845759*	0.88365*
9	0.834633*	0.987356*
10	**0.726658**	0.858159*
11	0.817492*	0.960061*
12	0.972883*	
13	0.988365*	
14	0.937356*	
15	0.898159*	
16	**0.796138**	
17	0.954777*	
18	0.980061*	
19	0.96441*	
20	0.950516*	

V.   RESULTS

The mean scores obtained by the brain damaged subjects and normal adults in both trials under all the subtests and Karl Pearson's correlation coefficient between the averages of five subtests scores of both the trials are given in Table 2. These correlation values are above 0.800 and significant even at 0.001level. Also the absolute difference between the average scores in both trials is small. These results indicate that the adopted and standardized version of MTDDA (HINDI) is highly stable over the time. Tables 3 and 4 depict the Pearson's correlation coefficients of the 5 subtests of this modified MTDDA in the brain- damaged and normal groups respectively. These tables also include the average score of all the individuals in each subtest under both the trials, along with absolute change. All correlations in Tables 3 and 4 were above .800 and the absolute differences in the average scores in these tables are very small. These results also validate the stability of this version of MDTTA over time with respect to each subtest. Although the correlation coefficient in the Tables 2, 3 and 4 suggest strong relationship between the two trials but they do not indicate how accurately one could predict test retest reliability of individual subjects. Therefore, to account for this information, we calculated Pearson's coefficient for each subject individually, using five pairs of scores of two trials associated with five subtests. These are presented in Table 5. It is noteworthy that the distributions of the scores were exceptionally similar for both the trials except for three patients who had reliability coefficient around .7 which is highly significant, but slightly (approximately .1) less than the well celebrated value .800 mentioned by Nunnally [3].

VI.   DISCUSSION

Any reference work on psychometric test construction emphasizes that a test, to be a useful research and clinical tool, must meet acceptable standards of reliability. .Variability in test scores can arise from several sources, including chance errors, differences among subjects tested, differences among judges scoring the test, defects inherent in the test itself and differences from one administration to the other. The later three scores are to be minimized in highly reliable instrument [4]. Not all these issues of the test stability have been investigated in Indian standardized short version of MTDDA and to the best of our knowledge, no investigation has been carried out to assess its test - retest reliability among the brain-damaged individuals in Indian population. The test -retest reliability reported by Schuell, *et. al.* involved retesting upon termination of treatment with the retest interval ranging from 1-3 months but the purpose was to measure the recovery and not to examine the test-retest stability of the measurement devise [7] .

VII.   CONCLUSION

The present study concluded that adapted and standardized version of MTDDA for Indian population offers both sensitivity and reliability necessary for the test. It may have some limitations but clinically, it is a useful instrument with test- retest reliability that compares favorably with the other commonly used instruments.

VIII.   REFERENCES

1) Schuell, Minnesota Test for Differential Diagnosis, Minneapolis: University of Minnesota Press, 1972.
2) Kertesz, A., The Western Aphasia Battery, .New York, Grune And Stratton,1982
3) Nunnally, J.C., Psychometric Theory (2nd Ed.).New York,: McGraw – Hill, (1978).
4) Cynthia M .Shewan And Andrew Kertesz .The rRliability and Validity Characteristics of the Western Aphasia Test Battery (WAB), Journal Of Speech And Hearing Disorders , XLV, Aug 1980: 308-324
5) Sjewan C   .The Shewan Spontaneous Language Analysis System for Aphasic Adults :description reliability and validity, Journal of Communication Disorders, 1988:21, 103 -138
6) Darley F L and Moll KL. Reliability of Language Measures and Mize of Language Sample, Journal of Speech and Hearing Disorders. (1960) three, 166-173.
7) SCHUELL, 1964.
8) Matarazzo, J.D., Herman, D.O.: Base Rate Data for Wais Test- Retest Stability and VIQ-OIQ Dfferences .in Neurophysical,.1984, 6:351-35