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PERFORMANCE ON LURIA-NEBRASKA NEUROPSYCHOLOGICAL BATTERY IN SCHHIZOPHRENIC PATIENTS*

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The Luria Nebraska Neuropsychological Battery (LNNB) was administered on a group of 40 schizophrenic patients, 30 brain damaged subjects and 30 normal controls. The data were analysed using SPSS software. Discriminant function analysis results suggested overall hit rate of 77%. On MANOVA all the clinical scales of the LNNB were found to discriminate significantly amongst the groups. The schizophrenic patients performed better than brain-damaged but had poor performance in comparison to normal controls. The findings indicated high discriminative accuracy and clinical effectiveness of the LNNB in Indian population.

Attempts to outline neuropsychological aspects of specific psychiatric disorders have grown geometrically since mid 1970's (Dean, 1985; Levin *et al.*, 1989). Neuropsychological test have been found to have several advantages over neurological instruments. First these have a wider sensitivity to broader range of problems than individual neurological tests (Filskov & Goldstein, 1974), including sensitivity to problems at the biochemical level. Secondly, they have been found to correlate with neurological tests results and thirdly, the tests have the advantage of being less expensive and non-invasive.

The majority of earlier neurological investigations of schizophrenia were concerned with differentiating schizophrenic and brain damaged neurological patients based on the assumption that schizophrenia is a functional disorder (Heaton *et al.*, 1978; Malec, 1978; Chelune *et al.*, 1979) However most of these studies were limited by the methodological considerations. Firslty, the assumption that schizophrenics should always differ from neurological pateints was not found to be very substantial, given the hypothesis of underlying brain pathology in subgroups of schizophrenic (Johnstone *et al.*, 1976; Andreason *et al.*, 1986; Weinberger *et al.*, 1986). Secondly most of the studies used single tests of brain damage or a combination of them having a dichotomous binary approach, with an example on classifying patients into those in the brain damage and the ones without. Thus, these studies contributed very little in understanding the brain behaviour mechanism of the schizophrenic patients. However, despite the limitations, it was possible to draw some general conclusions from these studies. For example, schizophrenics can usually be differentiated from neurological patients with documented brain damage in that the later have significantly low performance scores, (Abrams *et al* ., 1981). Few of these studies, however included normal conrol groups or non-schizophrenic psychiatric groups, thus it was unclear whether schizophrenics are more impaired than either of these control groups.

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In recent years, Luria-Nebraska Neuropsychological Battery (LNNB) has been one of the most widely reported standardized comprehensive tool in research on neuropsychological functioning of schizophrenic patients. A number of studies have been reported functioning of schiziphrenic patients. A number of studies have been reported showing its efficacy in differentiating schizophrenics from organics (Purisch *et al.*, 1978; Moses & Golden, 1980; Moses *et al* ., 1983), from normal controls (Hammeke *et al* ., 1978; Kemali *et al* ., 1985) and in differentiating between schizophrenic groups (Golden *et al* ., 1982). LNNB has been reported to classify schizophrenic patients with different levels of cognitive performance (Moses, 1983; Nizamie *et al* ., 1992).

There has been very little contribution in the field of neuropsychology fron India. Siddiqui & Pershad (1989)reviewed Indian literature on psychometric assessment of cognitive deficits from 1977 to 1988. There were 75 studies during this period,however, most of them were on brain damaged patients. In 13 studies only schizophrenic population was studied. Most of these studies used single tests of brain-damage (Mishra *et al* ., 1983; Sen Mazumdar & Mazumdar, 1983). A comprehensive evaluation of neuropsychological functioning in schizophrenia is not yet reported from India. This was more so, because till recently, a comprehensive battery was not available. Pershad & Verma (1989) have published PGI Battery of Brain Dysfunction (PGI-BBD), however, being a recent arrival, findings on it in psychiatric population are yet to be reported.

Luria's approach for eliciting cognitive deficits have been used in clinical practice on Indian population. Sharma *et al.* (1981) first reported the clinical usefullness of Luria Neuropsychological Investigation (LNI) (Christensen, 1975a; b) on a group of brain damaged patients. Nizamie (1983) used LNI on a group of brain damaged patinets. Nizamie (1983) used LNI on a group of brain-damaged patients. Nizamie (1983) used LNI on a group of leucotomized and non-lucotomized schizophrenic patients. A number of studies since have been carried out (Nizamie *et al* ., 1988; Panda, 1988; Sasi, 1989; Srivastava, 1989; James, 1990; Khanna *et al* ., 1991; James *et al* ., 1991) using the original version of LNNB (Golden *et al*., 1985). The findings of these studies were encouraging. They reported the efficacy and utility of LNNB in assessing the general and specific cognitive deficit among various clinical populations.

In the present study performance on LNNB of the schizophrenic patients was compared with the performance of a group of brain damaged and non-patient, normal controls. It was attempted to find out the discriminative accuracy and clinical effectiveness of LNNB in these groups.

MATERIAL AND METHOD

SAMPLE

A total of 100 right-handed male subjects were taken for the study. The sample com-

prised of 40 schizophrenic patients, 30 patients with organic mental disorders, and neurological diseases and 30 non-patients, normal controls. The patients were taken from the inpatients and outpatients of the Central Institute of Psychiatry (CIP), Ranchi. The normal control subjects were randomly selected from the staff of CIP and other memebers of the community meeting the selection criteria. Schizophrenic pateints fulfilling DSM III criteria (1980) were taken for the study. Patients having history of neurological disorders, alcoholism, drug abuse, epilepsy, mental retardation, and electro-convulsive therapy (ECT) within 6 months prior to the testing were excluded. Co-operative patients below the age of 55 and with no significant side-effects of drugs were chosen. The brain-damaged patients had organic mental disorder (DSM III) or neurological disease. The clinical diagnosis was made by a consultant psychiatrist based on clinical history, clinical examination and relevant investigations. Patients with paralysis of the extremities, poor vision and aphasia were excluded from the study. Non-patient normal controls comprised subjects having no history of major psychiatric disturbance, mental retardation, organic mental disorder, alcoholism, drug abuse, head injury or any significant physical illness. The three groups under study were matched for the age. However, they were not strictly comparable on educational level (as assessed by years of schooling) (Table 1).

PROCEDURE

All the subjects selected were interviwed individually. The LNNB (Golden *et al* ., 1985) was administered individually to all the patients using the standardized administration procedure. Among the schizophrenics and organic subjects it was administered only after the patients were settled and cooperative, Since Hindi, was the mother tongue of the most of the subjects, instructions were given in the same language without changing the intent of the items. In the patient groups the battery was administered usually in the 3-4 sessions spread over two days in order to minimize the effect of fatigue and inattentiveness. For the normal controls a single session sufficed. In the present study 10 clinical scales of the LNNB were taken into consideration. Items of the clinical scales were scored based on the criteria given in the manual. The critical level was determined using the standard formula. In few cases, educational level was adjusted depending on the clinical judgement. In general, two scaled score above the critical level (Golden *et al* ., 1981) was used to discriminate brain damaged patients from normals. The data were analyzed using Statistical Package for Social Sciences (SPSS) software.

RESULTS

The results show that the three groups differed from each other on all the scales of the LNNB with mean level of performance as the dependent measure. The brain-damaged subjects performed worst in comparison to schizophrenic or normal control subjects. The schizophrenic (Group 1) performed better than the brain-damaged patients (Group 2), but had poorer performance in comparison to normal control (Group 3). All the LNNB variables were found to dis-

Table-1 : Age and Education variables means, standard deviation for three groups.

	Schizophrenia (N=40)		Brain-damaged (N=30)		Non-patient Normal control (N=30)		P
	Mean	SD	Mean	SD	Mean	SD	
Age	32.2	(8.59)	30.2	(12.6)	32.3	(11.05)	NS
Education	15.53	(2.76)	10.4	(4.15)	12.03	(4.38)	p<.01

Table-2 : T. score means, standard deviations, ratios and significance levels for three groups on the clinical scales of the LNNB.

LNNB Scale/Group	N	Mean	S.D.	F	P
Motor (C1)					
Group 1	40	44.25	8.87		
Group 2	30	53.03	17.26		
Group 3	30	33.4	2.9		
Overall	100	43.63	13.39	23.58	.000
Tactile (C3)					
Group 1	40	44.25	6.84		
Group 2	30	47.93	9.96		
Group 3	30	37.97	3.76		
Overall	100	43.47	8.19	14.53	.000
Visual (C4)					
Group 1	40	58.9	10.62		
Group 2	30	57.57	10.7		
Group 3	30	46.67	7.91		
Overall	100	54.83	11.20	14.69	.000
Receptive speech (C5)					
Group 1	40	44.53	9.25		
Group 2	30	54.40	16.91		
Group 3	30	37.1	7.78		
Overall	100	45.26	13.45	16.4	.000
Expressive speech (C6)					
Group 1	40	43.05	7.14		
Group 2	30	52.40	14.28		
Group 3	30	36.03	5.17		
Overall	100	43.75	11.34	22.64	.000

Contd.....

Table-2 : (Contd.)

LNNB Scale/Group	N	Mean	S.D.	F	P
Writing (C7)					
Group 1	40	47.28	8.05		
Group 2	30	52.8	8.83		
Group 3	30	42.8	6.29		
Overall	100	47.59	8.67	12.31	.000
Reading (C8)					
Group 1	40	43.63	6.02		
Group 2	30	51.2	9.56		
Group 3	30	41.43	5.51		
Overall	100	45.24	8.14	15.73	.000
Arithmetic (C9)					
Group 1	40	45.4	7.52		
Group 2	30	60.63	20.49		
Group 3	30	42.7	4.58		
Overall	100	49.16	14.48	18.65	.000
Memory (C10)					
Group 1	40	52.65	10.74		
Group 2	30	60.93	15.64		
Group 3	30	36.73	8.49		
Overall	100	50.36	15.18	32.39	.000
Intellectual (C11)					
Group 1	40	52.3	9.62		
Group 2	30	63.43	14.75		
Group 3	30	44.17	8.42		
Overall	100	53.2	13.33	22.76	.000

criminate significantly amongst the groups (Table 2) (Fig. 1).

MANCOVA was done to partial out the effect of age and education variables on the performance of the LNNB. Results on MANCOVA suggested significant difference on all the clinical scales of the LNNB amongst the groups suggesting no significant impact of these variables on the LNNB performance.

Discriminant function analysis using SPSS module was carried out to determine whether the three groups could be distinguished on the basis of their cognitive test result. The result of discriminat function analysis suggested that the LNNB could discriminate correctly 82.5% of the schizophrenic patients from brain-damaged and normal control group, 66.7% of brain-damaged patients and 80% of normal controls. Percentage of overall correct classifica-

Table-3 : Classification of cases on the basis of discriminant function analysis

Actual group	No. of cases	Predicted group membership 1	2	3
Group 1 (Schizophrenia)	40	33 (82.5%)	2 (5%)	5 (12.5%)
Group 2 (Brain-damaged)	30	8 (26.7%)	20 (66.7%)	2 (6.7%)
Group 3 (Non-patient Normal control)	30	5 (16.7%)	1 (3.3%)	24 (80.0%)

Percent of "Grouped" cases correctly classified - 77%.

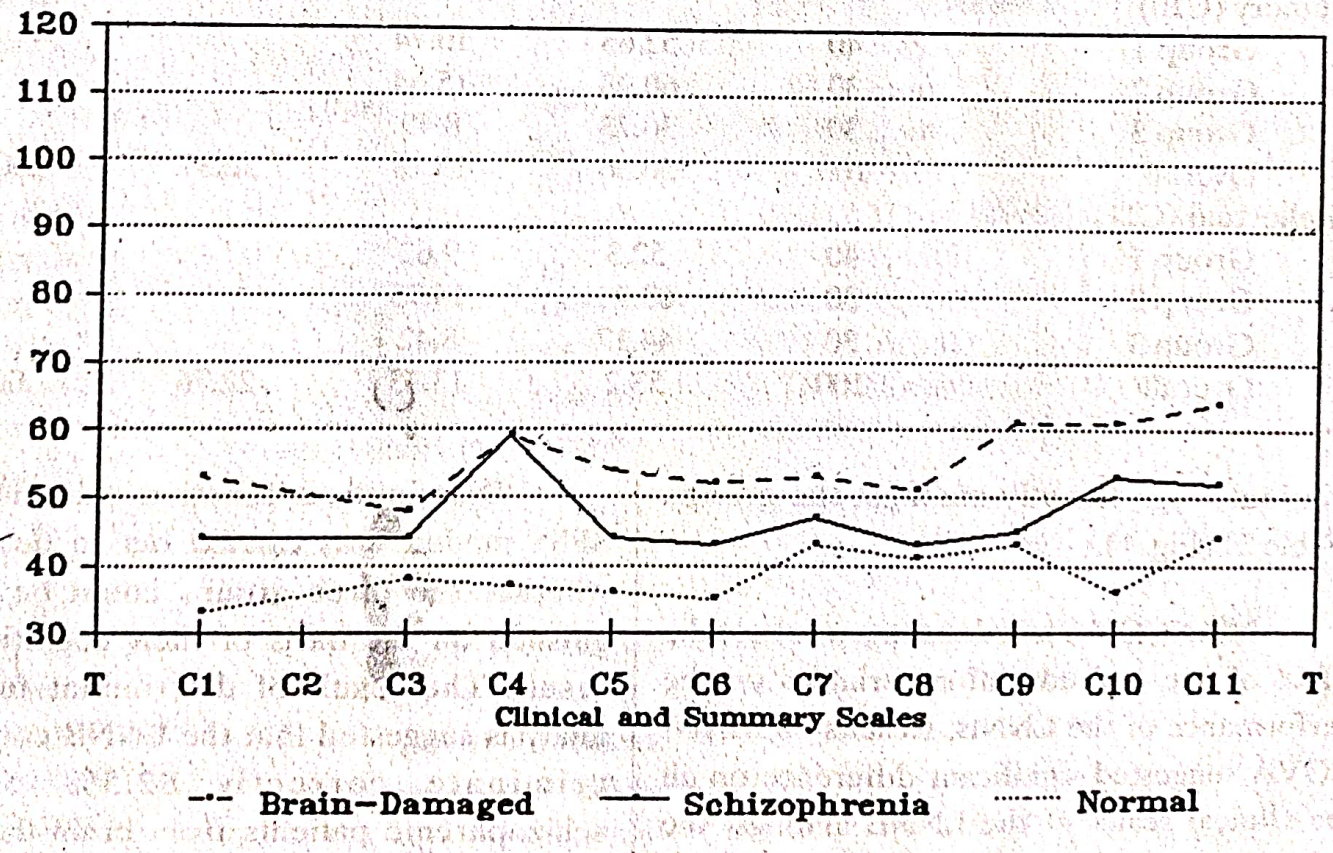

Figure – 1

tion is 77% (Table 3). Thus77% of the cases could be correctly classified on the basis of their pattern of cognitive test scores.

The three groups were compared with each other on each LNNB scales by means of 't' test of significance, to find out the differential pattern of each of the clinical scales between group comparisons by 't' test yielded significant differences for allthe clinical scales except Tactile and Visual Scales (schizophrenic vs brain-damaged) and Reading Scale (schizophrenics normal).

Table-4 : 't' test value for three group mean contrasts

LNNB Scale	Group contrast 1 vs 2a	2 vs 3b	1 vs 3a
Motor	2.54*	6.07**	4.84**
Tactile	1.74 NS	5.13**	4.91**
Visual	.52 NS	4.49**	5.53**
Receptive speech	2.89**	5.09**	3.64**
Expressive speech	3.29**	5.91**	4.78**
Writing	2.69**	5.05**	2.62**
Reading	3.8**	4.86**	1.59 NS
Arithmetic	3.88**	4.68**	2.27*
Memory	2.49**	7.45**	6.92**
Interrectual Processes	3.6*	6.22**	3.76**

a. df 68 (1 vs 2 and 1 vs 3)

b. df (2 vs 3)

* p. < 05

** p. < 01

NS not significant

DISCUSSION

All the LNNB clinical variables were found to discriminate significantly amongst the group as was evident from MANOVA and MANCOVA analysis. The LNNB performance pattern discriminated schizophrenics from both normal and brain-damaged groups (Fig. 1.) There are earlier reports of performance by schizophrenic patients on LNNB (Golden *et al* ., 1982; Moses & Golden, 1979; 1980). It is important to note, that this intermediate level of performance confounds interpretation when the choice is between classifying schizophrenic as normal or brain-damaged. Golden *et al*. (1982) cautioned against interpreting difference in the performance on LNNB between brain-damaged and schizophrenic patients as normal performance.

On discriminat function analysis (Table 3) LNNB was found to have an overall hit rate of 77% in a group of schizophrenic, brain-damaged and normal control. Sawicki & Golden (1984) reported similar findings in a group of large, heterogenous sample of 1,037 normal, psychiatric and brain- damages subjects. Donias *et al* . (1989), Yun *et al* . (1987), and James *et al* . (1991) used LNNB in a culturally divergent population. Donias *et al* . (1989) from Greece reported a hit rate of 87% for the controls and 78% for the brain-damaged subjects. Yun *et al* . (1987) reported 86-98% hit rate in the normal group and 60-88% in the brain-damaged group from China, while James *et al* . (1991) reported 86-66% for brain-damaged and 100% hit rate for normal controls. In the present study 82.5% of schizophrenics in comparison to 66.7% of brain-damaged group and

80% of normal controls were classified correctly. Comparatively, low hit rates in brain-damaged and normal controls may be attributed to the difference in the selection of the samples. Most often, the patients in the brain-damaged groups in other studies were those suffering from cerebral trauma or cerebral vascular disorder, enhancing the chance of significant cognitive impairment, whereas, in the present most of the cases were suffering from epilepsy or had viral encephalitis in the past. The average age of the patient too was low in comparison to the other studies. Similarly, no attempt, was made to exclude those normal controls who performed poorly due to emotional problem. Test behaviour record of 6 subjects in the normal control group suggested that they had marked test anxiety, were nervous and hesitant,resulting in poor performance on the LNNB. Differences in the selection of the samples, both the diagnostic makeup and patients clinical status have frequently been found to be an important variable in influencing the findings across the studies (Shelly & Goldstein, 1983).

Among schizophrenic patients 82.5% were classified correctly on discriminant analysis, however, 12.5% were found to perform similar to that of normal controls (Table 3). Strauss & Silverstein (1986) reported that a subgroup of schizophrenics performed similar to normal controls on neuropsychological evaluation. Five percent of schizophrenic patients were found to be in the brain-damaged group (Table 3).It is well known that a subgroup of schizophrenic patients may have clear signs of organic deficits on various neuro diagnostic tests (Kemali *et al* ., 1985; Kelip *et al* ., 1986; Roberts, 1990). Thus, it is possible that these 5% of cases in the present series had underlying brain pathology, however, this needs to be validated against external criteria such as MRI, CT scan etc.

Among the brain-damaged subjects 26.7% were classified under schizophrenic group. This high percentage of brain-damaged patients in schizophrenic groups is not very surprising considering that a significant number of these patients also had psychiatric complaints, mostly of psychotic nature. Thus, the findings clearly reflect differential sensitivity of LNNB to pick up psychiatric disturbances in a group of brain-damaged subjects.

In summary, inspite of some similarity in performance with both the groups (brain damaged and normal control)schizophreni patients seem to have distinctive profile patte on LNNB, which clearly differentiates it fro other groups. Results of this study thus co firmed the discriminative and clinical utilit LNNB in a mixed group of normal, bra damaged and schizophrenic population. Th our findings support our earlier observatic (James et al ., 1991) and suggest that the LNN may be used as an effective transcultural instru ment for neuropsychological assessment.

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