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DISCRIMINATION OF SCHIZOPHRENICS WITH AND WITHOUT NERVOUS SYSTEM DAMAGE USING THE LURIA–NEBRASKA NEUROPSYCHOLOGICAL BATTERY

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The Luria-Nebraska Neuropsychological Battery was administered to 40 inpatient schizophrenics (17 non-brain-damaged and 23 brain-damaged) at a state hospital. Results indicated that 109 individual items as well as all 14 summary scales were significantly different between groups. Findings were reviewed with regard to clinical effectiveness of brain damage detection with the Luria–Nebraska in these populations and to supporting the concept of neuropsychological deficit gradients.

The comparison of organic to nonorganic populations has been the traditional method for assessing the effectiveness of a neuropsychological test (Lezak, 1976). Unfortunately, relatively few studies have used specific subpopulations for comparison to elucidate the range of such effectiveness (Malec, 1978).

Studies which do compare such populations not only tend to illustrate the range of effectiveness but also suggest that neuropsychological deficits are observed on a gradient ranging from normal to schizophrenic to brain damage: low to high, respectively. For example, Purisch, Golden, & Hammeke (1978) found that schizophrenics performed better than brain-damaged individuals on the Luria–Nebraska Neuropsychological Battery.

These findings, as with related studies, should be considered preliminary, due to numerous limitations. Specifically, Adams (1980) has suggested that these results could be confounded with one or more of the following variables; rater training, inter-rater reliability, reliability across clinical settings, significantly different subject populations and related hospitalization factors, nonspecific diagnosis and inappropriate statistical techniques. Even with these strong criticisms, the cost-effectiveness and preliminary reported efficacy of the Luria–Nebraska Neuropsychological Battery (Golden, Hammeke, & Purisch, 1979) still warrants further study of its efficacy in discriminating specific subpopulations and in examining the hypothesized brain damage gradient.

METHOD

Subjects

Two groups of inpatients (i.e., nonbrain-damaged and brain-damaged) schizophrenics from Northeast Florida State Hospital's Unit II volunteered for the study. Participants read, comprehended, and signed informed consent forms as well as met Shearn and Whitaker's (1969) and DSM-III's (American Psychiatric Association, 1980) criteria

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TABLE 1

Diagnostic classification for nonbrain-damaged and brain-damaged schizophrenics

Schizophrenic with	SCUT		Paranoid		Schizo-affectives		Catatonic		Simple	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cerebral trauma	4	17.4			1	4.3				
Metabolic/toxic	3	13.0	2	8.7						
CVA	2	8.7								
Epilepsy	4	17.4								
Degenerative	3	13.0								
Infectious	4	17.4								
Total	20	86.9	2	8.7	1	4.3				
Non damaged schizophrenic	7	41.2	5	29.4	3	17.6	1	5.9	1	5.9

TABLE 2

Means, standard deviations, and univariate *t*-tests for comparison of the brain-damaged and nonbrain-damaged schizophrenics on relevant demographic variables

Variable	Group	*n*	Mean	S.D.	*t*	*p*
Age	Brain-damaged	23	43.8	18.1	0.83	0.409
	Nonbrain-damaged	17	39.4	13.6		
Education (No. of grades)	Brain-damaged	18	8.7	3.4	3.36	0.002
	Nonbrain-damaged	15	12.1	2.1		
Length of curr. in hospital (days)	Brain-damaged	23	706.7	891.0	0.01	0.996
	Nonbrain-damaged	17	705.1	1160.1		
Chronicity (months)	Brain-damaged	23	119.8	156.3	0.63	0.535
	Nonbrain-damaged	17	155.2	200.9		
Number of previous hospital.	Brain-damaged	20	4.1	4.7	0.14	0.887
	Nonbrain-damaged	15	3.9	4.9		
Age of onset	Brain-damaged	22	27.7	23.8	0.34	0.735
	Nonbrain-damaged	17	29.9	15.0		

Note: Subjects were excluded from analysis if no data were available on a particular variable.

for the selection of schizophrenic subjects. A clinical psychologist and a psychiatrist jointly determined diagnosis. Table 1 provides subdiagnosis of the group members while Table 2 provides demographic variables. No differences between groups were observed for any demographic variable, excluding education. The damaged group contained 13 males and 10 females while the nondamaged sample had 9 males and 8 females.

Confirmed neurological diagnosis was ascertained using medical examinations by physicians and/or tests such as CAT scans and EEGs. All participants in this group exhibited abnormal behavior after brain damage. No individual was included in the nondamaged group if any evidence of neural damage was detected by either the psychologist or physician using interviews, histories, examinations, and/or tests.

Procedure

The 269 items of the Luria–Nebraska Neuropsychological Battery (Golden, Purisch, & Hammeke, 1979) were individually administered between 8:30 a.m. and 4:30 p.m. in an isolated lobby of the individual's respective ward. The test administrator was trained in neuropsychology, in general, and the Luria–Nebraska, in particular. Since the inpatients were not referred for evaluations, the test administrator was blind to patient diagnosis and history.

TABLE 3

Raw and *t*-score means, standard deviations and univariate *t*-tests for comparison of the brain-damaged ($n = 23$) and nonbrain-damaged ($n = 17$) schizophrenics on the 14 summary scales of the Luria–Nebraska neuropsychological battery

Scale	Group	T-score mean	Raw score		*t*	*p*
			Mean	S.D.		
Motor	Brain-damaged	68.2	35.2	18.5	4.21	0.000
	Nonbrain-damaged	42.7	12.7	13.8		
Rhythm	Brain-damaged	43.4	13.4	7.3	3.20	0.003
	Nonbrain-damaged	35.9	6.9	5.0		
Tactile	Brain-damaged	64.0	15.5	9.7	4.32	0.000
	Nonbrain-damaged	43.2	4.6	4.1		
Visual	Brain-damaged	65.6	15.2	4.7	6.17	0.000
	Nonbrain-damaged	44.5	6.5	4.0		
Expressive speech	Brain-damaged	64.8	25.4	18.0	3.50	0.001
	Nonbrain-damaged	41.4	9.2	7.4		
Receptive speech	Brain-damaged	92.3	44.3	20.0	2.86	0.007
	Nonbrain-damaged	88.0	29.0	10.6		
Writing	Brain-damaged	69.6	13.6	8.8	4.27	0.000
	Nonbrain-damaged	48.4	4.2	2.9		
Reading	Brain-damaged	62.6	10.2	9.8	3.21	0.003
	Nonbrain-damaged	42.9	2.3	2.9		
Arithmetic skills	Brain-damaged	100.2	23.4	12.3	4.55	0.000
	Nonbrain-damaged	60.6	8.2	7.1		
Memory	Brain-damaged	72.3	17.1	7.3	3.12	0.003
	Nonbrain-damaged	55.9	10.3	6.3		
Intellectual process	Brain-damaged	74.5	38.5	13.9	3.24	0.002
	Nonbrain-damaged	55.8	23.8	14.6		
Pathognomic	Brain-damaged	61.9	23,9	10.5	4.72	0.000
	Nonbrain-damaged	40.2	10.2	6.6		
Left hemisphere	Brain-damaged	63.6	13.3	8.6	3.80	0.001
	Nonbrain-damaged	43.5	4.5	4.7		
Right hemisphere	Brain-damaged	66.5	14.5	9.0	4.30	0.000
	Nonbrain-damaged	42.6	4.3	4.4		

Additionally, time and order of testing were randomized. Data were transcribed to graphic cards by a technician unaware of the purpose of the study.

RESULTS

As can be seen in Table 2, no statistically significant differences were found between the damaged and nondamaged samples in terms of five demographic indices. The nondamaged group was found to have completed significantly ($p<0.002$) more grades of education, on the average, than the damaged group. In addition, no significant difference (Chi-square $=0.051, p = 0.822$) was observed in the distribution of males and females within the damaged (male = 13, female = 10) and nondamaged (male = 9, female = 8) groups.

Preliminary to multivariate analyses, a comparison was made between response distributions of the two samples of the individual items of the

battery. The nondamaged sample exhibited significantly ($p<0.05$) better performance on 106 items. Additionally, the two groups were compared on the 14 summary scales using multivariate analyses of variance. The nondamaged group performed significantly (minimum of 0.007) better than the damaged group on each of the 14 scales (see Table 3).

DISCUSSION

These results suggest that the Luria–Nebraska Neuropsychological Battery can significantly differentiate schizophrenics with or without brain damage. Furthermore, the notion of a deficit gradient appears to be supported with the constraint of the battery and population.

The present study supports the findings of Purisch *et al.* (1978) in that the Luria–Nebraska Neuropsychological Battery can accurately discriminate patients with and without brain damage. The current study extends those findings to more specific populations. It is interesting to note that both studies used at least one similar population (i.e., nondamaged schizophrenics) but that the results for these populations were considerably different. For example, the means for the scales in the previous study were consistently higher for the nondamaged subjects than those observed in the present study.

The discrepancy was probably a function of different subject selection and testing procedures. In both studies similar screening methods were used. However, in the Purisch *et al.* (1978) investigation, not all patients were residents of the same facility nor were they tested by the same experimenter (Golden, Note 1). In the present study, all subjects were from the same facility and were tested by the same experimenter. Furthermore, discrepancies on educational attainment, length of hospitalization, chronicity, and age of onset were indeed different between studies. Also, patients from the present study were not referred for consultation so that the test administrator was blind as to the diagnosis and history. It is worthwhile noting, nevertheless, that the present study employed fewer subjects and theoretically less divergent populations but that the results appear to be considerably more robust than the Purisch *et al.* (1978) investigation.

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Reference Note

1. Golden, C. J. Personal communication, November 7, 1979.