



U/PERS 68 ASSESSMENT OF BRAIN DAMAGE IN SADF PERSONNEL AND THEIR  
DEPENDANTS.

I. INTERIM NORMS FOR THE REITAN-INDIANA AND HALSTEAD  
NEUROPSYCHOLOGICAL TEST BATTERIES FOR AGES  
5 TO 14 YEARS.



Submitted to  
CHIEF OF THE SADF

NATIONAL INSTITUTE FOR PERSONNEL RESEARCH  
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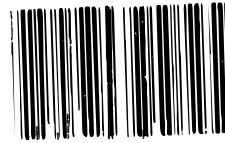
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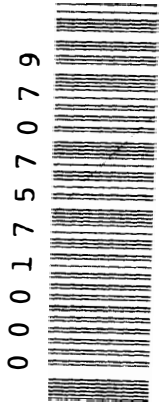
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## SUMMARY

The relevant literature was surveyed, and scores obtained on the subtests of the Reitan-Indiana Neuropsychological Test Battery (RINTB) by normal children aged 5 to 8 years, and the Halstead Neuropsychological Test Battery (HNTB) by children between the ages of 9 and 14 years, were abstracted. These are given in standardized format. Recalculated norms for various age levels and age groupings, based on the above data, are also provided. Descriptions of tests used in the RINTB and HNTB appear in the appendix.

It is strongly recommended that data obtained by MMI during the application of these tests to SADF personnel be made available to NIPR for research purposes.

## OPSOMMING

Relevante literatuur is nagegaan, en tellings behaal op die subtoetse van die Reitan-Indiana Neuropsigologiese Toetsbattery (RINTB) deur normale kinders van 5 tot 8 jaar, en die Halstead Neuropsigologiese Toetsbattery (HNTB) deur kinders tussen die ouderdomme van 9 en 14 jaar, is uitgetrek. Dit word in standaard-vorm aangegee. Herberekende norms vir verskillende ouderdomsvlakke en ouderdomsgroeperings, gebaseer op bogenoemde data, word ook aangegee. Beskrywings van toetse van die RINTB en HNTB verskyn in die byvoegsel.

Daar word sterk aanbeveel dat gegewens, wat deur MMI tydens die toepassing van hierdie toetse op SAW-personeel verkry is, vir navorsingsdoeleindes aan NIPN beskikbaar gestel word.

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## INTRODUCTION

The incidence of cognitive and non-cognitive behavioural disturbances associated with head injury and other sources of possible brain damage among SADF personnel and their dependants has necessitated the use of additional tests to supplement the diagnostic information provided by the electroencephalogram (EEG) (Murdoch and Nelson, 1975)<sup>1)</sup> and neurological examination. The tests in question have been applied for some time by MMI to SADF personnel and by NIPR to clinical and medico-legal cases, but both institutes have been well aware of the hazards of using such procedures originally developed in other countries, without normative information relating to Republic of South Africa populations.

The number of cases tested by these two organizations (NIPR : 44, MMI : 180) is as yet too small to allow the determination of norms for RSA. The situation was even worse because of the absence of an integrated record of overseas findings.

The aim of this report is to make available a scoring manual based on overseas data to serve as an interim aid for the assessment of degree of brain damage in clinical cases aged 5 to 14 years. This has been based on a review of the literature (Knights and Tymchuk, 1968<sup>2)</sup>, Spreen and Gaddes, 1969<sup>3)</sup>, Reitan, 1971a<sup>4)</sup>, 1971b<sup>5)</sup>, 1971c<sup>6)</sup>, Boll, 1974<sup>7)</sup> and Klonoff and Low, 1974<sup>8)</sup>), and gives the results obtained by previous investigators using the RINTB and HNTB on normal groups of children in standardized format according to the scoring instructions accepted by Reitan (Reitan, no date<sup>9)</sup>, Anon., 1968<sup>10)</sup>), and a recalculation of norms for various age levels and age groupings.

It must be emphasized that the normative treatment used (provision and calculation only of mean and standard deviation) is rudimentary, but that the nature of the normative data supplied in many published instances is inadequate for any more sophisticated statistical approach. The data should, however, serve to emphasize the deficiencies in function of any individual brain-damaged case and provide a point of departure for the inexperienced interpreter of the mass of information resulting from application of the RINTB and HNTB. Nothing more is hoped for, or implied, in the preparation of this report, nor should it be taken as a denigration of the intra-individual approach.

## METHOD

Relevant sources of normative data for the RINTB and HNTB were obtained over a period of about 4 years (1971 to 1975). In some instances, these sources were out of print and difficult to obtain. It is hoped that most of the references giving normative data are quoted in this report. In certain cases, units of scoring differed from those suggested by Reitan (Reitan, no date<sup>11</sup>), Anon., 1968<sup>12</sup>), and in these instances data were reworked and scores provided in standardised format. Some references report values (for example, upper and lower extremes, medians) which were not utilised in the present write-up, as no significant body of data was available for comparative purposes. In other instances, data were incomplete (for example, the size of the sample from which the results were obtained, or the standard deviation, were not given), or appeared inconsistent with those obtained by other investigators. The results of these investigations are not reported. Although the RINTB was developed for use with children aged 5 to 8 years, the results of the application of some of the subtests of this battery to children younger than 5 years are given for the sake of completeness.

In most cases scores were derived using the apparatus, instructions and scoring methods accepted by Reitan (Reitan, no date<sup>13</sup>), Anon., 1968<sup>14</sup>) (See Appendix). Exceptions to this rule are specifically mentioned.

## SUBJECTS

1. Age : It must be emphasised that the ages of subjects in different investigations are by no means consistently presented, nor in some cases defined with any precision. Thus, the ages given in this report should be regarded only as approximations.
2. Race : In no instance is specific mention made of the race of subjects. It is probably safe to assume, from the sources used, that the majority of subjects were White, with perhaps a few Black subjects.
3. Sex : The norms given are for males and females combined. In only a very few instances were results for boys and girls reported separately, and in these cases results were recalculated on the combined group to ensure a reasonably populous norm group.
4. Normality : The results presented here are for so-called "normal" groups, often control groups whose results were compared with those obtained by children with brain damage. In most cases, normality of subjects was described by terms such as 'with no

history of school failure', 'neither past nor present evidence of cerebral damage or disease', etc. In a few cases, criteria of normality were rigidly defined and strictly applied. In others, criteria of normality were not specified. Thus, the normality of the groups whose results are presented in this report should by no means be regarded as rigidly established or homogenous.

5. Source : In most cases the source was not mentioned. In some, subjects were obtained from schools, in at least one other, they were volunteers responding to a request sent to parents for normal subjects to participate in a psychological testing programme. Again, an homogenous population in terms of source, is not suggested.
6. Other descriptors : Most articles quoting normative data are Canadian or American, and the majority of subjects, therefore, will have these nationalities. The socio-economic status of subjects is largely undescribed, but probably in the majority of cases middle class or upper-middle class. In one case, however, subjects appeared to be drawn from a lower socio-economic class.

It must be emphasised that the normative data in this report, deriving from a White, probably middle or upper-middle class White Canadian or American population, should be applied with caution to South African population groups. Differences in test performance attributable to cultural differences are not excluded.

## RESULTS

Norms for the RINTB are given between pages 5 and 12, those for the HNTB between pages 14 and 19.

NORMS FOR REITAN-INDIANA NEUROPSYCHOLOGICAL  
TEST BATTERY FOR CHILDREN (5 to 8 years)

The order of presentation of norms follows the description of subtests 1 - 10 given in Reitan (no date)<sup>15)</sup>, pp. 19-25. The lateral dominance examination (subtest 11) is described in the revised manual of administration (Anon., 1968)<sup>16)</sup>, p. 5. It does not form part of the standard RINTB test array.

The following will be used throughout the report :

Numbers were assigned to references according to their alphabetic sequence given at the end of the report.

<sup>++</sup> Indicates that norms have been calculated by combining results obtained from the references cited. This applies to subtests 1 - 11 of the RINTB and subtests 1 - 10 of the HNTB.

Abbreviations :

H	Hand
kg	kilograms
min	minutes
N	number of subjects in sample
s	seconds
SD	standard deviation
yrs	years

	Ref. No.	Age (yrs)	N	Mean	SD
<b>1. <u>CATEGORY TEST</u></b>					
1.1 Total errors on 80 items	3	2-3	39	47,0	10,5
	3	4	52	41,2	8,4
	++ 3,4	5	73	31,5	7,5
	++ 3,4	6	66	24,3	11,0
	++ 3,4	7	86	19,3	10,3
	++ 3,4,6,9	8	151	13,3	7,3
	++ 3,4,9	2-8	467	24,7	14,4
	++ 3,4	2-5	164	38,3	10,7
	++ 3,4,9	5-8	376	20,1	11,2
	++ 3,6,9	6-8	303	17,4	10,1
<b>2. <u>TACTUAL PERFORMANCE TEST</u></b>					
2.1 Time (in min)					
2.1.1 Total					
	3	5	63	18,29	5,62
	3	6	54	15,84	8,69
	3	7	60	11,93	4,14
	++ 3,9	8	78	9,63	3,83
	++ 3,9	5-8	255	13,63	6,65
2.1.2 Dominant H					
	3	5	63	7,10	3,86
	3	6	54	6,33	3,83
	3	7	60	5,39	2,87
Dominant H + Right H <sup>(1)</sup>					
	++ 3,9	8	77	4,43	2,00
	++ 3,9	5-8	254	5,72	3,32
2.1.3 Non-dominant H					
	3	5	63	5,84	4,20
	3	6	54	5,71	3,56
	3	7	60	4,10	2,14
Non-dominant H + Left H <sup>(2)</sup>					
	++ 3,9	8	77	3,35	1,80
	++ 3,9	5-8	254	4,65	3,21
2.1.4 Both H					
	3	5	63	5,37	4,33
	3	6	54	3,82	2,56
	3	7	60	2,44	1,42
	++ 3,9	8	78	1,88	1,10
	++ 3,9	5-8	255	3,28	2,96

	Ref. No.	Age (yrs)	N	Mean	SD
2.2 Memory correct	3	5	63	0,9	0,8
	3	6	54	2,9	1,9
	3	7	60	3,3	1,6
	++ 3,9	8	77	3,9	1,3
	++ 3,9	5-8	254	2,8	1,9
2.3 Location correct	3	5	63	0,2	0,4
	3	6	54	1,3	1,5
	3	7	60	1,8	1,8
	++ 3,9	8	77	2,6	1,7
	++ 3,9	5-8	254	1,5	1,7
<p>(1) The results for the dominant hand and right hand are combined. These are not necessarily equivalent.</p> <p>(2) The results for the non-dominant hand and left hand are combined. These are not necessarily equivalent.</p>					
<p>3. <u>FINGER TAPPING TEST</u></p> <p><u>Electric tapper</u></p> <p>3.1 Mean tapping rate for 5 10-s trials</p> <p>3.1.1 Dominant H</p>					
	3	2-3	39	22,28	5,36
	3	4	52	23,23	3,48
	3	5	63	26,98	5,14
	++ 3,9(3)	6	65	28,62	3,60
	++ 3,9	7	110	31,52	4,77
	++ 3,9	8	126	35,75	5,66
	++ 3,9	2-8	455	29,91	6,73
	++ 3(4)	2-5	154	24,52	5,15
	++ 3,7,9	5-8	393	31,93	6,01

	Ref. No.	Age (yrs)	N	Mean	SD
3.1.2 Non-dominant H	3	2-3	39	20,15	4,01
	3	4	52	21,79	4,18
	3	5	63	23,99	4,18
	++3,9	6	65	25,85	3,11
	++3,9	7	110	28,21	3,99
	++3,9	8	126	31,31	5,27
	++3,9	2-8	455	26,72	5,72
	++3	2-5	154	22,27	4,42
	++3,7,9	5-8	393	28,36	5,18

(3) These authors did not follow the instructions for administration advised by Reitan (no date)<sup>17)</sup>.

(4) These results do not agree with those reported by these authors for the age range 2-5 years, and are based on a recalculation of individual data for the ages 2-3, 4 and 5 years given by them.

4. <u>MARCHING TEST</u>					
4.1 Time (in s)					
4.1.1 Dominant H					
	3	2-3	39	87,0	43,0
	3	4	52	45,5	14,4
	3	5	63	35,4	13,9
	3	6	54	24,9	6,9
	3	7	60	27,5	14,7
	3	8	65	21,6	9,8
	++3	2-8	333	37,2	27,2
	++3(4)	2-5	154	51,9	32,5
	++3	5-8	242	27,4	12,9
4.1.2 Non-dominant H					
	3	2-3	37	101,4	60,0
	3	4	52	56,0	21,7
	3	5	63	40,6	12,1
	3	6	54	30,4	9,3
	3	7	60	30,4	10,2
	3	8	65	24,5	8,5
	++3	2-8	331	43,2	32,9
	++3(4)	2-5	152	60,7	40,9
	++3	5-8	242	31,5	11,8

	Ref. No.	Age (yrs)	N	Mean	SD
4.2 Errors					
4.2.1 Dominant H	3	2-3	39	5,2	3,6
	3	4	52	2,0	2,1
	3	5	63	0,8	1,0
	3	6	54	0,7	1,0
	3	7	60	0,5	0,8
	3	8	65	0,4	0,7
	++3	2-8	333	1,4	2,3
	++3(4)	2-5	154	2,3	2,9
	++3	5-8	242	0,6	0,9
4.2.2 Non-dominant H	3	2-3	39	5,6	3,9
	3	4	52	2,6	2,1
	3	5	63	1,5	1,6
	3	6	54	1,0	1,0
	3	7	60	1,0	1,1
	3	8	65	1,1	1,2
	++3	2-8	333	1,9	2,4
	++3(4)	2-5	154	2,9	3,0
	++3	5-8	242	1,2	1,3
(4) See previous footnote.					
5. <u>COLOUR FORM TEST</u>					
5.1 Time to complete task (in s)	3	4	52	121,0	63,1
	3	5	63	55,8	21,6
	3	6	54	35,9	17,1
	3	7	60	28,9	12,8
	3	8	65	22,2	7,8
	++3	4-8	294	50,8	45,8
	++3	5-8	242	35,7	20,2
5.2 Errors	3	4	52	4,4	2,3
	3	5	63	2,2	1,6
	3	6	54	0,6	1,0
	3	7	60	0,4	0,7
	3	8	65	0,3	0,6
	++3	4-8	294	1,5	2,0
	++3	5-8	242	0,9	1,3



	Ref. No.	Age (yrs)	N	Mean	SD
<b>6. <u>PROGRESSIVE FIGURES TEST</u></b>					
6.1 Time to complete task (in s)	3	5	63	113,7	38,6
	3	6	54	79,5	43,9
	3	7	60	66,4	39,7
	3	8	65	44,0	18,9
	++3	5-8	242	75,6	44,4
<b>7. <u>MATCHING PICTURES TEST</u></b>					
No suitable norms available					
<b>8. <u>TARGET TEST</u></b>					
8.1 Number of items correctly drawn	3	4	52	2,2	2,3
	3	5	63	6,8	3,7
	3	6	54	10,4	4,5
	3	7	60	12,6	3,3
	3	8	65	14,8	2,8
	++3	4-8	294	9,6	5,6
	++3	5-8	242	11,2	4,7
<b>9. <u>INDIVIDUAL PERFORMANCE TESTS</u></b>					
9.1 Matching V's					
9.1.1 Time to complete task (in s)	3	2-3	39	66,8	26,4
	3	4	52	55,9	19,0
	3	5	63	65,8	28,0
	3	6	54	41,6	12,3
	3	7	60	40,5	13,8
	3	8	65	35,7	14,3
	++3	2-8	333	50,0	23,2
	++3(4)	2-5	154	62,7	25,4
	++3	5-8	242	46,0	22,0

	Ref. No.	Age (yrs)	N	Mean	SD
9.1.2 Errors	3	2-3	39	6,2	2,3
	3	4	52	5,7	2,0
	3	5	63	3,8	2,5
	3	6	54	2,1	2,1
	3	7	60	1,4	1,9
	3	8	65	0,9	1,2
	++ <sub>3</sub>	2-8	333	3,1	2,8
	++ <sub>3</sub> (4)	2-5	154	5,0	2,5
++ <sub>3</sub>	5-8	242	2,0	2,3	
9.2 Star					
9.2.1 Time to complete task (in s)					
No norms available					
9.2.2 Errors					
No suitable norms available					
9.3 Matching figures					
9.3.1 Time to complete task (in s)	3	2-3	39	75,6	38,6
	3	4	52	63,1	24,9
	3	5	63	55,1	26,1
	3	6	54	31,4	9,6
	3	7	60	30,7	15,9
	3	8	65	23,0	8,1
	++ <sub>3</sub>	2-8	333	44,3	28,5
	++ <sub>3</sub> (4)	2-5	154	63,0	30,5
++ <sub>3</sub>	5-8	242	35,2	20,7	
9.3.2 Errors	3	2-3	39	3,8	2,7
	3	4	52	2,0	2,0
	3	5	63	0,9	1,1
	3	6	54	0,7	1,1
	3	7	60	0,4	1,2
	3	8	65	0,2	0,5
	++ <sub>3</sub>	2-8	333	1,2	1,9
	++ <sub>3</sub> (4)	2-5	154	2,0	2,2
++ <sub>3</sub>	5-8	242	0,5	1,0	

	Ref. No.	Age (yrs)	N	Mean	SD
9.4 Concentric squares 9.4.1 Time to complete task (in s) No norms available 9.4.2 Errors No suitable norms available (4) See previous footnote.					
<u>10. APHASIC AND PERCEPTUAL DISORDERS</u>					
10.1 Aphasia No norms available 10.2 Imperception 10.2.1 Tactile No norms available 10.2.2 Auditory No norms available 10.2.3 Visual No norms available 10.3 Tactile finger localization (Tactile finger recognition) 10.3.1 Errors Preferred H Non-preferred H 10.4 Finger-tip symbol writing 10.4.1 Errors Preferred H Non-preferred H					
	7	5-8	29	1,7	1,6
	7	5-8	29	1,6	1,8
	7	5-8	29	1,0	1,3
	7	5-8	29	0,9	1,3

	Ref. No.	Age (yrs)	N	Mean	SD
10.5 Tactile form recognition					
10.5.1 Time (in s)					
Preferred H	7	5-8	29	8,4	20,4
Non-preferred H	7	5-8	29	1,8	10,8
11 <u>LATERAL DOMINANCE EXAMINATION</u>					
11.1 Time to write name (in s)					
11.1.1 Right H	9	6	11	24,6	6,0
	9	7	48	25,1	12,2
	9	8	41	20,2	8,6
	<sup>++</sup> 9	6-8	100	23,0	10,6
11.1.2 Left H	9	6	11	50,6	19,3
	9	7	48	38,3	16,5
	9	8	41	35,0	16,0
	<sup>++</sup> 9	6-8	100	38,3	17,3
11.1.3 Preferred H	7	5-8	21	19,5	11,1
11.1.4 Non-preferred H	7	5-8	21	36,6	19,8
11.2 Grip strength (in kg)					
11.2.1 Right H	9	6	16	8,8	1,6
	9	7	60	10,3	2,2
	9	8	31	12,1	2,6
	<sup>++</sup> 9	6-8	107	10,6	2,5
11.2.2 Left H	9	6	16	7,9	1,8
	9	7	60	9,5	2,0
	9	8	31	11,3	2,6
	<sup>++</sup> 9	6-8	107	9,78	2,43
11.2.3 Preferred H	7	5-8	29	9,45	1,95
11.2.4 Non-preferred H	7	5-8	29	8,86	2,20

NORMS FOR HALSTEAD NEUROPSYCHOLOGICAL  
TEST BATTERY FOR CHILDREN (9 to 14 years)

The order of presentation of norms follows the descriptions of subtests 1 - 8 given in Reitan, (no date)<sup>18)</sup>, pp. 8-18.

The lateral dominance examination, subtest 9, is described in the revised manual of administration (Anon., 1968)<sup>19)</sup>, p. 5.

Abbreviations given on p.4 are applicable to the HNTB also.

	Ref. No.	Age (yrs)	N	Mean	SD
<b>1. <u>CATEGORY TEST</u></b>					
1.1 Total errors on 168 items	++ 3,4,9	9	125	54,0	17,8
	++ 3,4,9	10	187	47,6	18,9
	++ 3,4,9	11	162	41,3	16,9
	++ 3,4,9	12	191	35,9	16,6
	++ 3,4,9	13	85	36,1	17,8
	++ 4,9	14	49	31,8	11,6
	++ 3,4,9	14-15	81	30,4	12,5
	++ 3,4,9	9-14	799	42,4	18,6
	++ 3,4,9	9-15	831	41,8	18,7
<b>2. <u>TACTUAL PERFORMANCE TEST</u></b>					
2.1 Time to place blocks (in min)					
2.1.1 Total	++ 3,9	9	92	8,93	4,43
	++ 3,9	10	91	7,66	3,48
	++ 3,9	11	96	6,36	2,34
	++ 3,9	12	104	6,15	2,79
	++ 3,9	13	32	4,96	1,54
	3	14-15	32	4,33	1,07
	++ 3,9	9-13	415	7,05	3,45
	++ 3,9	9-15	447	6,86	3,41
2.1.2 Right H + Dominant H <sup>(1)</sup>	++ 3,9	9	92	4,36	2,44
	++ 3,9	10	91	3,66	1,86
	++ 3,9	11	96	3,13	1,47
	++ 3,9	12	104	3,20	1,68
	++ 3,9	13	31	2,44	0,83
	3	14-15	32	2,31	0,72
	++ 3,9	9-13	414	3,49	1,91
	++ 3,9	9-15	446	3,40	1,88

	Ref. No.	Age (yrs)	N	Mean	SD	
2.1.3 Left H + Non-dominant H <sup>(2)</sup>	++ 3,9	9	92	3,18	1,97	
	++ 3,9	10	91	2,73	1,59	
	++ 3,9	11	96	2,15	0,90	
	++ 3,9	12	104	2,21	1,47	
	++ 3,9	13	31	1,61	0,70	
	3	14-15	32	1,30	0,61	
	++ 3,9	9-13	414	2,48	1,52	
	++ 3,9	9-15	446	2,40	1,53	
	2.1.4 Both H	++ 3,9	9	92	1,41	0,77
		++ 3,9	10	91	1,27	0,68
++ 3,9		11	96	1,13	0,61	
++ 3,9		12	104	1,05	0,56	
++ 3,9		13	32	0,83	0,38	
3		14-15	32	0,71	0,28	
3,9		9-13	415	1,18	0,66	
3,9		9-15	447	1,15	0,65	
2.2 Memory correct		++ 3,9	9	92	4,4	1,3
		++ 3,9	10	91	4,4	1,2
	++ 3,9	11	96	4,6	1,1	
	++ 3,9	12	104	4,8	1,0	
	++ 3,9	13	31	5,1	1,0	
	3	14-15	32	4,9	1,0	
	++ 3,9	9-13	414	4,6	1,2	
	++ 3,9	9-15	446	4,6	1,1	
	2.3 Location correct	++ 3,9	9	92	3,1	1,7
		++ 3,9	10	91	3,3	1,7
++ 3,9		11	96	3,6	1,6	
++ 3,9		12	103	3,8	1,5	
++ 3,9		13	31	3,7	1,4	
3		14-15	32	4,4	1,2	
++ 3,9		9-13	413	3,5	1,6	
++ 3,9		9-15	445	3,5	1,6	

(1) The results for the right hand and dominant hand are combined. These are not necessarily equivalent.

(2) The results for the left hand and non-dominant hand are combined. These are not necessarily equivalent.

	Ref. No.	Age (yrs)	N	Mean	SD
<b>3. SEASHORE RHYTHM TEST</b>					
3.1 Number correct out of 30 items	9	9	43	14,3	5,8
	9	10	42	18,9	6,5
	9	11	46	19,1	6,4
	9	12	47	19,9	5,3
	9	13	38	20,4	5,1
	9	14	44	19,5	5,4
	++9	9-14	260	18,7	6,1
<b>4. SPEECH PERCEPTION TEST</b>					
4.1 Number correct out of 60 items	++3,9	9	72	52,8	4,2
	++3,9	10	97	53,5	3,0
	++3,9	11	90	54,6	2,8
	++3,9	12	122	54,5	2,6
	++3,9	13	36	55,0	1,8
	3	14-15	32	55,6	2,2
	++3,9	9-13	417	54,0	3,1
	++3,9	9-15	449	54,1	3,1
<b>5. FINGER TAPPING TEST (Finger Oscillation Test)</b>					
<u>Manual Tapper</u>					
5.1 Mean tapping rate for 5 10-s trials					
5.1.1 Dominant H	++3,9 <sup>(3)</sup>	9	49	34,01	4,20
	++3,9	10	95	37,54	5,19
	++3,9	11	93	39,73	5,35
	++3,9	12	123	41,37	5,33
	3	13	21	45,97	5,80
	3	14-15	32	46,32	6,04
	++3,9	9-13	381	39,32	5,94
	++3,9	9-15	413	39,86	6,23



	Ref. No.	Age (yrs)	N	Mean	SD
5.1.2 Non-dominant H <sup>(3)</sup>	++ 3,9	9	49	30,31	3,40
	++ 3,9	10	95	33,14	4,80
	++ 3,9	11	93	35,06	4,98
	++ 3,9	12	123	36,75	3,86
	3	13	21	42,01	4,58
	3	14-15	32	42,18	5,45
	++ 3,9	9-13	381	34,90	5,16
	++ 3,9	9-15	413	35,46	5,54
<u>Electric tapper</u> (The manual tapper is used in the HNTB. Results for the electric tapper are given for comparative purposes).					
5.2 Mean tapping rate for 5 10-s trials					
5.2.1 Dominant H	9	9	78	39,92	5,43
	9	10	91	41,80	5,07
	9	11	68	45,60	5,35
	9	12	90	47,43	5,27
	9	13	13	50,22	4,20
	++ 9	9-13	340	43,94	6,13
5.2.2 Non-dominant H	9	9	78	34,48	4,22
	9	10	91	36,07	4,63
	9	11	68	39,20	4,38
	9	12	90	40,98	5,27
	9	13	13	44,42	6,40
	++ 9	9-13	340	37,95	5,53
(3) These authors did not follow the instructions for administration advised by Reitan (no date) <sup>20)</sup> .					
6. <u>APHASIA SCREENING TEST</u>					
No norms available.					

	Ref. No.	Age (yrs)	N	Mean	SD
<b>7. <u>TRAIL MAKING TEST</u></b>					
7.1 Part A Time (in s)					
	++ 3,9	9	76	25,1	9,6
	++ 3,9	10	93	21,1	6,3
	++ 3,9	11	89	18,9	6,5
	++ 3,9	12	124	17,2	6,3
	++ 3,9	13	35	16,0	6,4
	3	14-15	32	14,6	3,3
	++ 3,9	9-13	417	19,8	7,7
	++ 8	9-14	133	15,4	6,6
	++ 3,9	9-15	449	19,4	7,6
7.2 Part B Time (in s)					
	++ 3,9	9	76	54,8	20,4
	++ 3,9	10	93	49,9	21,2
	++ 3,9	11	89	41,2	15,9
	++ 3,9	12	124	36,4	14,6
	++ 3,9	13	35	32,7	13,7
	3	14-15	32	31,6	10,7
	++ 3,9	9-13	417	43,5	19,2
	++ 8	9-14	133	33,0	14,1
	++ 3,9	9-15	449	42,6	19,0
<b>8. <u>PERCEPTUAL DISORDERS</u></b>					
8.1 Tactile finger localization (Errors)					
(No SDs are available for these means. However, the latter are given as they are the only ones reported.)					
8.1.1	Right H	2	9-14	27	1,2
8.1.2	Left H	2	9-14	27	1,4
8.2 Finger-tip number writing (Errors)					
8.2.1	Right H	2	9-14	27	2,5
8.2.2	Left H	2	9-14	27	3,0

	Ref. No.	Age (yrs)	N	Mean	SD
<b>9. LATERAL DOMINANCE EXAMINATION</b>					
9.1 Time to write name (in s)					
9.1.1 Right H	9	9	38	15,9	5,9
	9	10	40	13,0	4,5
	9	11	38	10,0	3,5
	9	12	33	9,8	4,6
	++9	9-12	149	12,3	5,3
9.1.2 Left H	9	9	38	28,9	10,5
	9	10	39	28,0	10,0
	9	11	38	20,1	8,2
	9	12	33	19,4	7,5
	++9	9-12	148	24,3	10,2
9.1.3 Preferred H	6	9-14	35	9,9	2,8
9.1.4 Non-preferred H	6	9-14	35	24,1	7,3
9.2 Strength of grip (in kg)					
9.2.1 Right H	9	9	27	14,7	2,6
	9	10	23	17,6	2,8
	9	11	33	19,5	3,7
	9	12	33	23,2	3,4
	++9	9-12	116	19,1	4,5
9.2.2 Left H	9	9	27	14,1	3,8
	9	10	23	16,1	2,5
	9	11	33	18,9	3,5
	9	12	33	21,7	3,5
	++9	9-12	116	18,0	4,5
<b>10. TACTILE FORM RECOGNITION</b>					
10.1 Errors					
(No SDs are available for these means. However, the latter are given as they are the only ones reported).					
10.1.1 Right H	2	9-14	27	0.3	
10.1.2 Left H	2	9.14	27	0,1	

APPENDIX

Description of subtests used in the RINTB and HNTB

CATEGORY TEST

This apparatus embodies a milk-glass projection screen on which stimulus material can be thrown by means of a slide projector. S sits facing the screen, and is required to respond to the stimulus by pressing 1 of 4 buttons on an answer panel located below the screen. A correct response is rewarded by a pleasing gong sound, an incorrect response evokes a harsh buzzing noise. Response buttons are identified by 4 colours in the RINTB, and are numbered from 1 to 4 in the HNTB. Eighty slide stimuli divided into 5 groups with a common response principle are used in the RINTB, and 168 stimuli with 6 underlying principles of response in the HNTB. S is not told what principle underlies each group, and is required to establish each principle by trial and error by means of 'gong' and 'buzzing' reinforcements. Only one response is allowed for each stimulus, and response buttons are utilized randomly for correct responses to preclude a positional set. Frequency of errors in responding is scored in both batteries.

This test would appear to embody a learning situation utilizing both positive and negative reinforcement within a relatively structured context. It depends on complex concept formation and abstraction abilities.

TACTUAL PERFORMANCE TEST (Time, Memory and Localization)

This is a modified Seguin-Godard form board, into which the pieces are fitted by a blindfolded S. S is blindfolded without being permitted to inspect either board or pieces. The preferred hand, then the non-preferred hand, and finally both hands are used for block-fitting. The same board is used in both the RINTB and HNTB, with 6 pieces for insertion. The board is positioned horizontally in the RINTB, and vertically in the HNTB. Times are recorded for preferred, non-preferred and bilateral performance. After removal of blindfold, blocks and board, S is required to draw the board and blocks in their correct positions. The drawing is scored for number of blocks correctly placed (memory) and localized (localization).

This test appears to depend on tactile discrimination of form, kinaesthesia, and co-ordination and dexterity of upper extremities. Visuo-spatial ability is related to correct positioning and memory of blocks.

RHYTHM TEST

This is a subtest of the Seashore Musical Abilities Test, requiring discrimination between pairs of rhythmic beats, sometimes similar and sometimes dissimilar, presented by means of a tape recorder. This test is used in the HNTB only.

Alertness and concentration, and the ability to perceive and compare rhythmic sequences are required.

#### SPEECH-SOUNDS PERCEPTION TEST

Sixty spoken nonsense syllables based on the "ee" sound are presented by means of a tape recorder. S is required to select the corresponding printed version of each of the 60 syllables from 3 alternatives on a test sheet. This is used only in the HNTB.

This test requires sustained attention, auditory perception of the stimulus material, and the ability to relate auditory and visual representations of the stimulus.

#### FINGER OSCILLATION TEST

In the HNTB a manually-operated tapper is used, in the RINTB, this is electrical-ly operated, and the key describes a smaller arc to compensate for the smaller fingers of the younger Ss. In both, 5 consecutive 10-s trials with the preferred hand, and then with the non-preferred hand, are given. S is required to move only the index finger of each hand, and to tap as fast as possible.

This is a measure of speed of fine motor function.

#### APHASIA SCREENING TEST

This test samples receptive and expressive aspects of dysphasic and related deficits. Abilities tested are naming of common objects, spelling, identification of numbers and letters, calculation, identification of body parts and differentiation between left and right, by means of the specific sensory modalities involved. This forms part of the HNTB with a simplified version being utilized in the RINTB.

#### MARCHING TEST

Material for this test consists of 5 pages each with a series of circles on left and right sides. The circles are connected by lines, indicating the direction S should follow in joining circles in crayon from the one nearest him to the one at the top of the page. Preferred and non-preferred hands are used for each page. Errors and times are recorded for each hand on each trial.

"Marching" up each page is a two-handed task, S following alternate left- and right-hand movements of the examiner as she moves each index finger along the sequence of circles on each side of the page, at a rate of about 1 move per second. The marching score is the total number of circles S is able to complete.

Gross skeletal motor function and co-ordination are measured by this test, which is part of the RINTB only.

#### TRAIL-MAKING TEST

Part A consists of 15 circles, numbered from 1 to 15, scattered over a sheet of white paper. S is required to connect the circles as quickly as possible and using a pencil, in sequence from 1 to 15. Part B comprises 15 circles numbered from 1 to 8 and lettered from A to G. S connects the circles, alternating sequentially between numbers and letters, again as quickly as possible. Scores are the number of seconds required to complete each part.

Abilities tapped by this test : recognition of symbolic significance of numbers and letters, scanning of stimulus material continuously and identification of the next number or letter in sequence, and integration of numerical and alphabetical sequences. This test is part of the HNTB only.

#### COLOUR FORM AND PROGRESSIVE FIGURES TESTS

These tests are, approximately, the equivalents in the RINTB of the Trail-Making Test in the HNTB. The Colour Form Test utilizes stimulus material of various colours and shapes. S is required to progress from one form to another, making his first move on the basis of shape, the next on the basis of colour. This approximates Part B of the Trail-Making Test. The Progressive Figures Test appears more difficult than the Colour Form Test, and probably has no real Trail-Making equivalent. Each stimulus figure comprises a large outside form, with a smaller shape enclosed inside. S is required to use the smaller, enclosed, shape as the next outside form for progression in sequence. Scores are times, in seconds, required to complete each test.

Organizational and abstraction abilities, concept formation and flexibility in thinking processes are probably tapped by these tests.

#### MATCHING PICTURES TEST

Material consists of 5 pages with 2 sets of items, one at the top, the other at the bottom, of the page. Corresponding items at top and bottom of the page are matched with each other. Matching requires increasing generalization with each page. The score is the number of correct responses on 19 items.

This tests simple abstraction or concept formation, and is confined to the RINTB.

TARGET TEST

Again confined to the RINTB, the stimulus figure is a large sheet of white paper with 9 large black dots arranged in a square, affixed to the wall. S's answer forms are 20 similar 9-dot figures on a sheet of paper in front of him. The experimenter points out a design on the stimulus figure by means of a pointer, using the 9 dots as reference points. After a 3-second delay, S is required to draw the figure on his answer sheet. Indicated designs are progressively more complex. The score is the number of items correctly reproduced by S.

Perception and expression of visuo-spatial relationships are involved in this test.

INDIVIDUAL PERFORMANCE TESTS

Matching V's. A stimulus card with V's subtending different angles, small on the left and large on the right, is placed in front of S. Blocks with V's subtending different angles are given to S and must be placed under the V on the stimulus card with the same angle. Time to completion and number of errors are scored.

Star-copying. S is required to copy a stimulus consisting of a six-sided star, after being told that the star is made up of 2 overlapping triangles, and that it should be drawn in this way. Time to completion and accuracy of the copy are scored.

Matching Figures. S is required to match individual stimulus figures with appropriate figures on a stimulus card. Figures range in design from simple to relatively complex. Time to completion and errors are scored.

Concentric Squares. S is asked to copy concentric squares, after being told that the stimulus figure is made up of 3 boxes placed inside each other, and they should be drawn in this way. Time to completion and accuracy are scored.

Tests comprising the Individual Performance Test all measure receptive and expressive aspects of visuo-spatial relationships, and are included only in the RINTB.

SENSORY-PERCEPTUAL EXAMINATION

All these tests are used in both the RINTB and HNTB.

Sensory Imperception. This procedure determines the accuracy of perception of bilateral simultaneous sensory stimulation in the tactile, auditory and visual sensory modalities, after determining that unilateral perception is intact.

Tactile Finger Recognition. Measures the ability of S, with eyes closed, to identify which individual fingers of preferred and non-preferred hands are



touched by the examiner. Four trials are used for each finger on each hand. Errors for each hand are scored.

Finger-tip Number Writing Perception. S reports numbers (in the HNTB) and "X's" or "O's" (in the RINTB) written on the finger-tips of each hand without the use of vision. Four trials for each finger on each hand are given. Errors are scored.

Tactile Form Recognition Test. S is required to recognize flat plastic shapes (cross, triangle, square, circle) placed in his hand in comparison with a set of visual stimuli. Times are scored for each trial and time for 4 trials for each hand is determined.

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