

Neurological Testing Material

CHAPTER 30

TESTS: PSYCHIATRIC, NEUROLOGICAL, PSYCHOLOGICAL

Introduction

Psychiatric, neurological and psychological tests (“instruments”) are used in a number of ways. The majority are used (after the diagnosis has been made) to quantify the patients condition at a particular time, with later re-testing providing a measure of progress – an example being the assessment of the effect of a medication. A few are used to make or help to make a diagnosis – and example being the assessment of cognitive function when dementia is suspected.

This chapter gives some examples of basic tests. In addition to their primary purpose of quantification of the “level” of psychopathology at a particular time, administering tests is an excellent learning experience for the student/clinician. In the learning situation, tests function as aide de memoirs, drawing our attention to aspects of psychopathology which we have forgotten, or never known.

A difficulty for students and scholars is that some tests are copyright and must be purchased. They are expensive and often difficult to obtain.

Some are “basic” and more than 4 decades old (Hamilton depression rating scale; Brief psychiatric rating scale) but have proven value and continue to be used in leading research.

There is no clear distinction between psychiatric, psychological and neurological tests. These designations relate to the disciplines with which they have traditionally been associated, rather than indicting particular disciplinary proprietary.

Those presented here are freely available either from original journals or from the web. So, owners of copyright can relax.

Psychiatric Tests

Mood disorder

1. Hamilton depression rating scale (HAM-D/HDRS)– Chapter 8
2. Montgomery Asberg depression rating scale (MADRS) – Chapter 8
3. Young mania rating scale (YMRS) - Chapter 9

Obsessive compulsive disorder

Yale-Brown obsessive-compulsive scale (YBOCS) – Chapter 13

Anxiety

Hamilton rating scale for anxiety (HAM-A/HRSA) – Chapter 19

Psychosis

Brief psychiatric rating scale (BPRS) – Chapter 7

Cognitive functions

1. Abbreviated mental test score (AMTS) – Chapter 20
2. Mini mental state examination (MMSE) – Chapter 20

General Psychopathology and Improvement

1. Clinical Global Impression (CGI)

The CGI (NIMH, 1970) is a three item scale which is frequently used in psychiatric research. The items are (a) Severity of Illness, (b) Global improvement, and (c) Efficacy Index.

The Severity of Illness item is rated according to the clinician's experience, on a 7 point scale: 1 = normal (not at all ill), 2 = borderline mentally ill, 3 = mildly ill, 4 = moderately ill, 5 = markedly ill, 6 = severely ill, 7 = extremely ill.

The Global Improvement item is a rating of change, relative to the baseline state, on a 7 point scale: 1 = very much or much improved, 2 = moderately improved, 3 = minimally improved, 4 = no change, 5 = minimally worse; 6 = moderately worse, 7 = much worse or very much worse.

The Efficacy Index item is a rating of improvement compared to side effects and is rarely used.

2. Global Assessment of Function (GAF) Scale

The GAF is described in the DSM-IV, which should be consulted for details. The GAF aims to bring together the psychological, social and occupational function to a single point on a health-illness continuum. A skeleton follows:

91-100%: Superior functioning in a wide range of activities

81-90%: Absent/minimal symptoms; good functioning in all areas

71-80%: Slight at most impairment in social, school/occupational functioning

61-70%: Some mild symptoms or some difficulty in functioning

51-60%: Moderate symptoms or moderate difficulty in functioning

41-50%: Serious symptoms or any seriously impaired functioning

31-40%: Impairment in reality testing or communication

21-30%: Behaviour considerably influenced by delusions or hallucinations

11-20%: Some danger of hurting self or others; grossly impaired communication

1-10%: Persistent danger of severely hurting self or others.

The GAF has been recently criticised (Rutter, 2011).

Psychological tests

Neuropsychology is a branch of psychology which aims to understand how the structure and function of the brain relate to specific psychological processes. Neuropsychology is a specialized, learned and skilled activity. The heading, Psychological tests, is used to indicated a few available tests to the general student or clinician; these are not the stuff of "neuropsychological assessment".

1. Clock face

The patient is given paper and a pencil/pen and asked to draw a clock face, including the numbers, and to set the hands at a particular time.

This simple test has been used in neurology for many years (Battersby et al, 1956).

Purpose – screening task for visuospatial and constructional difficulties. (Interestingly, the clock face is now considered a test of constructional apraxia, but it was first described (Battersby et al, 1956) as a test of spatial agnosia, demonstrating how these concepts are interrelated.) It also relies on cognitive skills.

Scoring – A ten point scoring system has been developed. However, a scoring system is not usually needed in the clinical setting – people usually either pass or fail this test – of course, intelligence and education need to be considered, but most healthy people can do a pretty good job. Examples from the same individual at different times can be easily collected and compared.

More than half a century since it was first described, the clock face tests has been used to reflect different progress in different dementia subtypes (Lee et al 2011).

2. Draw a bicycle

The patient is given paper and a pencil/pen and asked to draw a bicycle.

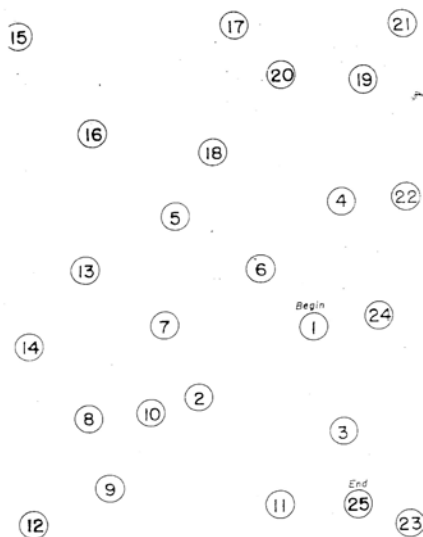
(Warning – this is not as easy as it sounds. It is a favourite of the current author, although it has received little attention in the clinical literature.)

Purpose – as with clock face drawing, this task screens for visuospatial and constructional difficulties. However, it has an added advantage. The patient can then be asked to explain how the bicycle works (Lezak, 1976; pp330-331). This calls for mechanical reasoning, and can present a challenge.

3. Trail making test

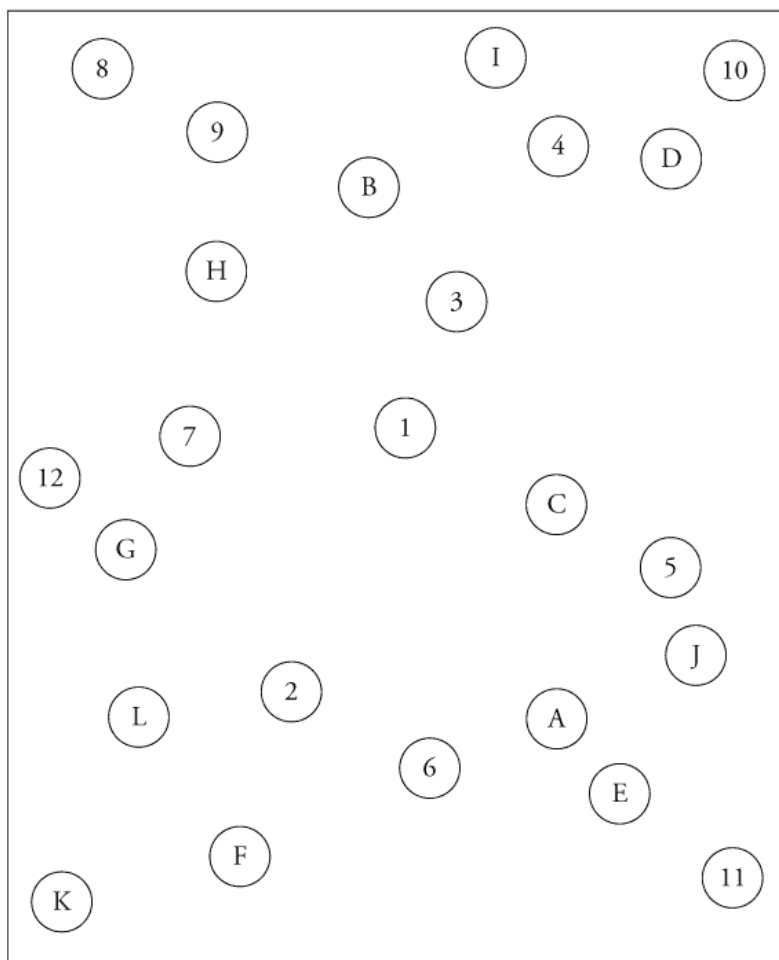
There are two parts (A, B; Partington & Leiter, 1949). They test speed, attention, sequencing, mental flexibility, and of visual search and motor function.

Part A is 25 numbers sprinkled randomly on a page. The task is for the patient to connect the numbers in order as quickly as possible. The time taken is recorded.



Trail making (Part A).

Part B includes numbers from 1 to 13 and letters from A to L sprinkled randomly on a page. The task is to connect the numbers and letters in order (1, A, 2, B, 3, C...) as quickly as possible. The time taken to complete is recorded.



Trail making (Part B).

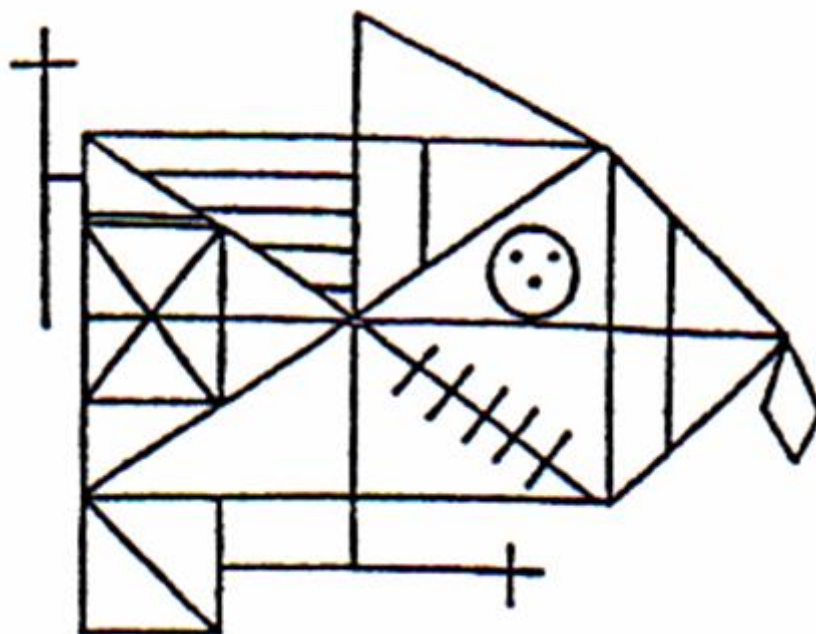
Scoring is based on seconds to complete task. Various authorities provide norm sets (Davis, 1968).

Distribution of Trail Making Scores (seconds) for Normal Population										
Age	20-39		40-49		50-59		60-69		70-79	
Part	A	B	A	B	A	B	A	B	A	B
90%ile	21	45	22	49	25	55	29	64	38	70
75%ile	26	55	28	57	29	75	35	89	54	132
50%ile	32	69	34	78	38	98	48	119	80	196
25%ile	42	94	45	100	49	135	67	172	105	292
10%ile	50	129	59	151	67	177	104	282	168	450

4. Rey complex figure

This figure was first created/researched well over half a century ago (Rey, 1941). Methods of administration differ, some ask the patient only to copy the figure, and others ask the patient to create the figure from memory (various intervals).

This test assesses visuospatial and constructional ability and visual memory.



The Rey complex figure.

Interestingly, it was recently used to demonstrate that during major depression episodes the memory is impaired, but improves with remission (Hammer and Schmid, 2013).

Scoring – many methods of scoring have been devised. For bedside testing the non-expert uses a pass/fail grading system and refers the patient for expert assessment if necessary. This test can be repeated (with due consideration to learning effect). The collected attempts over time provide a record of progress.

Osterrieth (1944) was among the first to develop a scoring system. The components of the figure are identified according to the following list and then each component is assessed. Results can be listed as raw scores and percentiles.

1. Cross upper left corner, outside rectangle
2. Large rectangle
3. Diagonal cross
4. Horizontal midline of 2
5. Vertical midline
6. Small rectangle, within 2 to the left
7. Small segment above 6
8. Four parallel lines within 2 upper right
9. Triangle above 2 upper right
10. Small vertical line within 2, below 9
11. Circle with 3 dots in 2

12. Five parallel lines with 2, crossing 3, lower right
13. Sides of triangle attached to 2 on right
14. Diamond attached to 13
15. Vertical line within triangle
16. Horizontal line within 13, continuing 4 to right
17. Cross attached to low centre
18. Square attached to 2, lower left

For each of the 18 units		
		Score
Correct	Placed properly	2
	Placed poorly	1
Distorted or incomplete	Placed properly	1
	Placed poorly	1/2
Absent or unrecognizable		0
		Maximum = 36 points

Percentile Norms for Adults: Rey Complex Figure				
Trial	Percentile			
	25	50	75	100
Copy	31	32	34	36
Memory	18	22	27	35

5. Controlled word association test (CWAT)

The CWAT is mentioned in Chapter 27. The patient is asked to say as many words as they can think of starting with particular letters (F, A, S; Benton, 1973). Proper nouns and the same words with different endings (hat, hats) are discounted.

Purpose – to assess word fluency

Scoring - at the bedside the clinician expects at least 10 words in one minute.

In more formal testing, the total number of words generated from the three exercises is determined. This number is then adjusted for age and years of education. From the adjusted scores the percentile is calculated.

Adjustment Formula: Controlled Word Association Test			
Adjusted Formula: Female			
Education Years Completed	Age 25-54	Age 55-59	Age 60-64
Less than 9	+9	+10	+12
9-11	+6	+7	+9
12-15	+4	+5	+7
More than 16	-	+1	+3
Adjusted Formula: Male			
Education Years Completed	Age 25-54	Age 55-59	Age 60-64

7. Digit span

Digit span testing has been mentioned in tests of concentration (Chapter 26 – Higher Cortical Functions). This procedure has been operationalized in the Weschler Adult Intelligence Scale (Weschler, 1955).

The test has two parts (Digits Forwards; Digits Backwards). The examiner says digits at about one per second. In Digits Forwards the patient is to repeat the digits said by the examiner, in Digits Backwards the patient is to reverse the digits (surprisingly). Two attempts may be made at each level. When a patient fails two attempts at one level, the test ceases.

Purpose – a test of verbal memory and concentration.

Scoring – this is a complicated matter and the examiner must refer to the WAIS manual. However, Lezak (1976) states, “In the general population, all but a few elderly can recall four digits forwards and three reversed... The average adults raw score of eleven is most often based on six digits forwards and five backwards” (page 209).

DIGITS FORWARD		
SERIES	TRIAL 1	TRIAL 2
(3)	5-8-2	6-9-4
(4)	6-4-3-9	7-2-8-6
(5)	4-2-7-3-1	7-5-8-3-6
(6)	6-1-9-4-7-3	3-9-2-4-8-7
(7)	5-9-1-7-4-2-8	4-1-7-9-3-8-6
(8)	5-8-1-9-2-6-4-7	3-8-2-9-5-1-7-4
(9)	2-7-5-8-6-2-5-8-4	7-1-3-9-4-2-5-6-8

DIGITS BACKWARDS		
SERIES	TRIAL 1	TRIAL 2
(2)	2-4	5-8
(3)	6-2-9	4-1-5
(4)	3-2-7-9	4-9-6-8
(5)	1-5-2-8-6	6-1-8-4-3
(6)	5-3-9-4-1-8	7-2-4-8-5-6
(7)	8-1-2-9-3-6-5	4-7-3-9-1-2-8
(8)	9-4-3-7-6-2-5-8	7-2-8-1-9-6-5-3

Neurological tests

Higher cortical functions

Various – Chapter 26

Frontal lobe functions

Various – Chapter 27

Parietal lobe function

Various – Chapter 26

Soft neurological signs

Schizophrenia (and perhaps other psychiatric disorders) is believed to be a neurodevelopmental disorder. Studies have demonstrated markedly increased signs of “soft neurological signs” which parallel psychopathology in both schizophrenia and bipolar disorder (Whitty et al, 2006; Zhao et al, 2012). OCD is also associated with significantly greater soft neurological signs than healthy controls (Jaafari et al, 2012).

NEUROLOGICAL SOFT SIGNS – HEIDELBERG MANUAL

The Heidelberg Manual is one of the leading standardized neurological soft sign examination systems. It has been kindly made available to the DOP by the authors.

J.Schröder, Ch. Reitz and M.Binkert
Translated by D. Barber

Corresponding author:
Prof. Dr. Johannes Schröder
Section Geriatric Psychiatry
University of Heidelberg
Voss Str. 4
69115 Heidelberg
FR-Germany

Heidelberg 1988/1991/2006

NEUROLOGICAL SOFT SIGNS - INSTRUCTIONS FOR EXAMINATION

The examination is to be carried out in a calm environment, without interruptions or additional observers. Patients with a history of neurological disorders, drug abuse, or alcoholism are to be excluded from examination. The examination procedure is so chosen that the initial tests are carried out with the patient in a standing position. The patients' ability to perform a given exercise is scored:

- 0: Patient has no, or inconspicuous difficulty with the exercise.
- 1: Slight, just perceivable or shortly intermittent problems.
- 2: Recognisable difficulty with the test exercise.
- 3: Marked difficulty, continually present problems, or completely defective performance.
In an otherwise normal performance (score=0), clear body side differences are quantified by score=1.

1. **Gait**

The gait is judged after a distance sufficient that the patient walks at his normal pace - thus preferably before the examination, as the patient walks to the room. Pay attention to the patients' dynamics, stride length, and coordination, as well as for exaggerated, reduced, or asymmetrical arm movements.

0: No conspicuous problems.

1: Reduced or exaggerated arm swing; after several strides the general impression is of a somewhat undynamic or intermittently disturbed gait.

2: One or two features clearly change the gait e.g. small-stepping, over-striding, barely swinging arms, rhythm loss.

3: Toddling, undynamic shuffling, or strong coordination difficulties impede walking.

2. **Tandem walking**

Patient instruction: "Placing one foot directly before the other, try to walk in a straight line." If requested, the examiner demonstrates the exercise. The walking distance should be at least three meters. The exercise is to be performed firstly with open, and repeated with closed eyes. Possible problems: balance disorders, snaking path, feet not placed directly before each other.

0: With closed eyes the patient loses balance, but with open eyes has only a little difficulty.

1: Even with open eyes, considerable balance problems, path deviations, and over-striding occur.

3. **Right/left orientation**

The patient and examiner stand facing each other, arms length apart. Verbal instructions to the patient:

a) "Touch your right upper arm with your left index finger."

b) "Touch your right thumb with your left index finger."

c) "Touch my right hand with your left index finger."

d) "Touch my left hand with your left index finger - and now my right hand."

Whereby in (c) and (d) the examiner holds his arms crossed before his chest.

0: (a) and (b) completed without hesitation - with (c) and (d) only a little hesitation.

1: Slight hesitation with (a) or (b). Immediate self-correction of errors with (c) or (d).

2: Long uncertainty with (a) or (b); spontaneous self-correction with (a) or (b); a false action with (c) or (d).

3: Simple pointing error/s with (a) or (b).

In case, during the further examination, a right/left orientation is observed, it should be evaluated on the above scale.

4. **Arm-holding test**

The test is demonstrated by the examiner, who explains: "Please stand with your legs together, arms straight ahead, elbows straight, palms upwards, fingers splayed, and close your eyes." Pay attention for arm sinking, loss of finger splaying, opposing movements of the little fingers, pronation, and differences between the sides.

- 0: Within a reasonable period (1-2 min.), no problems appear.
- 1: A minor fault e.g. finger movements, or slight pronation, or slight tendency to let the arms sink.
- 2: The faults in (1) are combined and/or more pronounced.
- 3: The basic position clearly changes after a few seconds. Different faults in combination e.g. clear arm sinking, finger movements, and pronation.

5. **Finger-to-nose test**

Directly after Test 4: "Keeping your eyes closed, touch the tip of your nose with your right index finger; now with your left finger." The exercise is then repeated with open eyes.

- 0: The exercise is promptly and confidently performed.
- 1: Minor correction movements, or slight pointing inaccuracy e.g. touching the side of the nose with closed eyes.
- 2: With closed eyes, trembles of indecision and/or pointing inaccuracy occur. With open eyes, however, the exercise is performed with ease.
- 3: Even with open eyes, inaccuracy and trembles of indecision occur.

6. **Ozeretzki's Test**

The test movements are demonstrated and explained by the examiner and then followed through with the patient a few times.

Instruction: "Keeping your arms straight ahead, make a fist with your right hand and open your left hand wide. Now pull your arms back to your chest and make fists with both hands; extend your arms straight again and open wide your right hand. Now keep repeating this action, alternately opening the other hand."

The exercise is conducted firstly with open, and then closed eyes, since in this order the performance mostly improves. The patient should aim for the fastest possible tempo. Usually, the exercise needs to be demonstrated several times. Pay attention to the tempo and rhythm, and for faltering, re-starting, and to whether the arms are fully stretched.

- 0: After a little practice, the exercise is successfully performed.
- 1: By higher tempos, only short sections of the exercise are successfully completed, these being interrupted by hand errors, loss of rhythm, or slowing of the tempo.
- 2: Even slowly, only a few sections are successfully completed. Difficulty in coordinating the arms occurs - the basic pattern is, however, correct.
- 3: Even after a slow demonstration, no section is correctly completed; the correlation with the demonstrated actions is low.

7. **Diadochokinesis**

The exercise is explained and demonstrated: The hands are held up by the sides of the head. Instruction: "Imagine you are replacing two light bulbs, screwing one in, the other out." Ensure, by correcting and re-demonstrating if necessary, that both hands pronate, or supinate, simultaneously. The exercise should be performed with increasing tempo, first with open, and then closed eyes. Pay attention to the rhythm, finger positions, synchronization, and tempo, and for amplitude differences between the sides.

- 0: The action is prompt and smooth. At the most a slight asymmetry (developed by the dominant side) occurs.
- 1: Slight faults e.g. loss of rhythm, bent fingers - especially the fourth or fifth finger.
- 2: Several errors e.g. interruptions, gradual change in the hand positions.
- 3: The performance sharply deteriorates after a few seconds; very pronounced coordination difficulties; even slowly the movements are un-rhythmical.

8. Pronation-supination

The exercise is demonstrated and explained: Standing, the patient alternately slaps the back of one hand with the palm of the other - performed initially with open, and proceeding with closed eyes. The patient is to aim for the fastest possible tempo.

- 0: A swift, reliable performance. A slight slowing on the non- dominant side is not significant.
- 1: At a high tempo, occasional errors or pausing occur, or the hands are incompletely rotated. The performance slowly improves.
- 2: Difficulties and minor errors at a low tempo.
- 3: Frequent gross errors.

9. Finger-to-thumb opposition

The exercise is demonstrated to the now seated patient and explained: "Lay the backs of your hands on your thighs. Firstly, with your right hand, touch your thumb once with each finger, one after the other, then reverse the finger sequence." Initially, if mistakes occur, explain and demonstrate the exercise again. With open eyes, the exercise is performed with the right, and then the left hand. This is to be repeated with closed eyes. The patient should aim for the fastest performance.

- 0: The performance is fluent and secure.
- 1: Broken rhythm; slow; side differences; single errors.
- 2: Faltering and re-starting; the finger sequence is incorrect.
- 3: Even slowly, the exercise cannot be completed.

10. Mirror movements

While one hand is actively performing exercise (9), the other (initially inactive) hand possibly registers these movements.

- 0: No perceivable mirror movements.
- 1: Slight, active jerking appearing only intermittently. (Passively transferred movements, or tremors are insignificant.)
- 2: Frequent, clear jerking of single fingers.
- 3: Similar movements appear to those exercised by the active hand.

11. Two-point-discrimination

The test is conducted using a caliper rule. This is explained to the patient and demonstrated on his arm. To avoid discriminating-ability-fatigue due to repeated application of the caliper, the ball of the thumb and the finger tips are tested. The caliper is placed, lightly and briefly, at a right angle to the finger length. If the discriminating abilities of the fingers are dissimilar then that of the index finger is taken. Firstly, clearly discriminable intervals are used, then intervals of 3, 5, 4, 5,

6mm etc. till two points can be perceived. The reliability of the test is checked using an interval of 0mm.

- 0: The threshold is 3.5mm or less.
- 1: 6mm or less.
- 2: 10mm or less.
- 3: more than 10mm.

12. Graphesthesia

A sheet of paper is laid before the patient, upon which the letter X, a circle, a square, and the number 3 are drawn. Seen by the patient, one of the symbols is traced in his hand. He should try to name this symbol. If he is unable to recognise the symbol, despite this visual aid, the score "9=not capable" is given. The patient closes his eyes. Using a pen, the following sequence of symbols is traced (approx. 3cm high) lightly on the patient's palm: In the right palm a square; left palm an X; right a circle; left a square; right an X; left a 3; right a circle; left a 3.

- 0: All symbols are easily recognised.
- 1: Indecision; errors immediately self-corrected; only one error.
- 2: Two to three errors.
- 3: More than three errors.

13. Face-hand test

The patient lays the palms of his hands on his thighs. The examiner sits opposite and explains that he will touch the patient at one, or simultaneously two places and that the patient is to say on which side, and where he was touched. The patient closes his eyes and, using a pen in each hand, the examiner touches him (lightly and briefly) firstly on the right cheek, then afterwards on the left hand; then on the left cheek, and then on the right hand. He touches then the right side of the forehead and afterwards the right hand - then the left side of the forehead and afterwards the left hand. After a 5 sec. pause both cheeks, and afterwards both hands, are touched simultaneously with equal pressure. Usually a patient is less able at identifying a double-touch thus, on the first double-touch error, the patient is asked, "Only there?" Upon correcting himself, the error is disregarded.

- 0: All touches are easily located.
- 1: One double-touch is not recognised.
- 2: 2 to 3 double-touch errors.
- 3: 4 or more errors, in particular with single touching.

14. Stereognosis

The test is conducted with five small coins, named here in order of size i.e. coin 1 is the smallest, coin 5 the largest. The patient is told he should try to recognise three coins placed individually in his right, and then in his left hand. The coins are not shown to the patient beforehand. Six trials are conducted per hand, in the sequence:

- a) right: coin 1,4,2 / left: coin 4,1,2
- b) right: coin 2,1,4 / left: coin 2,4,1

In case the patient sees the coins, the test is conducted with coins 2,4 and 5, or coins 1,3 and 5. The consistency of coin re-recognition is of interest - thus consistently naming particular coins differently is not significant.

- 0: All coins are recognised. Two or less errors.
- 1: Mistaking of coins of similar size (e.g. 2 and 4)
- 2: Mistaking of coins of clearly differing sizes (e.g. 1 and 4), but partly correct identification.
- 3: Coins are not recognised. Patient guesses roughly.

15. Fist-edge-palm-test

The exercise is demonstrated and explained: Firstly the table is lightly rapped with the pronated fist, then with the edge of the open hand, then with the palm, then again with the fist etc. The exercise is performed with the left, and then right hand, initially with open, then with closed eyes. The fastest possible tempo is to be aimed for. On initial occurrence of errors, the exercise should be followed through with the patient again.

- 0: Fast, trouble-free performance.
- 1: Slow; Fist is sometimes hit on the side; Pausing.
- 2: Sequence sometimes incorrect.
- 3: No section correctly completed.

16. Speech and articulation

The patients' speech characteristics having been observed during the whole examination, he is additionally posed two tongue-twisters:

- a) She sells sea shells on the sea shore.
- b) Peter Piper picks a pot of pickled pepper.

Each sentence is spoken by the examiner, then repeated twice by the patient. On request, the sentence is repeated. On occurrence of difficulty, the test is re-started after a short pause.

- 0: The repeated sentences are spoken swiftly and fluently.
- 1: Single mispronunciations; Single syllable errors remain on the second repetition.
- 2: Several syllable errors; Word order changed.
- 3: Sentence clearly altered.

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