

Relationship between Somatic and Psychopathometric Variables in Disorders of Consciousness

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Summary. Function psychosis is the most frequently observed response of the brain to disturbances in general practice and in hospital. A complete test system is presented for measuring grades of severity of function psychoses. It is possible to trace the course of the function psychosis in a curve similar to pulse and temperature curves.

Key words: Function psychosis – Disorders of consciousness – Psychopathometry – Transit syndrome test – Orientation scale.

I. Function Psychoses (Disorders of Consciousness)

Function psychoses result from a diminution of *psychic and mental functions* and are basically *reversible* in respect of the syndrome genesis [7] and *non-specific* in respect of the agents causing cerebral dysfunction (Bonhoeffer, 1917).

Function psychoses constitute a homogeneous and dynamic system of syndromes ranging from mild transit syndrome to unconsciousness and coma [7, 11—13]: full mental acuity; mild, moderate, and severe transit syndromes; clouded consciousness; intermediate (= border) syndrome between clouding of consciousness and unconsciousness; loss of consciousness; neurological symptomatology of coma. So far as we can see, the level of coma is best measured by the Munich Coma Scale [1], about which will be reported in a following paper.

Table 1. Features of function psychoses

Diminution of psychic and mental functions
Non-specific pathogenesis
Basic—concerning the syndrome genesis—reversibility
Homogeneous syndrome dynamics
Caused by diminution of the cerebral fundamental function
Various external configurations



The concept of the transit syndrome introduced for the first time the *principle of dynamic unity of syndrome* and of *quantitative reduction* [7, 8].

The possibility of measuring the degree of function psychoses was the *starting point* for developing psychopathometric tests [9—11, 13].

II. Psychopathometric Variables

A. Definition of Psychopathometry

In contrast to psychometry, which endeavours to measure normal psychic functions and structures, psychopathometry—the term was introduced by us in 1964 [13]—aims at measuring changes in psychopathologic and behavioral disorders.

B. Special Features of Psychopathometry

Many conditions must be taken into consideration when constructing psychopathometric tests and applying them to the patient.

C. Psychopathometric Tests for Specific Syndromes

For two decades our research group has been constructing tests for measuring the degree of function psychosis [4, 9—11, 13]. The first method developed to measure function psychoses was published by F. Böcker [see 11]. This *syndrome test* examines psychic functions and function systems such as memory and sense perception in 13 efficiency subtests. It was standardized on persons with and without function psychosis. The test's range reaches from full alertness to mild clouding of consciousness, while more accurate results can be expected in mild to severe transit syndrome.

To be more exact and reliable, my coworkers have developed and extended Böcker's work:

Table 2. Special features of psychopathometry

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| 1. <i>Measuring the degree of disturbances</i> |
| a. Specificity of the test concerning the syndrome |
| b. Dynamic of the disturbance which is measured |
| c. Causal external criterion |
| 2. <i>No remarkable effects in repetition</i> |
| d. Intraindividual course of disturbance can be investigated |
| 3. <i>Clinical usefulness</i> |
| e. Suitable for hospital and general practice |
| f. Avoiding to stress the patient |
| g. Economy |
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1. Transit Syndrome Test (TST)
 2. Orientation Scale (OS)
 3. Function-Psychosis-Scale-A (FPSA)
 4. Function-Psychosis-Scale-B (FPSB)
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Table 3. Psychopathometric tests for specific syndromes

1. *The Transit Syndrome Test (TST)* measures decrease of attentiveness and memory function. It contains *nine subtests* each of which should be solved within one minute. Hence the time taken for instructions, carrying out the test, and registration of results does not exceed ten to fifteen minutes.

In *subtest one*, twelve pictures of items of everyday use are to be named as quickly as possible. The pictures are then covered and the patient is asked to recall the items he can remember (*subtest 2*). In *subtest 3* the supervisor presents a magnetic plate with small movable blocks on it. Each of these blocks bears a two-digit number which must be read as quickly as possible. The patient is then requested to arrange the blocks in arithmetical order (*subtest 4*). Finally he must put them back in their original places, which are marked accordingly (*subtest 5*). Most of the test items are approved in psychology and psychiatry. The main objective was to construct the subtests in such a manner that utmost justice is granted the patient in his extraordinary situation.

Further on, a higher reliability was obtained in standardizing by checking variables like *age* and *intelligence*, which we believe are extremely important [4].

The score on every subtest is inserted into a *standard schedule* and the respective measurable points are added up to the overall points. The severity of the function psychosis can be associated with the *total score*.

2. *The Orientation Scale (OS)*. Another approach in testing for function psychoses was introduced by K.-F. Druschky, who developed an orientation scale which questions orientation to time, place, and person in hospitalized patients.

3. *Function-Psychosis-Scale-A (FPSA)*. This scale consists of 27 items. It assesses function psychotic patients and covers all states of disturbance from the verge of normality to loss of consciousness. The best differentiation is obtained between

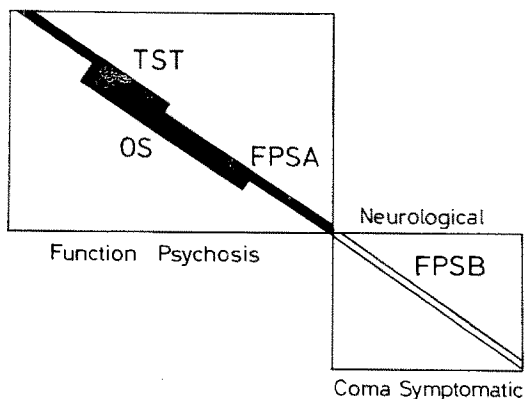


Fig. 1. Psychopathometric tests for function psychoses

moderate transit syndrome and intermediate syndrome. This scale has been extended to

4. *Function-Psychosis-Scale-B (FPSB)*. Similar tests such as the 'Mental Status Questionnaire' by E. Pfeiffer [5] have recently been published in the USA. It seems to cover moderate to severe grades of function psychoses. FPSB inclusively detects disturbances of orientation, communication, reflexes, and pupil abnormalities. It is used mainly for measuring severe transit syndrome up to unconsciousness. As patients in this state are mostly hospitalized, this test is meant for clinical use. FPSB consists of 33 items which the supervisor must rate 'solved' or 'unsolved'. The tasks are arranged in order of difficulty and are one-dimensional according to the model of a *Guttman-scale*.

The first *six subtests* serve for testing reflexes and registration of pupil dilation. The following *27 items* contain requests and questions such as 'Draw a circle in the air!' 'How old are you?' 'What's the season, spring, summer, fall, or winter?' 'Which month is it now?' and 'Which ward are you in?'

As the tests are strictly arranged in order of difficulty and their single dimension has been proved, the FPSB may be taken before items in which a solution by the patient is not expected. If he fails seven succeeding items, the tester may stop the procedure. For this reason the test very often does not last longer than two or three minutes. So far there has been no significant systematic learning effect on repetition [4].

Procedure and analysis of the TST, the FPSA, and the FPSB can be learned quickly. They can also be conducted by relatively inexperienced supervisors.

The *standard norms* are not to be compared with percentage figures. This means, for example, that from a score of 50 points it is incorrect to infer that the subject is in possession of only 50% of his original mental efficiency. The main reason for the introduction of this scale is its practicability. The same reasons probably led Endicott et al. [2] to develop a Global Assessment Scale for the extent of general psychotic disturbances, the norms of which range from 1 to 100.

D. Reduction of Psychic Functions

Analysis of the unity of psychic and mental functions shows that *basic* functions (reaction time and memory) can be separated from the *specific* entities: sensory perception, thinking, mental representation, inner awareness (introspection), feeling and volition (striving and willing). Taken together, the basic and specific functions constitute the *total* complement of mental faculties.

It should be borne in mind that the term '*function*' means the process of psychic activity and experience. It should not be confused with the meaning of dependent variables in the sense of mathematical science.

III. Somatic Variables

Concerning the almost unlimited range of variation in etiopathogenic cerebral processes, there are only *a few* somatic variables which can be measured:

One-hundred-fifty patients who attempted suicide with an overdose of *barbiturates* were examined with psychopathometric tests during the course of

Table 4. Somatic variables

A. Level of barbiturate in serum
B. Cerebral hypoxidosis
C. Level of alcohol in serum

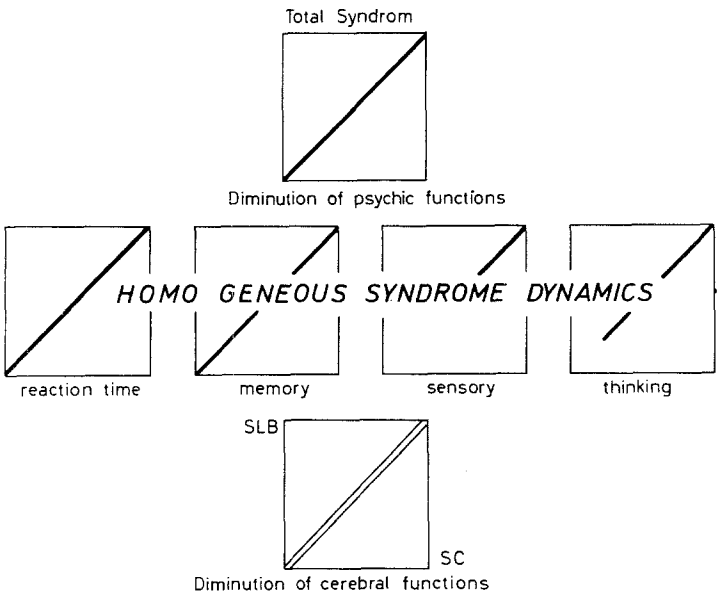


Fig. 2. Barbiturate intoxication. Psychopathometric investigations and serum level

intoxication. In twenty-three cases the effect of intoxication lasted several days. In the course of elimination of the drug, corresponding serum levels of barbiturate could be matched with the results of the psychopathometric tests.

As to the differences in the duration of intoxication, we determined the standard of the intraindividual course (CS) and the standard of the level of serum barbiturate (SLB).

In most of the cerebral processes there are no measurable etiopathogenic parameters available, so that the psychopathometric examination demonstrates in the best way the course and severity of cerebral dysfunction. As FPSB and TST are standardized on the same norms, and *no remarkable learning effects* on repetition have occurred, the same scale of points can be used for both.

Figure 3 shows the *course of function psychosis* of a 52-year-old housewife with a subarachnoidal haemorrhage from an aneurysm of the right A. cerebri media. On the ninth day the gamut of the function psychosis showed an acute deterioration. Angiography revealed spasms of the cerebral arteries which disappeared after five days. Due to the fact that Figure 3 demonstrates the situation of only one case, conclusions concerning the effectiveness of the applied drug are not justified. From the *function psychosis curve* one can deduce important facts at

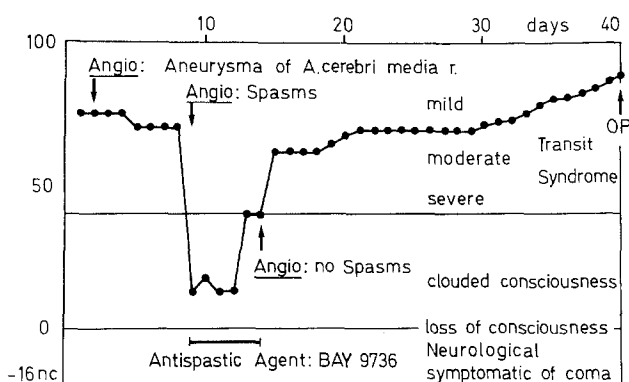


Fig. 3. SPSB-curve. From H.-H. Fuchs, K. A. Flügel, K.-F. Druschky

a glance, as from pulse and temperature curves. It is worthwhile for psychopathometric research work to include *neurophysiological parameters* [see 3, 6, 11], such as quantified EEG and evoked potentials.

IV. Significant Correlations Between Somatic and Psychopathometric Variables

In the *barbiturate intoxication* we found significant correlations between serum level of barbiturates and psychopathometric scores, as demonstrated in Figure 2. The four diagrams in the middle of the figure show the improvement of psychic functions, such as reaction time and memory functions, corresponding to the decreasing level of barbiturates.

Disturbances of *sensory perception* can be assessed as impaired performance, paralleling the severity of the overall syndrome. The *tachistoscope*, for instance, may be used to test visual alertness. With increased severity of the function psychosis the time required by the patient to recognize images presented to him will increase correspondingly.

Disturbances of *mental faculties* affecting vivid mental representation and meaningful coordination of thought contents can be assessed quantitatively in terms of reduced performance, for instance by the Hamburg-Wechsler Intelligence Test for Adults (HAWIE, a German adaptation of the Wechsler-Bellevue-Scale).

The *upper diagram* demonstrates the decrease of function psychosis from loss of consciousness to full mental state during the phase of elimination of barbiturate. Our investigations have demonstrated that the degree of function psychoses caused by intracranial *space-occupying processes* depends on the decrease of blood flow and therefore on the degree of hypoxidosis [6, 11, 13].

My coworkers have also investigated the *influence of alcohol* on reaction time, quantified EEG, evoked potentials, and function psychoses [3, 6]. On the first day subjects were tested without alcohol; on the second day the tests were repeated after ingestion of alcohol. It could be demonstrated that even in mild and moderate transit syndrome initial and peak latency of the visual evoked potential are increased. At the highest level of serum alcohol correlations of the variables are significant on the 1% niveau.

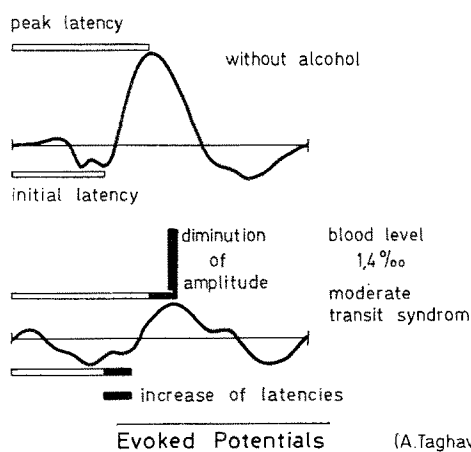


Fig. 4. Serum level of alcohol, evoked potentials and psychopathometric scores. From: [6]

(A. Taghavy, 1974)

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¹ Here further references