

Catatonia as a Psychomotor Syndrome: A Rating Scale and Extrapyramidal Motor Symptoms

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Summary

BACKGROUND: Catatonia was first described by Kahlbaum as a psychomotor disease with motor, behavioral, and affective symptoms. In keeping with this concept, we developed a rating scale for catatonia (Northoff Catatonia Scale [NCS]) with three different categories of symptoms (i.e., motor, behavioral, affective). Furthermore, the question of the relationship among catatonic symptoms, extrapyramidal motor symptoms, and neuroleptics was addressed in the present study.

METHOD: 34 acute catatonic patients and 68 age-, sex-, diagnosis-, and medication-matched psychiatric control subjects were investigated on days 0, 1, 3, 7, and 21 with the NCS, with other already validated catatonia rating scales by Rosebush, Bush (BFGRS), and Rogers (MRS), as well as with scales for hypokinetic (SEPS) and dyskinetic (AIMS) extrapyramidal motor features. Validity and reliability of the new scale, factor analysis, correlational analysis, and differences between catatonic patients and psychiatric control subjects were statistically calculated.

RESULTS: NCS showed high validity (i.e., significant posi-

tive correlations [$p < 0.0001$] with the other scales, significant differences between catatonic and control subjects), high intra- and interrater reliabilities ($r = 0.80\text{--}0.96$), and high affective subscores. Factor analysis revealed four factors best characterized as affective, hypoactive, hyperactive, and behavioral. Catatonic scores in NCS correlated significantly with AIMS on day 0 and SEPS on days 7 and 21. There were no significant differences in catatonic (i.e., NCS, MRS, BFGRS) and extrapyramidal (i.e., AIMS, SEPS) scores between neuroleptically treated and untreated catatonic subjects.

CONCLUSIONS: The following conclusions were drawn: (1) the NCS has to be considered as a valid and reliable rating instrument for catatonia; (2) catatonia can be characterized by psychomotor symptoms encompassing motor, affective, and behavioral alterations; and (3) extrapyramidal hyperkinesias like dyskinesias are apparently closely related to catatonic symptoms which, in general, seem to be relatively independent of previous neuroleptic medication.

Key Words: Catatonia—Psychomotor scale—Neuroleptics—Extrapyramidal hyperkinesias.

Catatonia was first described by Kahlbaum¹ as a psychomotor disease with hypo- and hyperkinetic motor features, affective alterations, and behavioral anomalies. Kraepelin² and Bleuler³ associated catatonia exclusively with motor symptoms in schizophrenia neglecting particularly its affective alterations. Subsequently, Kraepelin and Bleuler's concept dominated nosologic and symptomatologic classification of catatonia (see DSM-III-R and DSM-IV) whereas its psychomotor complexity, as originally described by Kahlbaum, was almost

forgotten.⁴ In addition to nosologic and symptomatologic complexity, the introduction of neuroleptics has further complicated diagnosis and interpretation of catatonia because the relationship between neuroleptic-induced extrapyramidal motor features and catatonic symptoms still remains more or less unclear.^{4,5}

In contrast to current classificatory systems (DSM-IV, ICD-10), a recent nosological study showed the usefulness of Kahlbaum's concept of catatonia as a separate disease entity.⁶ The present investigation focuses on the psychomotor complexity of catatonic symptoms, establishing a rating instrument based on the original description by Kahlbaum. Although other rating scales for the assessment of catatonia have been recently developed by Rosebush,⁷ Rogers (MRSs and MRSc⁸) and Bush

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(BFCRS⁹), none of these scales considers the particular importance of affective symptoms and extrapyramidal hyperkinesias as emphasized by Kahlbaum¹ and recent studies.¹⁰⁻¹² Therefore, we developed our own scale, the Northhoff Catatonia Scale (NCS; see Appendix), which, similar to Kahlbaum's, includes three distinct categories of symptoms (that is, hypo- and hyperkinesias, affective symptoms, and behavioral alterations). In addition to the measures of validity and reliability of the NCS, the problem of the relationship among catatonic symptoms, extrapyramidal motor features, and neuroleptics was addressed in the present study. We therefore investigated 34 acute catatonic patients and 68 age-, sex-, diagnosis-, and medication-matched psychiatric control patients with NCS, other catatonia scales (Rosebush, BFCRS, MRSs, MRSc), and extrapyramidal motor scales (AIMS, SEPS) on days 0, 1, 3, 7, and 21.

METHODS

Catatonic Patients

We investigated 34 acute catatonic patients (21 women, 13 men; mean age: 36.35 years). They were selected from all incoming patients at the Psychiatric University Clinic in Frankfurt, Germany between 1992 and 1996 (incidence in relation to all incoming patients:

2.7%). On admission (day 0), seven were neuroleptically naive (subgroup 1), five were neuroleptically untreated in the last 6 months before admission (subgroup 2), 14 were neuroleptically untreated on admission but not in the 6 months before (subgroup 3), and eight were neuroleptically treated (subgroup 4) on admission (see Table 1). Significant differences in general psychopathology (GAS, BPRS) could not be found between these four subgroups or between neuroleptically treated (subgroups 3 and 4) and neuroleptically untreated (subgroups 1 and 2) catatonic patients. On admission, six patients were on tricyclic antidepressants, one patient was on lithium, and none were on lorazepam or other benzodiazepines. Patients receiving lorazepam or other benzodiazepines either on admission or in the 3 months before were excluded from the study ($n = 6$) to avoid potential interactions between benzodiazepines and catatonic symptoms (especially the affective symptoms, which might be strongly altered by benzodiazepines). Clinical history revealed an average duration of illness of 4.3 ± 1.2 years (means \pm standard deviation [SD]), 2.9 ± 0.7 numbers of previous hospitalizations, 2.1 ± 0.9 previous catatonic episodes, and average duration of current catatonic symptoms (as revealed by interviews with relatives and/or friends) of 4.5 ± 2.1 days.

Catatonic syndrome was diagnosed according to cri-

TABLE 1. Clinical and demographic characteristics in catatonic and psychiatric control patients

	Catatonic patients	Psychiatric control patients
Number	34	68
Age (yrs)	36.35 ± 6.9	36.68 ± 8.2
Sex (f/m)	21/13	42/26
Neuroleptic treatment on admission	7 naive* 5 untreated for 6 mos 14 untreated on admission 8 treated on admission	14 naive* 10 untreated for 6 mos 28 untreated on admission 16 treated on admission
Neuroleptic treatment between days 0 and 21 (CPZ equivalents)	CPZ = 220.1 ± 80.5 mg	CPZ = 205.6 ± 90.6 mg
Psychotropics on admission	6 tricyclic antidepressants 1 lithium	12 tricyclic antidepressants 2 lithium
Psychotropics between days 0 and 21	23 tricyclic antidepressants 4 lithium	46 tricyclic antidepressants 8 lithium
DSM-IV diagnosis	295.20 (n = 13) 296.34c (n = 6) 296.44c (n = 8) 296.54c (n = 7)	295.10 (n = 26) 296.34 (n = 12) 296.44 (n = 16) 296.54 (n = 14)
NCS total score	35.4 ± 11.3	4.7 ± 2.1
NCS motor	11.1 ± 2.8	0.6 ± 0.3
NCS affective	13.9 ± 5.9	3.4 ± 1.1
NCS behavioral	10.4 ± 2.6	0.7 ± 0.7
Duration of illness	4.3 ± 1.2 y	3.8 ± 1.4 y
Hospitalizations	2.9 ± 0.7	3.1 ± 0.9
Catatonic episodes	2.1 ± 0.9	0

* Naive, never treated.

DSM-IV, *Diagnosis and Statistical Manual of Mental Disorders*, 4th edition; NCS, Northhoff Catatonia Scale.

teria by Rosebush⁷ and Lohr and Wiesniwski¹³ which both use a rather strict definition of catatonia by relying on a cluster of at least four of 12 symptoms (that is, three of 11 symptoms) as recommended by Gelenberg.¹⁴ All patients had to be classified as catatonic by two independent psychiatrists (JW and JE) who were different from the ones who evaluated catatonic scales (GN and AK) so decision about entry criteria and catatonic ratings were independent of each other.

Patients with concomitant Parkinson's disease, other extrapyramidal movement disorder (that is, Huntington chorea, and so forth), other motor disorders (that is, ataxia, and so forth), or neuroleptic malignant syndrome (NMS) were excluded from the study ($n = 7$) to avoid potential confusion between catatonic and extrapyramidal symptoms.

All 34 catatonic patients underwent evaluation of catatonic symptoms (see below for various scales), hypo- and hyperkinetic movements, and general psychopathology on day 0 (before initial medication), day 1 (24 hours after admission), day 3, day 7, and day 21. All catatonic patients were initially treated with intravenous 2–4 × 1 mg lorazepam (mean: 3.4 mg) receiving no other medication in the first 24 hours. Depending on the comorbid disease, patients were treated with psychotropic medication (that is, antidepressants, neuroleptics, and so forth; see Table 1 for further details) between days 1 and 21 in addition to lorazepam. No patient was evaluated as catatonic any more on day 21. Comorbid diagnosis (see Table 1 for details) was made on discharge by two clinical psychiatrists entirely independent from the study. Between 1992 and 1994, diagnosis was made with a structured clinical interview prospectively according to DSM-III-R¹⁵ and retrospectively according to DSM-IV,¹⁵ whereas after 1994, DSM-IV¹⁵ was used prospectively.

Psychiatric Control Subjects

We compared catatonic patients with an age- and sex-matched psychiatric control group (42 women, 26 men; age: 36.68 years, mean ± SD). The psychiatric control group included patients with a similar comorbid diagnosis but without catatonic syndrome (see Table 1). In addition, psychiatric control subjects were matched with catatonic patients in their psychotropic (that is, neuroleptics, and so forth) premedication (before admission) and medication in the 3-week study period. There were no significant differences in severity of general psychopathology, as measured with BPRS and GAS, between both groups. Subsequently, catatonic patients differed only in their manifestation of catatonic syndrome from psychiatric control subjects but not in underlying psychiatric disease or in psychotropic medication.

NORTHOFF CATATONIA SCALE

Item Selection for Scale

Kahlbaum's original monograph of catatonia,¹ historic descriptions,^{2,3,16–18} and recent studies^{7–11,19–21} about catatonia served as the basis for the development of our own scale. Thereby, we pursued a cross-sectional approach neglecting the longitudinal aspects of Kahlbaum's description which should be addressed in a separate study. Based on the psychomotor concept of catatonia by Kahlbaum, we distinguished among motor, affective, and behavioral symptomatic categories in our scale. With reference to Kahlbaum and the other reports and studies about catatonia (see above), we included 40 items (13 motor symptoms, 12 affective symptoms, 15 behavioral symptoms) in the final rating scale (NCS; see Appendix). We opted for an inclusive approach for two reasons. First, systematic studies of large populations for catatonic signs have not been conducted yet so there was no basis for excluding any particular symptom somehow related to catatonia. Second, all descriptions and studies about catatonia point out a certain diversity of symptoms so that a rating scale should be able to account for such psychomotor complexity. Each item was scored on a 0–2-point scale and sought to be operational. In some items direct quantification is used to estimate severity and in other items specific procedures to elicit the sign were provided.

Catatonia was defined as the presence of at least one symptom from each category, that is, only the constellation of motor, affective, and behavioral alterations was considered to be catatonic. Such a definition of catatonia presupposes the psychomotor concept by Kahlbaum, and it does not regard any of the catatonic symptoms as specific for catatonia. In NCS, catatonic symptoms are defined more rigorously than in other catatonia scales, like for example in BFCRS. Catalepsy in BFCRS is defined only as spontaneous maintenance of posture but not necessarily as posturing against gravity as required in NCS. The BFCRS does not distinguish between passive (catalepsy) and active (posturing) maintenance of posture and defines immobility only as extreme hypoactivity but not as complete akinesia for at least a half hour as in NCS. Automatic obedience is defined in BFCRS only as an exaggerated cooperation whereas in NCS, patients have to fulfill senseless or dangerous tasks on the examiner's request.

Reliability of Scale

To examine the reliability of our scale, each of its constituent items was subject to an analysis of interrater reliability. Data were obtained by two independent raters

(GN and AK) who assessed all patients. One of the raters first (succession was randomized) carried out the investigation and was followed by the other without any conferring. Both raters investigated and observed patients totally independent from each other and were blind to clinical diagnosis. After the first examination, patients were investigated a second time by both raters to establish measures of intrarater reliability.

Validity of Scale

First, we determined diagnostic agreement between cases as defined as catatonic by our scale (NCS) and other criteria⁷ and scales (Modified Rogers scale [MRS] in Lund⁸ and Starkstein¹²). Unfortunately, the recent published and validated Bush-Francis Catatonia Rating Scale (BFCRS⁹) could not be used prospectively in all our patients, because in the first years of our investigation it was not yet available. However, because the BFCRS is a well validated and reliable instrument, we applied it retrospectively to all other patients which was done by the same raters (GN and AK) as in the prospective examinations.

Second, all patients were investigated not only with our own scale (NCS) but with other criteria lists⁷ and scales which were already validated (Modified Rogers scales for schizophrenia [MRSs] and catatonia [MRSc] in Lund⁸ and Starkstein,¹² Bush-Francis Catatonia Rating Scale [BFCRS⁹], either prospectively [Rosebush, MRSs, MRSc] or retrospectively [BFCRS]). Statistical correlations were calculated between our scale (NCS) and the other instruments (MRSs, MRSc, Rosebush, BFCRS).

Third, subscores of each of the three categories (motor, affective, behavioral-volitional) in our scale were examined for their statistical correlation with the total score in our scale as well as with the total scores in the other scales.

Fourth, we investigated a non-catatonic psychiatric control group with the same comorbid disease but without catatonic syndrome and with similar medication with the same instruments (NCS, MRSs, MRSc, BFCRS, Rosebush) looking for statistical comparisons and measures (that is, NCS score) of sensitivity/specificity for separation between catatonic patients and psychiatric control subjects.

Fifth, we compared distribution and scores of catatonic symptoms between schizophrenic (295.20) and affective (296.34, 296.44, 296.54) psychotic patients within the catatonic sample.

Sixth, we calculated correlations between general psychopathology (as measured with BPRS and GAS) and

catatonic symptoms (NCS, MRSc, MRSs, BFCRS, Rosebush) in catatonic and non-catatonic patients.

EVALUATION OF MOVEMENTS AND PSYCHOPATHOLOGY

Catatonic Symptoms

Catatonic symptoms were evaluated prospectively on day 0 (before initial medication), day 1 (24 hours after admission), day 3, day 7, and day 21 with the following criteria and scales by two independent raters (GN and AK): Rosebush criteria,⁷ Northoff Catatonia Scale, Modified Rogers scale for schizophrenia (MRSs) and catatonia (MRSc),^{8,12} and, partially only retrospectively (see above), the Bush-Francis Catatonia Rating Scale (BFCRS⁹). Interrater reliabilities for the various catatonic scales (Rosebush, MRSs, MRSc, BFCRS) revealed average intraclass correlation coefficients between 0.90 and 0.96. Intra- and interrater reliabilities for the NCS is reported in the *Results* section.

HYPO- AND HYPERKINETIC EXTRAPYRAMIDAL MOVEMENTS

Hypokinetic movements were evaluated with the modified version, which includes ratings for akathisia as well, of the Simpson-Angus Scale for Extrapyramidal Side Effects (SEPS²³). Hyperkinetic movements were evaluated with the Abnormal Involuntary Movement Scale (AIMS²⁴). Ratings were done on days 0, 1, 3, 7, and 21 by two psychiatrists (JE and JW) independent from catatonic raters (GN and AK). Interrater reliabilities for SEPS and AIMS revealed average intraclass correlation coefficients between 0.91 and 0.97.

GENERAL PSYCHOPATHOLOGY

General psychopathology was evaluated with the Brief Psychiatric Rating scale (BPRS²⁵) and the Global Assessment Scale (GAS²⁶) by two independent raters (GN and JW; average intraclass correlation coefficients between 0.90 and 0.95 for interrater reliability) on days 0, 1, 3, 7, and 21.

STATISTICAL ANALYSIS

Statistical analysis was carried out with the following purposes: (1) to establish validity and reliability of our own scale (NCS); (2) to investigate dimensions of psychopathology; and (3) to search for a relationship among catatonic symptoms, extrapyramidal hypo- and hyperkinetic, and neuroleptic premedication.

Correlations between our own (NCS) and the other scales (Rosebush, BFCRS, MRSs, MRSc) were calculated for both the catatonic and psychiatric control groups by Kendall correlation. In addition to correlations

within groups, we calculated differences in all scales between groups (that is, catatonic patients and psychiatric control subjects) using Student's *t* test. Furthermore, similar calculations were also applied to schizophrenic ($n = 13$) and affective ($n = 21$) catatonic patients who were divided into these two groups according to their underlying psychiatric disease.

Correlations between NCS scores and clinicodemographic variables were calculated as well showing no significant correlations. Frequency distributions of catatonic symptoms were investigated using chi-square analysis, Fisher's two-tailed exact test for cell sizes less than five, and contingency tables.

Factor analysis using a Varimax rotation from the Statistical Package for the Social Science (SPSSX) was applied on the NCS to reveal potential psychopathologic dimensions in the catatonic group. Only items with a higher load than 0.5 were considered in the description of the factors. Factor analysis was carried out in two ways, cross-sectionally for NCS scores on day 0 (inclusion of only 34 assessments) as well as longitudinally (that is, over a period of 3 weeks) including ratings from days 0, 1, 3, 7, and 21 (inclusion of $34 \times 5 = 170$ assessments which, statistically, is better than inclusion of only 34 assessments although it violates the statistical assumption of independence).

The relationship between catatonic symptoms and extrapyramidal hypo- and hyperkinesias was investigated by calculating correlations between catatonic (that is, Rosebush, MRSs, MRSc, BFCRS, NCS) and extrapyramidal movement (that is, SEPS, AIMS) scales using similar correlation procedures as described above. From a statistical point of view, one may be concerned about the application of multiple correlations. We therefore focused not only on *p* values but on correlation values (*r* values) as well the latter being independent of the number of correlations calculated. Furthermore, differences between neuroleptically treated and neuroleptically untreated patients (separately for catatonic patients and control subjects) as well as between catatonic patients and psychiatric control subjects (that is, separately for neuroleptically treated and untreated patients) were calculated using analysis of variance (ANOVA) and Student's *t* test with Bonferroni correction for multiple comparisons.

RESULTS

Northoff Catatonia Scale

Validity

First, there was a 100% agreement in the definition of catatonia among our entrance criteria (Rosebush, Lohr),

our own scale (NCS), and the various other scales (MRSs, MRSc, BFCRS, DSM-IV); that is, all patients entering the study as catatonic according to Lohr and Rosebush were diagnosed as catatonic also according to the NCS and the other scales.

All patients diagnosed as catatonic according to Lohr and Rosebush showed at least one symptom from each category (motor, affective, behavioral) in NCS. The lowest number of symptoms in NCS in the catatonic group was eight, all other patients showing a higher number of catatonic symptoms (see Tables 1 and 2 for total scores and subscores in NCS). Furthermore, catatonic patients showed not only high motor and behavioral subscores in NCS, but high subscores in the affective category as well (see Table 1). A total score in NCS of >7 separated catatonic from non-catatonic patients with a sensitivity and specificity of 100% (that is, all catatonic patients but none of the non-catatonic psychiatric patients showed a NCS score >7).

Second, we found highly significant positive correlations ($p < 0.0001$) with high *r* values ($r = 0.72-0.88$) between NCS and Rosebush criteria, between NCS and BFCRS, between NCS and MRSs, as well as between NCS and MRSc (see Table 2 for further detail) on days 0, 1, 3, 7, and 21 within the catatonic group. Furthermore, significantly positive correlations were found among MRSs, MRSc, Rosebush, and BFCRS. In contrast to the catatonic group, psychiatric control subjects showed significant positive correlations with lower *r* values among NCS, MRSs, MRSc, Rosebush, and BFCRS only on day 0 (see Table 2) but not on the other days.

Third, the three subscores in NCS (motor, affective, behavioral) correlated significantly positive ($p < 0.0001$; $r = 0.85-0.94$) with the total score in NCS on all days. Total score as well as motor and behavioral subscores in NCS correlated significantly positive ($p < 0.0001$; $r = 0.81-0.91$) with total scores in MRSs, MRSc, Rosebush, and BFCRS on all days. Only the affective subscore in NCS showed no significant correlations ($p > 0.05$; $r = 0.34-0.39$) with the other scales.

Fourth, the catatonic patients and the psychiatric control group showed significant ($p < 0.0001$) differences in NCS total scores and all three (motor, affective, behavioral) subscores, MRSs, MRSc, Rosebush, and BFCRS on day 0, the former group being higher than the latter (see Table 2).

Fifth, we found significant differences between schizophrenic ($n = 13$) and affective ($n = 21$) catatonic patients not in frequency distribution of catatonic symptoms or in catatonic scores (NCS, MRSs, MRSc, BFCRS, Rosebush). In addition, in AIMS and SEPS no

TABLE 2. Scores in catatonia scales on day 0 and their correlations in catatonic ($n = 34$) and psychiatric control patients ($n = 68$)

	Correlations					
	Scores on day 0		NCS		MRSc	
	Catatonic patients	Psychiatric control group	Catatonic patients	Psychiatric control group	Catatonic patients	Psychiatric control group
NCS	35.4 ± 11.3 (×)	4.7 ± 2.1	—	—	$r = 0.8143$ $p < 0.0001$	$r = 0.4292$ $p < 0.0001$
MRSc	15.1 ± 6.3 (×)	0.7 ± 1.0	$r = 0.8143$ $p < 0.0001$	$r = 0.4292$ $p < 0.0001$	—	—
MRSs	31.1 ± 13.3 (×)	2.7 ± 1.1	$r = 0.8341$ $p < 0.0001$	$r = 0.5926$ $p < 0.0001$	$r = 0.8898$ $p < 0.0001$	$r = 0.8276$ $p < 0.0001$
Rosebush	8.6 ± 1.9 (×)	1.2 ± 0.9	$r = 0.7614$ $p < 0.0001$	$r = 0.4597$ $p < 0.0001$	$r = 0.7225$ $p < 0.0001$	$r = 0.8401$ $p < 0.0001$
BFCRS	26.4 ± 7.2 (×)	2.1 ± 1.0	$r = 0.8345$ $p < 0.0001$	$r = 0.5268$ $p < 0.0001$	$r = 0.7214$ $p < 0.0001$	$r = 0.6825$ $p < 0.0001$

	Correlations					
	MRSs		Rosebush		BFCRS	
	Catatonic patients	Psychiatric control group	Catatonic patients	Psychiatric control group	Catatonic patients	Psychiatric control group
NCS	$r = 0.8341$ $p < 0.0001$	$r = 0.5926$ $p < 0.0001$	$r = 0.7614$ $p < 0.001$	$r = 0.4597$ $p < 0.0001$	$r = 0.8345$ $p < 0.0001$	$r = 0.5268$ $p < 0.0001$
MRSc	$r = 0.8898$ $p < 0.0001$	$r = 0.8279$ $p < 0.0001$	$r = 0.7225$ $p < 0.0001$	$r = 0.8401$ $p < 0.0001$	$r = 0.7214$ $p < 0.0001$	$r = 0.6825$ $p < 0.0001$
MRSs	—	—	$r = 0.6702$ $p < 0.0001$	$r = 0.7894$ $p < 0.0001$	$r = 0.8125$ $p < 0.0001$	$r = 0.7254$ $p < 0.0001$
Rosebush	$r = 0.6702$ $p < 0.0001$	$r = 0.7894$ $p < 0.0001$	—	—	$r = 0.7215$ $p < 0.0001$	$r = 0.5897$ $p < 0.0001$
BFCRS	$r = 0.8125$ $p < 0.0001$	$r = 0.7254$ $p < 0.0001$	$r = 0.7215$ $p < 0.0001$	$r = 0.5897$ $p < 0.0001$	—	—

NCS, Northoff Catatonia Scale; MRSc, Modified Rogers Scale for catatonia; MRSs, Modified Rogers Scale for schizophrenia; Rosebush, Criteria list by Rosebush; BFCRS, Bush Francis Catatonia Rating Scale.

(×) = significantly higher ($p < 0.0001$) scores in catatonia than in psychiatric control patients.

significant differences between both diagnostic catatonic subgroups were found.

Sixth, significant correlations between general psychopathology (BPRS total, BPRS subscales, GAS) and catatonic scores (NCS, BFCRS, MRSs, MRSc, Rosebush) were not found in catatonic or in psychiatric control patients.

Reliability

The NCS proved highly reliable ($r = 0.80$ – 0.96) for total score as well as for single items in measures of interrater reliabilities (see Table 3). Strong interrater reliabilities were maintained at the low, middle, and high ranges of the rating scale. Kappa coefficients averaged 0.81 (SD = 0.12) for items present in more than 15% of the sample.

Intrarater reliability showed high intraclass correlation coefficients between 0.80 and 0.95 (see Table 3). Internal

reliability was calculated as well and proved to be high (Cronbach alpha = 0.87).

PSYCHOPATHOLOGIC DIMENSIONS

Cross-sectional factor analysis of NCS on day 0 (inclusion of only 34 assessments) revealed four factors (see Table 4). The first factor (eigenvalue: 8.39; explanation of variance: 21.5%) could best be described as an “affective” factor, the second (eigenvalue: 3.61; explanation of variance: 9.3%) as a “hyperactive” or “excited” factor, the third (eigenvalue: 2.98; explanation of variance: 7.6%) as a “hypoactive” or “retarded” factor, and the fourth (eigenvalue: 2.82; explanation of variance: 7.2%) as a “behavioral” factor (see Table 4). Longitudinal factor analysis of NCS on all days (inclusion of $34 \times 5 = 170$ assessments) revealed almost similar factors. The first factor (eigenvalue: 9.28; explanation of variance: 31.8%) included similar symptoms as the “affec-

TABLE 3. Reliabilities of items in the Northoff Catatonia Scale (NCS)

Motor symptoms	Intrarater reliability	Interrater reliability
Mannerisms	0.92	0.93
Stereotype	0.91	0.84
Festination	0.93	0.88
Athetotic movements	0.89	0.92
Dyskinesias	0.93	0.95
Gegenhalten	0.88	0.89
Posturing	0.93	0.95
Catalepsy	0.87	0.89
Flexibilitas cerea	0.91	0.90
Rigidity	0.87	0.88
Muscular hypotonus	0.91	0.90
Sudden muscular tone alterations	0.92	0.96
Akinesia	0.91	0.93
Affective symptoms	Intrarater reliability	Interrater reliability
Compulsive emotions	0.88	0.89
Emotional lability	0.92	0.93
Impulsivity	0.89	0.86
Aggression	0.80	0.89
Excitement	0.91	0.93
Affect-related behavior	0.92	0.92
Flat affect	0.90	0.91
Affective latence	0.92	0.93
Anxiety	0.94	0.95
Ambivalence	0.91	0.81
Staring	0.92	0.94
Agitation	0.90	0.91
Behavioral symptoms	Intrarater reliability	Interrater reliability
Grimacing	0.93	0.92
Verbigerations	0.91	0.94
Perseverations	0.92	0.91
Aprosodic speech	0.89	0.80
Abnormal speech	0.92	0.91
Automatic obedience	0.88	0.89
Echolalia/echopraxia	0.94	0.96
Mitgehen/mitmachen	0.91	0.92
Compulsive behavior	0.90	0.93
Negativism	0.89	0.90
Autism/withdrawal	0.81	0.89
Mutism	0.92	0.93
Stupor	0.91	0.90
Loss of initiative	0.92	0.93
Vegetative abnormalities	0.94	0.95
Total score	Intrarater reliability	Interrater reliability
Total score	0.94	0.94
Motor subscore	0.95	0.94
Affective subscore	0.91	0.92
Behavioral subscore	0.93	0.92

ive” factor (except mitgehen/mitmachen) and in addition akinesia (0.78). The second factor (eigenvalue: 3.89; explanation of variance: 10.5%) included similar symptoms as the “hyperactive” factor except affective latence and muscular hypotonia. The third factor (eigenvalue:

2.87; explanation of variance: 8.90%) included similar symptoms as the “hypoactive” factor and in addition staring (0.58), mutism (0.59), and festination (0.61). The fourth factor (eigenvalue: 2.85; explanation of variance: 7.4%) included similar symptoms as the “behavioral” factor and in addition verbigeration (0.54), stereotypies (0.59), and echolalia/praxia (0.61).

Catatonic Symptoms and Hypo-/Hyperkinetic Movements

Significant positive correlations ($p < 0.0001$; $r = 0.77-0.89$) between NCS total score and AIMS, between motor subscore in NCS and AIMS, between Rosebush and AIMS, between MRSc/MRSs and AIMS, as well as between BFCRS and AIMS were found on days 0 and 1 in the catatonic group (and both diagnostic subgroups, schizophrenic and affective psychosis, within the catatonic sample) but not on days 3, 7, and 21 or in the psychiatric control group (see Table 5). In contrast, on days 3, 7, and 21 significantly positive correlations ($p < 0.0001$; $r = 0.56-0.72$) between NCS (total score, motor subscore) and SEPS, between Rosebush and SEPS, between MRSc and SEPS, as well as between BFCRS and SEPS were found (see Table 5). No significant correlations were found between SEPS and catatonic scales on days 0 and 1, whereas on days 3, 7, and 21 no significant correlations between AIMS and catatonic scales were found.

On day 0 catatonic patients (total number and both diagnostic subgroups) showed significantly higher AIMS and SEPS scores than the respective psychiatric control subjects (see Table 5).

There were no significant differences in AIMS and SEPS scores among the different days (days 0, 1, 3, 7, 21) within each group (catatonic patients and psychiatric control subjects) or between the two diagnostic subgroups (schizophrenic and affective) within the catatonic sample. Catatonic patients showed the highest SEPS and AIMS scores on day 0 and gradually decreasing scores in both scales from days 0 to day 21 (see Table 5). This decrease did not reach a level of statistical significance probably because of high standard deviations (see Table 5).

Catatonic Symptoms and Neuroleptics

On days 0, 1, and 3 the NCS, MRSc, Rosebush, and BFCRS did not differ significantly either between neuroleptically untreated ($n = 12$) and neuroleptically treated ($n = 22$) catatonic patients or between the four distinct subgroups (see *Methods*) with regard to neuroleptic medication (that is, neuroleptically naive [subgroup 1], untreated for 6 months [subgroup 2], untreated

TABLE 4. Items (load >0.5) and factors in factor analysis of ratings on day 0 according to the Northoff Catatonia Scale (NCS) in 34 catatonic patients

	Factor 1	Factor 2	Factor 3	Factor 4
Eigenvalue	8.39	3.61	2.98	2.82
Explanation of variance	21.50%	9.30%	7.60%	7.20%
Symptoms	Festination (0.76) Automatic obedience (0.52) Affect lability (0.69) Agitation (0.57) Excitement (0.60) Affect-related behavior (0.69) Negativism (0.50) Staring (0.52) Anxiety (0.67) Compulsive emotions (0.50) Mitgehen/mitmachen (0.50)	Grimacing (0.72) Verbigerations (0.58) Stereotypy (0.58) Athetosis (0.65) Dyskinesias (0.65) Echolalia/echopraxia (0.65) Muscular hypotonia (0.54) Sudden muscular tone alterations (0.69) Perseverations (0.50) Loss of initiative (-0.70) Affective latency (-0.56)	Gegenhalten (0.58) Posturing (0.66) Catalepsy (0.60) Flexibilitas cerea (0.63) Autism/Withdrawal (0.53) Akinesia (0.57)	Compulsive behavior (0.79) Perseverations (0.50) Compulsive emotions (0.83) Mutism (-0.50) Stupor (-0.64)

on admission [subgroup 3], and treated on admission [subgroup 4]). No significant differences in single symptoms according to NCS were found between neuroleptically treated and untreated catatonic patients. On days 7 and 21 neuroleptically treated patients showed significantly higher scores ($p < 0.01$) in NCS, MRSc, Rosebush, and BFCRS than neuroleptically untreated patients. This was supported by results from subgroup analysis, sub-

groups 3 and 4 showing significantly higher scores ($p < 0.01$) than subgroups 1 and 2 in NCS and Rosebush on days 7 and 21.

Neuroleptically untreated catatonic patients showed significantly higher AIMS scores on day 0 than neuroleptically treated catatonic patients (see Table 5), which was confirmed by similar results in the same calculations for the four neuroleptic subgroups. In contrast to AIMS,

TABLE 5. Extrapyrimal scores (AIMS and SEPS) in catatonic and psychiatric control patients

	Catatonic (n = 34)		Neuroleptically untreated catatonic patients (n = 12)		Neuroleptically treated catatonic patients (n = 22)	
	SEPS	AIMS	SEPS	AIMS	SEPS	AIMS
Day 0	17.5 ± 6.7 (a) (*)	11.2 ± 11.3 (a) (*) (x)	15.5 ± 8.2 (b) (*)	20.6 ± 12.9 (b) (*) (d) (***) (x)	18.6 ± 5.7 (c) (*)	6.0 ± 10.6
Day 1	12.3 ± 5.8	5.4 ± 10.8 (x)	11.3 ± 6.9 (b) (*)	11.3 ± 6.9 (b) (*) (x)	12.8 ± 5.3 (c) (*)	3.1 ± 6.1
Day 3	10.4 ± 5.7 (x)	3.2 ± 7.7	9.0 ± 6.9 (x)	9.0 ± 6.9	11.3 ± 4.9 (x)	2.3 ± 6.5
Day 7	7.5 ± 7.6 (x)	2.4 ± 5.7	3.5 ± 4.7 (x)	3.5 ± 4.7	9.5 ± 8.2 e (*)	2.1 ± 5.1
Day 21	7.1 ± 7.6 (x)	3.2 ± 6.3	3.6 ± 4.8 (x)	3.6 ± 4.8	8.7 ± 8.1 e (*)	2.8 ± 7.5
	Psychiatric control patients (n = 68)		Neuroleptically untreated psychiatric control patients (n = 24)		Neuroleptically treated psychiatric control patients (n = 44)	
	SEPS	AIMS	SEPS	AIMS	SEPS	AIMS
Day 0	10.5 ± 8.9	5.8 ± 3.2	6.5 ± 5.9	4.2 ± 3.9	9.4 ± 5.6	5.1 ± 3.1
Day 1	13.9 ± 6.7	5.3 ± 4.9	6.4 ± 5.8	4.1 ± 3.1	9.3 ± 4.9	4.2 ± 2.9
Day 3	12.8 ± 8.9	4.9 ± 4.1	7.5 ± 7.2	5.2 ± 3.0	10.2 ± 4.1	3.9 ± 2.0
Day 7	9.8 ± 6.9	3.8 ± 2.9	5.1 ± 4.9	4.5 ± 2.9	10.9 ± 3.9	2.8 ± 1.0
Day 21	10.2 ± 8.5	4.1 ± 2.8	4.1 ± 4.0	4.0 ± 3.1	9.8 ± 4.1	2.7 ± 2.8

(x), significant positive correlation ($p < 0.0001$) with catatonic scales (NCS, MRSc, MRSs, Rosebush, BFCRS); (a), Catatonic group significantly higher than psychiatric control group; (b), Neuroleptically untreated catatonic patients significantly higher than neuroleptically untreated psychiatric control patients; (c), Neuroleptically treated catatonic patients significantly higher than neuroleptically treated psychiatric control patients; (d), Neuroleptically untreated catatonic patients significantly higher than neuroleptically treated catatonic patients; (e), Neuroleptically treated catatonic patients significantly higher than neuroleptically untreated catatonic patients; (*), $p < 0.005$; (**), $p < 0.001$.

there were no significant differences in SEPS between neuroleptically treated and untreated catatonic patients on day 0 (see Table 5). Neuroleptically treated catatonic patients showed significantly higher SEPS scores on days 7 and 21 than neuroleptically untreated catatonic patients.

Neuroleptically untreated catatonic patients showed significantly higher SEPS and AIMS scores than neuroleptically untreated psychiatric control subjects on days 0 and 1 (see Table 5). Neuroleptically treated catatonic patients showed only significantly higher SEPS but not AIMS scores than neuroleptically treated psychiatric control subjects on days 0 and 1 (see Table 5). On all other days (days 3, 7, and 21), no significant differences between catatonic and psychiatric control patients were found.

DISCUSSION

The present investigation of 34 catatonic and 68 psychiatric control patients with various catatonic and extrapyramidal scales showed the following results: (1) high validity and reliability of our own scale, the NCS, which is based on the psychomotor concept of catatonia as originally described by Kahlbaum; (2) distinct psychopathologic dimensions (affective, hypoactive, hyperactive, behavioral) emphasizing the importance of affective and behavioral alterations in catatonia; (3) a close relationship between catatonic symptoms and extrapyramidal hyperkinesias, that is, dyskinesias; and (4) no major influence of previous neuroleptic medication on catatonic symptoms.

Catatonia as a Psychomotor Syndrome

Our own scale, NCS, is based on the psychomotor concept in the original description of catatonia by Kahlbaum.¹ Accordingly, the NCS distinguishes three distinct categories of catatonic symptoms, that is, motor, affective, and behavioral, and diagnoses catatonia only in the presence of at least one symptom of each category. Such a psychomotor concept is supported by the following empiric findings: (1) all patients, diagnosed as catatonic according to the entry criteria by Lohr and Rosebush (see *Methods*), showed at least eight symptoms in the NCS as well as at least one symptom of each symptomatic category; (2) total score and subscores (motor, affective, behavioral) in NCS showed significant correlations among each other as well as with the other catatonia scales; (3) the NCS showed high values of intra- and interrater reliabilities so that it has to be considered as a reliable instrument; and (4) the NCS significantly correlated with other already validated catatonia scales so that it can be considered as a valid instrument.

In contrast to all other scales, the NCS includes the affective component as a separate symptomatic category. This inclusion of affective symptoms is supported by the following findings: (1) affective subscores were significantly higher in catatonic than in non-catatonic psychiatric control patients although both groups were matched in their underlying diagnosis (see Table 1); (2) affective subscores in NCS significantly correlated with general catatonic symptoms as reflected in NCS total (see *Results*); and (3) the first factor in both factor analysis loaded predominantly on affective symptoms (see Table 4). Despite the particular importance of affective symptoms in catatonia, one might nevertheless be inclined to argue that symptoms like anxiety and agitation may rather be regarded as a nonspecific expression of the underlying psychiatric disease (i.e., schizophrenic or affective psychosis) than of catatonia itself. However, in catatonic and non-catatonic patients anxiety as measured in psychopathologic scales (BPRS total, BPRS subscales, GAS) is not significantly correlated with scores in catatonia scales. The particular importance of affective alterations is further underlined by clinical studies reporting intense and uncontrollable emotions,¹¹ high Hamilton-Anxiety scores,¹⁰ and an association with depression¹² in catatonia. Such affective alterations may at least partially account for the often observed dramatic therapeutic efficacy of the anxiolytic drug lorazepam in acute catatonic states.^{7,9,10,20}

The nosological status of catatonia, regarding it either as a syndrome or as a subtype of schizophrenic/affective psychosis, remains unclear. Although the present study can in no way be considered proof of the syndrome concept, some findings in the present study may however lend support to such a nosological view: (1) no significant differences in catatonic scores (that is, NCS total, BFCRS, MRSs, MRSc) and subscores (that is, NCS affective, NCS motor, NCS behavioral) between schizophrenic and affective catatonic patients (see Table 1); (2) similar frequency distributions of catatonic symptoms in schizophrenic and affective catatonic patients; (3) no significant differences in AIMS and SEPS between schizophrenic and affective catatonic patients; (4) no significant correlations between general psychopathologic (BPRS total, BPRS subscores, GAS) and catatonic scores in catatonic and non-catatonic patients; (5) high intercorrelations between the distinct symptomatic categories (affective, motor, behavioral) in NCS; and (6) a sensitivity and specificity of 100% in an NCS score >7 separating catatonic and non-catatonic psychiatric patients. Consequently, these findings would support the assumption of catatonia as a syndrome with a cluster of motor, affective, and behavioral abnormalities which are

relatively independent of the underlying comorbid disease, for example, schizophrenic or affective psychosis. One may nevertheless criticize the approach of the present study as circular because several of the symptoms, as applied in the entry criteria by Rosebush, also appear in the scale which is being validated. However, entry criteria and criteria in the scale for validation are not similar because the former does not include affective alterations and extrapyramidal hyperkinesias and does not distinguish between the different categories of symptoms. Consequently, the NCS with its three subscales does not replicate clinical entry criteria so that validity of the NCS is not self-evident or superfluous.

The sample investigated in the present study encompasses only acute catatonic patients, whereas those with chronic or organic catatonia were not considered. A recent study³⁰ could find no major differences in catatonic symptomatology, as measured with BFCRS, between acute and chronic catatonic patients. However, because the BFCRS does not contain many affective items (see above), our results in acute catatonic patients, obtained with the NCS, should not be automatically transferred to chronic patients.

Catatonia, Hyperkinesias, and Neuroleptics

In the pre-neuroleptic era, Kahlbaum¹ and other authors^{2,27,32-37} described extrapyramidal hyperkinesia such as choreatic- and athetotic-like movements as well as dyskinesias in catatonic patients. After the introduction of psychopharmacologic drugs, such movements have been generally associated with neuroleptics rather than with catatonia itself.²⁹ However, recent studies showed a close association between dyskinesias and catatonia^{10,21,28,30} which would be supported by the following results in the present study: (1) AIMS scores significantly correlated with catatonia scores (NCS total score, NCS motor subscore, BFCRS, MRSc, MRSs, Rosebush) only on days 0 and 1 (see Table 5) but not on the other days (3, 7, and 21) when most patients were being treated with neuroleptics; (2) neuroleptically untreated catatonic patients showed significantly higher AIMS scores on day 0 than neuroleptically treated catatonics (see Table 5); (3) neuroleptically untreated catatonic patients showed significantly higher AIMS scores on day 0 than neuroleptically untreated psychiatric control subjects; and (4) NCS scores (NCS total, NCS motor) significantly correlated with MRSs, the only scale that also included extrapyramidal hyperkinesias. Consequently, our results point out the close relationship between catatonia and extrapyramidal hyperkinesias, the latter not being explained by previous neuroleptic medication, that is, the occurrence of dyskinesias in catatonia

seems to be relatively independent of psychopharmacologic treatment. However, whether one assumes a co-existence of catatonia and dyskinesia, as is postulated by Bush,³⁰ or whether one considers dyskinesias as part of catatonic symptomatology has to remain an open question.

Furthermore, our results show that catatonic symptomatology in general is not strongly influenced by previous neuroleptic medication. We could not find any significant differences in symptomatic profiles (see *Results*) or in catatonic scores between neuroleptically untreated and treated catatonic patients on day 0. Furthermore, although neuroleptic premedication was matched between groups, catatonic patients nevertheless showed significantly higher AIMS and SEPS scores than psychiatric control subjects on day 0. Consequently, expression and manifestation of catatonic symptoms seems to be more or less independent of previous neuroleptic medication. Neuroleptically treated catatonic patients showed significantly lower AIMS scores than neuroleptically untreated catatonic patients on day 0, whereas hypokinesias, as measured with SEPS, did not differ significantly between both subgroups. Neuroleptics may initially suppress dyskinesias which would explain lower AIMS scores in neuroleptically treated catatonic patients on day 0 (see Table 5).

APPENDIX

Northoff Catatonia Scale

Patient:

ID:

Date:

Rater:

Quantification: applying to each item respectively

0 = abnormality absent

1 = abnormality definitely present, but moderately and occasionally present with possibility of interruptions

2 = abnormality constantly and severely present without any possibility of interruption

Diagnosis of catatonic syndrome: at least one symptom from each category (motor, affective, behavioral) independent from underlying comorbid disease

I. Motor Alterations

1. Mannerisms

Odd, bizarre, artificial execution of purposeful movements with a disturbance in the harmony of movements.

2. Stereotypy

Repetitive (>3), non-goal-directed movements with unchanged character during the frequent repetitions.

3. Festination

Uncoordinated, inappropriate, jerky-like, hasty move-

ments which suddenly appear after akinetic phases and cannot be voluntarily controlled by the patient.

4. Athetotic movements

Choreatic-like movements with a screw-shaped character.

5. Dyskinesias

Abnormal involuntary fast movements, which cannot be voluntarily controlled by the patient, disturbing the normal patterns of movements.

6. Gegenhalten (= paratonia)

Resistance to passive movements with proportional strength to the increase of muscle tone which seemed to be voluntarily controlled by the patient.

7. Posturing

Spontaneous and active maintenance of a posture against gravity over a certain time (>1 min) with no reactions and alterations at all which seemed to be voluntarily controlled by the patient.

8. Catalepsy

Passive induction of a posture by an external person with persistence (>1 min) against gravity so that the patient him- or herself seems to be unable to return to his or her initial posture.

9. Flexibilitas cerea

Passive movements of extremities against a slight, even resistance, similar to that of a bending candle, which does not seem to underlie voluntary control by the patient.

10. Rigidity

Muscular hypertonus which might be even and steady or cogwheel-like; exclude if tremor is present.

11. Muscular hypotonus

Slack and loose active movement with an apparently decreased muscle tone in passive movements.

12. Sudden muscular tone alterations

Rapid switches between muscular normotonus, hypotonus and hypertonus, which might be either induced by or unrelated to external events.

13. Akinesia

Complete absence and paucity of movements for at least a half hour.

Total Motor subscore:

II. Affective Alterations

1. Compulsive emotions

Patient shows abnormal affective reactions which are not voluntarily controlled by him- or herself or experienced as belonging to him- or herself.

2. Emotional lability

Labile and unstable affective reactions with sudden switches between extreme emotions which often cannot be followed (i.e., understood) by the external observer.

3. Impulsivity

Patient shows sudden and inappropriate emotional reactions combined with inadequate behavior which, afterward, cannot be explained by the patient him- or herself.

4. Aggression

Verbal or violent attack on objects or other persons which often is accompanied by extreme emotional states (i.e., anxiety or rages) and may be induced by external events.

5. Excitement

Extreme hyperactivity with nonpurposeful movements and extreme emotional reactions which can no longer be controlled by the patient him- or herself.

6. Affect-related behavior

Abnormal movements and behavioral reactions which are apparently closely related to particular emotional states and/or discharges.

7. Flat affect

Patients show decreased active and rather passive emotional reactivity so that quantity and quality of the emotions seem to be considerably reduced.

8. Affective latency

Patients need an abnormally long time to show an emotional reaction to an external stimulus which, subjectively, they often experience as difficulty of emotional initiation.

9. Anxiety

Patients show affective (i.e., expression of face), verbal, and/or vegetative (i.e., sweat, perspiration) signs of intense anxiety which can no longer be controlled by the patient him- or herself.

10. Ambivalence

Patients show conflicting (and/or opposing) emotions (and/or thoughts) so that they appear blocked ("stuck"), indecisive, and hesitant to the external observer.

11. Staring

Fixed gaze (>20 sec) with little visual scanning of environment, decreased blinking, and widely opened eyes, which is often accompanied by subjective experience of extreme and uncontrollable emotional states (i.e., anxiety).

12. Agitation

Signs of inner (i.e., subjective feeling) and/or outer (i.e., increased psychomotor activity) restlessness in relation to intense emotional experiences.

Total affective subscore:

III. Behavioral Alterations

1. Grimacing

Odd and inappropriate facial expressions, which can either persist or disappear suddenly, with no apparent and direct relation to the respective environmental situation.

2. Verbigerations

Repetition of phrases or sentences which are not goal-directed or adaptable with regard to the respective context.

3. Perserverations

Non-goal-directed repetition of thoughts and/or actions which become repeated either as a whole or as fragments.

4. Increased, compulsive-like speech

Increased quantitative production of verbal speech without sensible contents and voluntary control (i.e., patient cannot stop it if he or she wants to).

5. Abnormal speech

Patient shows qualitative abnormalities in volume (i.e., abnormally loud or quiet) and intonation (high, low, manic) of speech.

6. Automatic obedience

Exaggerated and reproducible (i.e., >5 times) cooperation with examiner's request even if these are senseless or dangerous so that the patient seems to possess no own volition. For example, patients fulfill dangerous tasks without any request or hesitation which otherwise they would not do.

7. Echolalia/praxia

Reproducible (i.e., >5 times) mimicking of other person's behavior (echopraxia) and/or speech (echolalia).

8. Mitgehen/mitmachen

Patients follow other persons in an inappropriate way either in their gait/walking movements (mitgehen) or in their actions (mitmachen) several times (>5) for at least 3 minutes.

9. Compulsive behavior

Patients show repetitive patterns (i.e., >5 times) of behavior which they feel driven to perform and cannot control or relate to themselves.

10. Negativismus

Active (i.e., doing the opposite) or passive (i.e., doing nothing despite repeated instructions) resistance to instructions and/or external stimuli, which should be reproducible for at least five times.

11. Autism/withdrawal

Patient avoids social contacts and tends to be on his or her own in social isolation. He or she either passively avoids contacts by not exposing him- or herself to other people or actively withdraws and isolates him- or herself in the presence of other people.

12. Mutism

Patient no longer speaks and makes no verbal responses at all for at least a half hour; exclude if known aphasia.

13. Stupor

Patient does not show any psychomotor activity for at

least a half hour so that he or she does not actively relate to his or her environment and does not passively react to external stimuli.

14. Loss of initiative

Patients subjectively experience a loss of initiative to do things they usually do without problems. Objectively they show no energy and initiative at all concerning daily routine and relation to the environment and/or other persons.

15. Vegetative abnormalities

Patients show subjective (i.e., sweating, perspiration, palpitations, and so forth) and objective (i.e., temperature, pulse, blood pressure, respiratory rate, and so forth) signs of autonomic dysfunction.

Total behavioral subscore:

Total score:

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