

Evaluation of Speech and Language in Neuropsychiatric Disorders*

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Summary. Changes of language and speech in neuropsychiatric patients are described by use of a quantifying procedure. In the transcript of a standardized interview the following variables are evaluated (by estimation of indices): rate of speech, pauses, indistinct and incomprehensible articulations, aphasic disturbances, subordinate: principal clause ratio, stuttering, neologisms, grammatical mistakes, thought disconnections, perseverations/verbigerations, vague utterances, disturbances of orientation, utterances with unusual thought content, euphoric utterances, dysphoric utterances, and change of the affective state. Reliability of these indices is tested by inter-rater comparison. The course of speech-language reorganization during therapy is followed. The present method does not intend to give a detailed psycholinguistic analysis, but it yields an objective measure of clinical impressions on abnormalities of language and speech in neuropsychiatric disorders.

Key words: Speech – Language – Quantitative psychopathology – Neuropsychiatric disorders.

Zusammenfassung. Mit Hilfe einer quantifizierenden Methode werden Veränderungen von Sprechen und Sprache bei neuropsychiatrischen Erkrankungen erfaßt. Durch Bestimmung von Indices werden im Transkript eines standardisierten Interviews folgende Variablen beurteilt: Sprachproduktion, Pausenfrequenz, Häufigkeit von verwaschenen und unverständlichen Worten, Häufigkeit von aphasischen Störungen, Nebensatz/Hauptsatz-Quotient, Häufigkeit von Stottern, Neologismen und grammatischen Fehlern, von Gedankensprüngen, Perseverationen/Verbigerationen und von vagen Äußerungen, von Orientierungsstörungen und ungewöhnlichen Denkinhalten, von euphorischen und dysphorischen Äußerungen und von Stimmungsschwankungen. Die Reliabilität dieser Indices wird durch Inter-Rater-Vergleich geprüft.

* Paper presented at a symposium "The measurement of change in Psychopathology" at the VI. World Congress of Psychiatry, Honolulu/USA, August 1977

** This work was supported by a grant of the Thyssen-Stiftung, Köln

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Der zeitliche Verlauf der Reorganisation von Sprechen und Sprache während der Therapie wird bei einigen Patienten untersucht. Mit der vorliegenden Methode wird keine detaillierte psycholinguistische Analyse versucht, sondern vielmehr ein Instrument bereitgestellt zur objektiven Erfassung des klinischen Eindrucks von Abnormitäten von Sprechen und Sprache bei neuropsychiatrischen Patienten.

Schlüsselwörter: Sprechen – Sprache – Quantitative Psychopathologie – Neuropsychiatrische Erkrankungen.

Introduction

Evaluation of speech and language behavior of a patient is one of the main sources for any psychopathological and neuropsychological description of his clinical state. An operationalization of this evaluative process should yield not only a higher degree of reliability (in psychopathology), but also lead to an improved description of the course of changes of speech and language behavior (i.e., it should bring about a measurement of change within these complex and basic phenomena).

In principle there exist two possibilities for operationalization of language evaluation; one is primarily a *linguistic*, the other primarily a *phenomenological-descriptive* method.

The aim of a linguistic analysis of language behaviour is an elucidation of the internal structure of language and its changes in different psychopathological states. A phenomenological-descriptive method aims primarily at quantification of variables in speech and language behavior which obviously influence the impression of a clinical observer. This kind of analysis has been performed on special clinical states such as anxiety (Mahl, 1958; Benton et al., 1955), depression (Szabadi et al., 1976), mania (Lorenz and Cobb, 1952), mania and depression (Andreasen and Pfohl, 1976, schizophrenia (content-analysis) (Tucker and Rosenberg, 1975), aphasic disturbances (Goodglass et al., 1964; de Villiers, 1974), and more specialized psychological factors such as defense mechanisms (Weintraub and Aronson, 1967) and self-object representation (Steingart and Freedman, 1972). These methods are relatively time consuming and are specialized on description of a single psychopathological phenomenon.

The aim of the present study is the elaboration of a standardized evaluative system which is practical, simple, and not very time consuming. It should include most relevant variables of psychopathology and neuropsychology.

Method

A standardized interview is recorded by tape and transcribed. The interview consists of the following questions (Table 1).

In the transcript several variables of the patient's speech and language behavior are evaluated by estimation of indices (Table 2).

Rate of speech is measured in the following way. Time intervals of 30 s are labeled in the transcript and the number of words within these intervals is counted.

Table 1

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1. Who are you?
 2. Where are you?
 3. How do you feel now? (After 30 s evt.: Could you elaborate?)
 4. How well did you sleep?
 5. How is your appetite?
 6. Do you have any somatic complaints?
 7. Anything happened to you during the last several days? (After 30 s evt.: Could you elaborate?)
 8. What is your main problem at the moment?
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Table 2

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1. Rate of speech (RS)
 2. Pauses (P)
 3. Indistinct articulations (I_1)
 4. Incomprehensible articulations (I_2)
 5. Aphasic disturbances (A)
(Disturbances of word finding: A_w), (Literal paraphasias: A_l), (Semantic paraphasias: A_s)
 6. Subordinate: principal clauses (S/P)
 7. Stuttering (S)
 8. Neologisms (N)
 9. Grammatical mistakes 1 (anacoluths) (G_1)
Grammatical mistakes 2 (others) (G_2)
 10. Thought-disconnections (T)
(Total: T_T), (With ties by semantic associations: T_s), (With ties by clang associations: T_c)
 11. Repetitions (perseverations/verbigerations) (R)
 12. Vague utterances (V)
 13. Disturbances of orientation (O)
 14. Unusual thought content (U)
 15. Euphoric utterances (E)
 16. Melancholic utterances (M)
 17. Dysphoric utterances (D)
 18. Change of affective state (C)
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For practical reasons *pauses* with a length of more than 2 s—as a first attempt—are regarded as significant. They are counted by use of a metronome which is adjusted to a frequency of 1 beat/s. Pauses of a duration of 2 s and more are marked in the transcript. A pause of 4 s is rated as two pauses and so forth. This and the following indices are related to a number of 50 words.

Indistinct articulations (I_1) are rated separately from *incomprehensible words* (I_2). This differentiation is done by the following definition: a word which cannot be understood after three attempts is defined as incomprehensible.

Aphasic disturbances are divided into (a) disturbances of word finding and (b) literal and semantic paraphasias.

A simple indicator for complexity of syntax is given by the relation of *subordinate clauses* divided by *principal clauses*.

In the *Stutter-Index* the number of repetitions of stutter elements is related to 50 words. There is a rating of neologisms.

In the index of *grammatical mistakes* anacoluths are separated from other disturbances of grammar. This distinction is performed since anacoluths might indicate psychomotor changes.

Thought disconnections are defined as interruptions within the stream of thought. They may be total or may be partially bridged by ties of semantic or clang associations.

Perseverations and verbigerations are rated by use of one common index.

Vagueness is rated if a patient circumscribes the intended meaning by imprecise utterances. In this and the following indices an utterance of one to five words is counted as one, six to ten as two, and so forth.

Disturbances of orientation concerning time, space, situation, and person are rated in one common index.

Unusual thought content is a rating of unusual, bizarre, psychotic verbal productions, especially of delusional character. Apparently hallucinatory utterances are also included here.

There is furthermore a rating of *euphoric, melancholic, and dysphoric* utterances, and an estimation of *change of the affective state*.

Reliability of these indices is tested by inter-rater comparison.

The present rating system is 'open' insofar as it can be complemented by further indices, e.g., measuring concretion versus abstraction or subject versus object orientation of utterances, and by more detailed linguistic parameters.

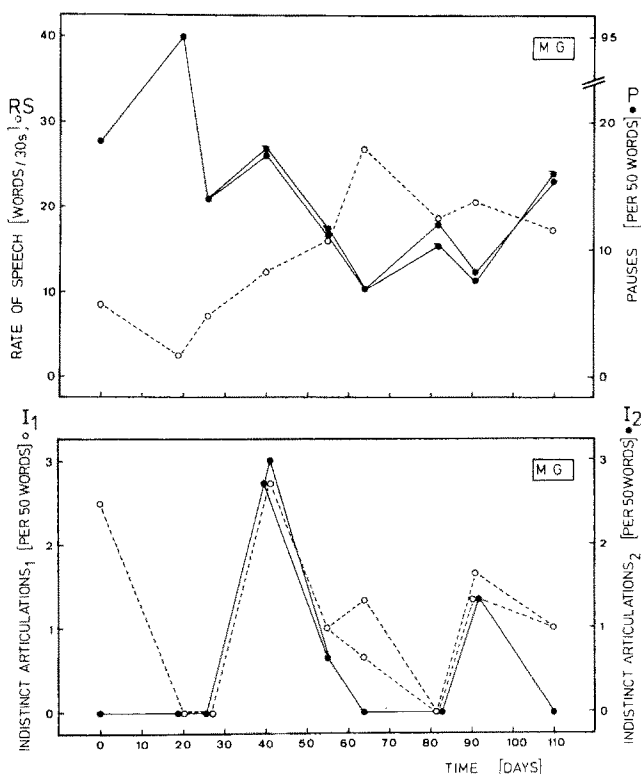


Fig. 1. Rate of speech, frequency of pauses, and frequency of indistinct (I_1) and incomprehensible (I_2) words as a function of time in a patient with chronic meningo-encephalitis. Evaluation by two independent raters

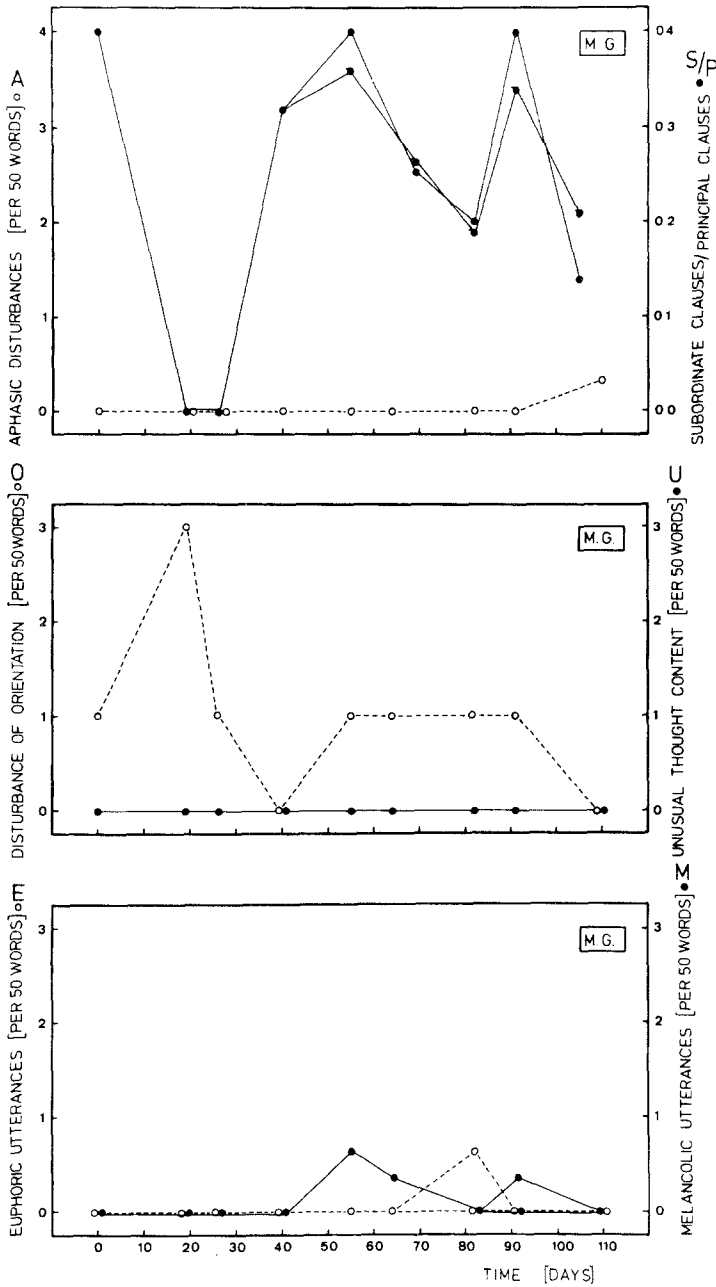


Fig. 2. Subordinate:principal clause ratio, frequency of aphasic disturbances, of utterances indicating a disturbance of orientation and unusual thought content, and of euphoric and melancholic utterances as a function of time in the same patient with chronic meningo-encephalitis

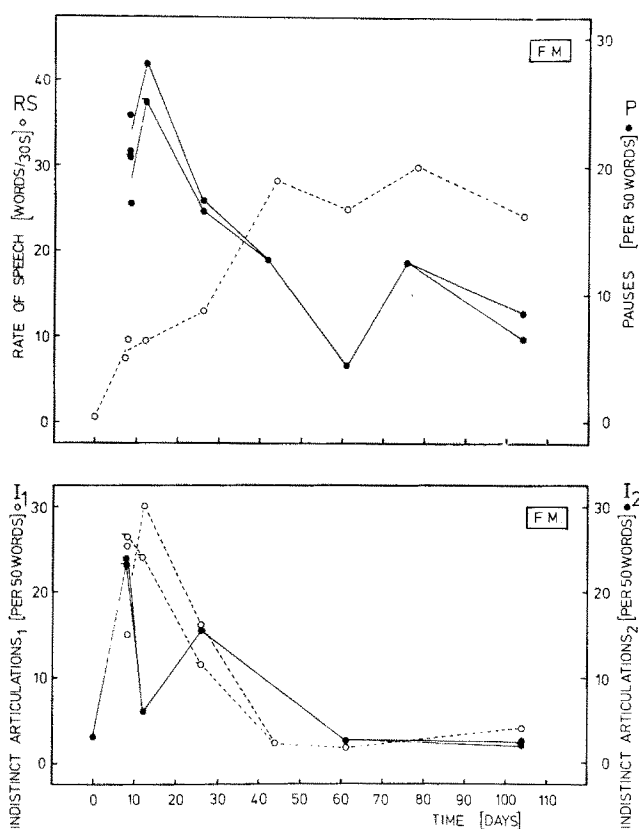


Fig. 3. Rate of speech, frequency of pauses, and frequency of indistinct (I_1) and incomprehensible (I_2) words as a function of time in a patient with multilobar vascular lesions in the diencephalon and the brain stem. At day 10 two interviews were evaluated

Results

Preliminary results have been obtained from repetitive interviews of some patients with neurologic and psychiatric disorders.

The first patient is a 55-year-old woman who suffers from a chronic meningo-encephalitis. At admission she was nearly mutistic and disoriented. During therapy of four months she became much more vivid, and her emotional responsiveness increased. Figure 1 shows the rate of increase of speech production and diminution of pauses during a period of 110 days. The half-life of both changes is in the region of 30 to 40 days. The indices of indistinct articulations and of uncomprehensible words show a high degree of scattering and only a small tendency toward improvement (Fig. 2). She had practically no aphasic disturbances. The index of subordinate clauses divided by principle clauses is relatively constant. Only interviews with a very low speech rate of less than 7 words/30 s showed no subordinate clauses. Disturbance of orientation was more pronounced in the beginning of therapy, but there were no utterances indicating delusional or

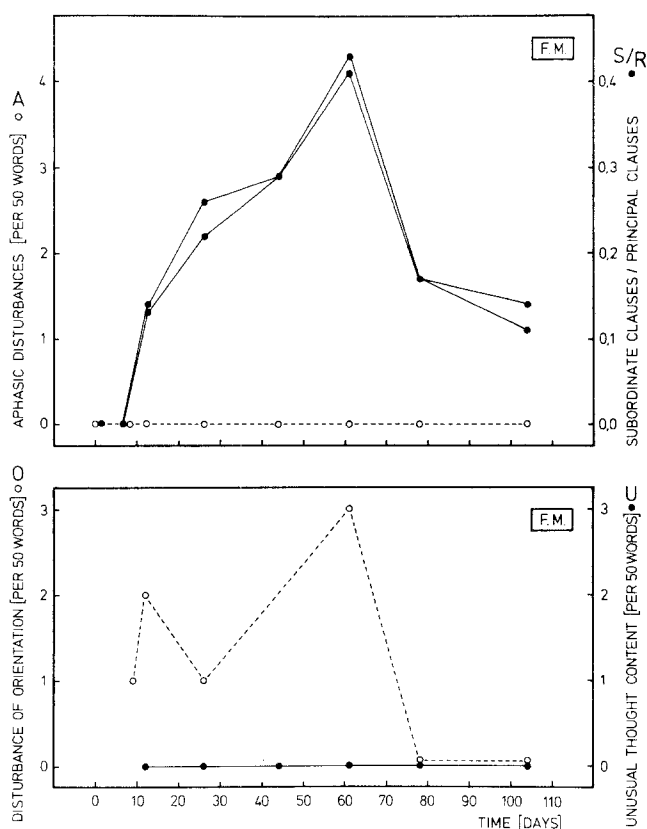


Fig. 4. Subordinate: principal clause ratio, frequency of aphasic disturbances and of utterances indicating a disturbance of orientation and unusual thought content as a function of time in the same patient with multilobar vascular lesions

hallucinatory thought content. Emotional responsiveness of the patient increased in the second half of therapy.

The second case is a 48-year-old man with multilobar vascular lesions in the diencephalon and the brain stem. In the beginning the patient had a disturbance of vigilance (Fig. 3). The rate of speech was practically zero and his few utterances were incomprehensible. During a period of about four months there was an enormous increase in speech production with a half-life of about 30 days, a reduction of pauses, and a concomitant reduction of indistinct and incomprehensible articulations (Fig. 4). He had no aphasic disturbances, the complexity of syntax as measured by the subordinate: principal clause ratio increased and showed a rebound to values in the region of 0.1 to 0.2. The disturbance of orientation was sizable in the beginning and then improved. There were no utterances indicating unusual thought content.

The third patient is a 49-year-old man suffering from massive bleeding into the left thalamus and internal capsule. At the beginning of observation he had a low speech rate (Fig. 5) which increased to normal values with a half-life of about

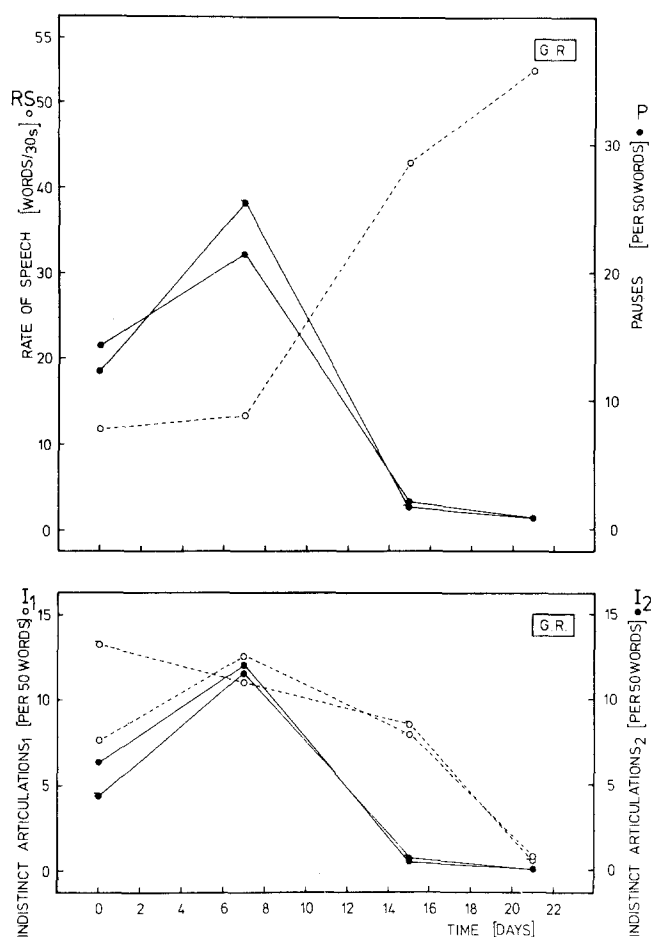


Fig. 5. Rate of speech, frequency of pauses, and frequency of indistinct (I_1) and incomprehensible (I_2) words as a function of time in a patient with massive bleeding into the left thalamus and internal capsule

12 days. This is much faster than in the preceding cases. There was a corresponding decrease of pauses and of indistinct articulations. Aphasic disturbances (Fig. 6), predominantly literal paraphasias and disturbances of word finding, remained relatively constant during the period of observation. The ratio of subordinate clauses divided by principal clauses was higher in the beginning than later on. There was a disturbance of orientation and a slight degree of depression, both of which normalized during the observation period.

Comparison of the data of a patient with hypomania and a patient with involutional depression shows a lower speech rate and a higher pause index in depression (Fig. 7). A higher subordinate:principal clause ratio and a higher frequency of thought disconnections is found in the interview of the hypomaniac patient (Fig. 8). Melancholic utterances are frequent in the depressive patient. Only one dysphoric utterance was rated in the interview of the patient with hypomania (Fig. 9).

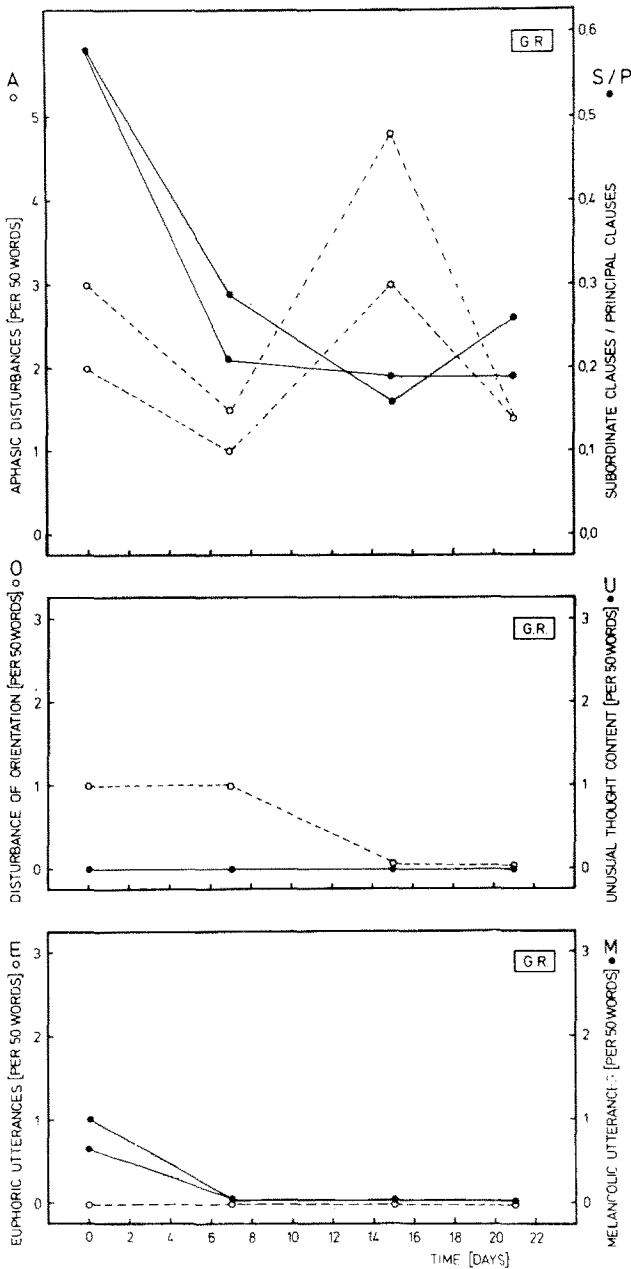


Fig. 6. Subordinate:principal clause ratio, frequency of aphasic disturbances, of utterances indicating a disturbance of orientation and unusual thought content, and of euphoric and melancholic utterances as a function of time in the same patient with massive bleeding

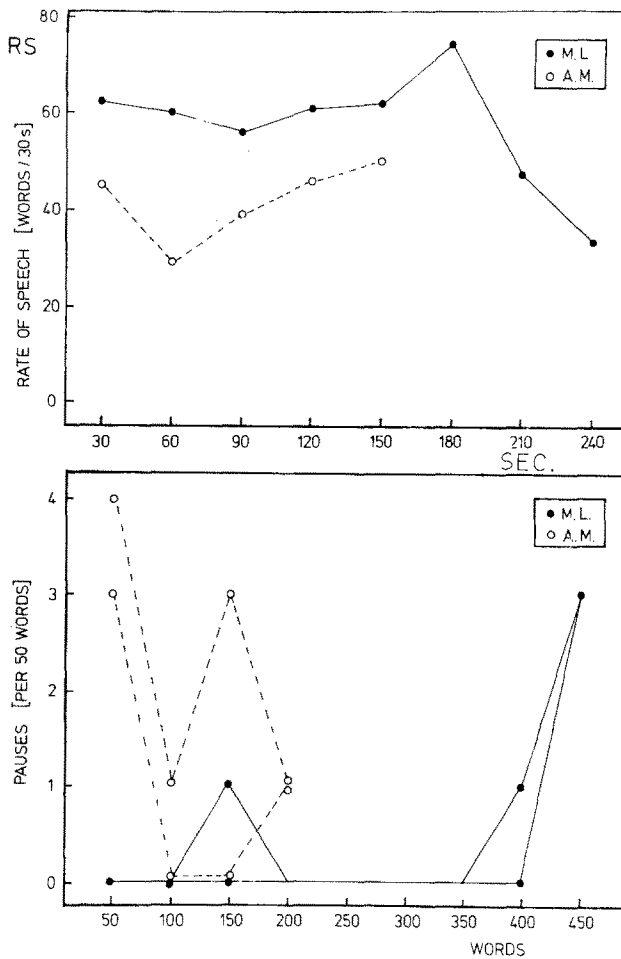


Fig. 7. Upper part: rate of speech as a function of time during one interview in a patient with hypomania (M.L.) and a patient with involuntal depression (A.M.). Lower part: frequency of pauses during one interview in the same two patients

Conclusions

From these preliminary results the following conclusions can be drawn:

- 1) The method used to evaluate speech and language is simple and practicle. A time of 40 to 60 min is sufficient for the rating of one interview.
- 2) Inter-rater reliability is relatively high.
- 3) The application of the indices used yields patterns which give a concrete characterization of the patient's speech and language behavior.
- 4) The course of these changing patterns can be followed by use of the method.

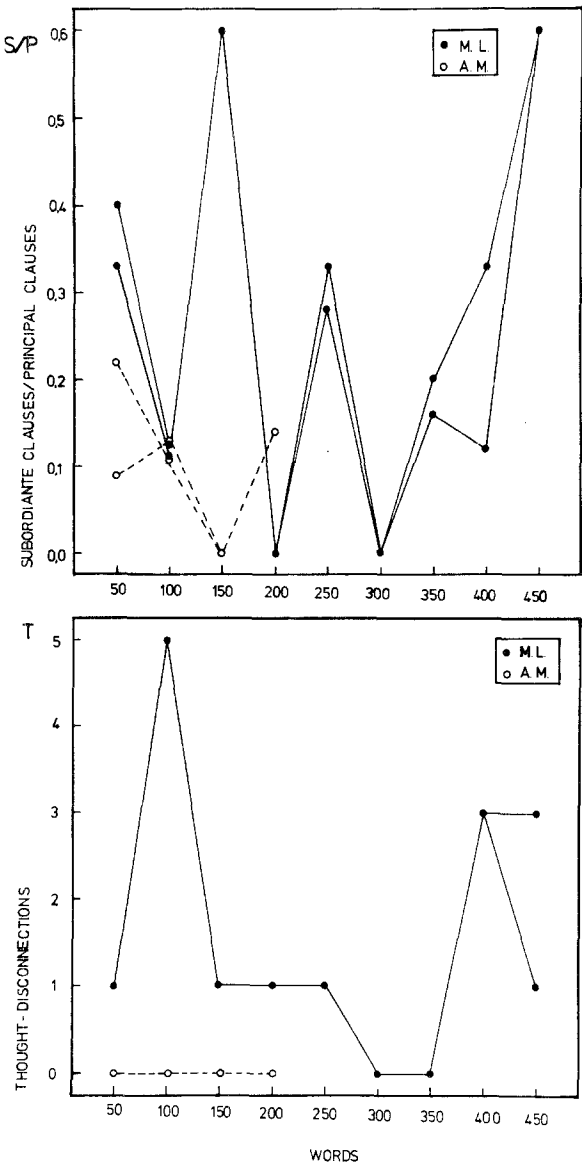


Fig. 8. Subordinate : principal clause ratio and frequency of thought disconnections during one interview in the same two patients with affective disturbances

The method may be useful in evaluation of the relationship between the underlying organic lesions and the neuropsychological disturbances. Furthermore it might play a role in psychopathological as well as biologic-psychiatric investigation of endogenous psychoses. Although the indices used represent a relatively rough approach to the problem, their advantage lies in the quantitative measurement of change in different variables, thus leading to hypotheses on the functional organization of speech and language in the brain.

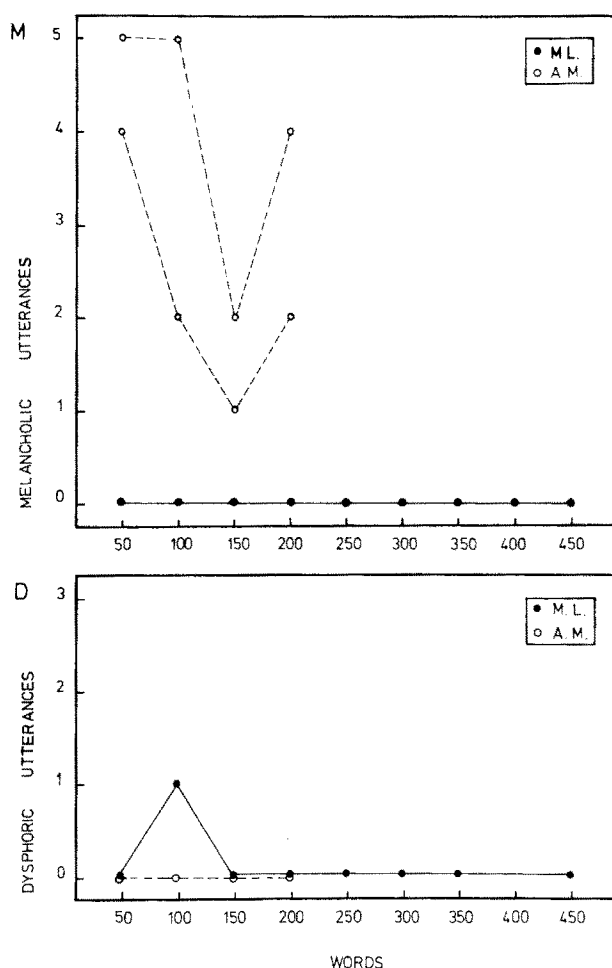


Fig. 9. Frequency of melancholic utterances and of dysphoric utterances during one interview in the same two patients with affective disturbances

Acknowledgement. Thankful appreciation is given to Dr. D. v. Cramon for his very constructive criticism and support of the present work. Furthermore, we thank Prof. Dr. D. v. Zerssen for fruitful discussions and suggestions. We are indebted to Mrs. J. Dinkel, Mrs. H. Goller, Miss B. Schultz, and Miss A. Wendl for their valuable technical assistance.

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Received January 10, 1978