

Applying multiple computerized text analytic measures to single psychotherapy cases

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Introduction

- This is an in-depth analysis of a psychodynamic oriented short term psychotherapy. The patient is a young male student, his therapist is a male psychoanalyst in his forties. These two make up what Luborsky calls a therapeutic alliance.
- But there was more: A third person, the girl friend of this patient joined the patient after two thirds of the treatment for one session.
- The analyses given here focus around this event and present both, the therapeutic dyad and the "extramural" triad which, at this very moment, became "intramural".

2.1 Clinical material

- The treatment with a total of 29 sessions within 9 months took place in the out-patient clinic of Ulm University. Except session no. 23 all of them have been audio- and video- recorded.
- In addition two catamnestic interviews, eight months and another year after, were recorded. All of these sessions have been transcribed and stored in a computer file. For research purposes they are available as both, edited and printed in two volumes or on diskette as text file.

2.2 Computer assisted measures

- Starting from a semiotic view, language is understood as a system of symbols whose structure is determined according to rules based on the relationship between form and content. Accordingly, it is possible to distinguish *formal*, *grammatical*, and *substantive* measurements.
- Each of these can be further subdivided according to whether it can be applied to a speaker's text or to the entire speech activity in a dialogue. It is therefore possible to speak of *monadic* or *dyadic* values for any of these types of measurements and data, and to use these measures in empirical studies, such as detecting state related repeating patterns of an individual's discourse.

Formal, grammatical and substantive measures

- Of the analyses that might be considered formal, the best known are simple frequencies of occurrence, which form the basis for ratios and distributions.
- A good and already well known example may be a patient's variability in his vocabulary which is known as Type-Token Ratio (Johnson, 1944) and can be seen as the ability to generate new words in the course of a therapy session or even in the course of a total treatment. Speech variability is calculated by dividing the number of different words (types, vocabulary size) by the total number of words (token, text size) in a given text.
- Herdan (1960) proposed the logarithmic type-token ratio which was found to be constant for text samples of various length. We will refer to this measure later on as *gamma*

Verbal versatility

- According to Holsti (1969 p.75) "the hypothesis that speech variability increases with successful therapy has generally been supported". While in psychotherapy research the type-token ratio has not been used that often within the last decades, there has been some activity in literary research at the end of the eighties (Baker, 1988; Simonton, 1990).
- In the context of psychotherapy research a patient's increasing power of verbal versatility may be interpreted as a sign of working through and improvement and thus as an objective measure for psychotherapeutic process in both macro- and microanalytic perspectives.
- Of course, transcription standards are essential if such a measure is to be applied reliably; much depends on what a word is defined as, what spelling is used, what markers may be used, and so on.

Redundancy

- Other interesting formal aspects of discourse might be revealed by information theoretic approaches. Spence (1968) brought up these concepts into psychotherapy research.
- Kächele and Mergenthaler (1984) demonstrated in a single case study the increase of the patients redundancy in the course of a five year lasting psychoanalysis as predicted according to one of Spence's hypotheses.
- A higher redundancy may become interpreted as a greater amount of inner freedom a neurotic patient may experience opposed to a rather depressive state when redundancy decreases. Although redundancy and type-token ratio tend to be negative correlated in many text types, mathematically seen they also could otherwise.

Speech disturbances

- Another formal analysis is measurement of speech disturbances, including production of broken words, broken thoughts, repetitions of words or fragments, stuttering, and use of specific interjections and particles.
- Such dysfluencies may occur in connection with warded-off material and have proved to be clinically sensitive (Mahl, 1956).

the characteristic vocabulary

- A qualitative rather than quantitative approach is obtained with computation of the characteristic vocabulary. When applied to patient's and therapist's speech it yields all words which have been used significantly more or less often by one speaker compared to the other.
- Correspondingly it can be used for the set of characteristic words before and after a significant event in a sequence of therapy sessions.
- Another interesting set of words is the common vocabulary, i.e. all words shared by both patient and therapist. These vocabularies can be examined in a variety of ways, including comparison of their constituent words, sizes, and changes over time.

Grammar

- An example of a grammar oriented measure is part of speech distribution.
- Part of speech distance characterizing the similarity/disimilarity of therapist and patient use of parts of speech can be calculated using chi-square statistics. This is a clearly dyadic measure which is usually out of control from the participants in some discourse. It is expected, that as a consequence of the therapeutic alliance, part of speech distance will decrease in the course of a treatment.
- Specific events, like a third person coming into the dyadic situation as in the study described here, may have significant effect on this variable (Mergenthaler 1990).

Dictionaries

- Among the substantive measures, content analytic dictionaries have been applied to study several areas of interest: Affective language, anxiety themes, regressive imagery, emotional tone, abstractness, concreteness, vagueness and more.
- These dictionaries may be used for classification purposes not only in longitudinal studies as this one is, but also in transsectional ones by calculating the frequency distribution of these categories or possible subcategories. They can also be used as screening instruments to locate moments of interest in a therapy session or to locate outstanding sessions in a series of transcripts, which might then undergo more detailed analyses.

2.3 Language dependent aspects of text analysis

- While formal measures are language independent, grammar based approaches like part of speech distance need language specific techniques.
- At Ulm Textbank this has been done for Martindale's Regressive Imagery Dictionary (Martindale 1975).
- Others have been developed independently in either language (Emotional Tone). Some are available in one language only (Anxiety Themes Dictionary, German; Referential Activity, English; Affect Dictionary, German).

3. The case

- The 25 years old student presented himself in the initial interview with obsessional symptoms of mild, but longstanding character.
- The need to control certain things, the fear of having lost something or the fear not having locked the doors of his car, was most prominent whenever he had to enter a house. When still a student of law he had difficulties performing his homeworks and felt hampered maintaining adequate social contacts.
- Changing the subject of his study to social work implied returning to his home town. There he began to live with a woman a few years older than him. A four year old son who came with his girl friend gave him the opportunity to play the role of a father that would treat this boy better than his own father had treated him.

Biography

- He was the youngest of four children, his mother felt overworked most of his childhood years with his father caring more for his cars than his kids. The symptom first occurred when he was trapped by elder kids and experienced a strong feeling of helplessness and humiliation. His social involvements always had been rather weak, especially avoidant he was in situations where open aggressiveness was asked for; only when playing chess he could play out his intellectual superiority.

Psychodynamics

- The presenting picture psychodynamically could be understood as expression of an unresolved oedipal longing for getting passive support by fatherly figures which was substituted by a regressive depending relationship to the girl friend. Other aspects of the dynamics pointed to intense feelings of sibling rivalry especially with his older brother whom the patient tried to follow when studying law. A pervasive pregenital longing for anaclitic, caring experiences was prominent in his envy for the boy being looked after by his mother.

Indication: focal therapy

- Weighing the differential importance of the three major areas of conflict the negativ-oedipal conflict was thought to be most pervasive. A focal dynamic short term therapy was indicated limited to 30 sessions duration.

Course of treatment

- The course of treatment was characterized by the patients undisguised demand for identificatory closeness to the male therapist trying to get on an equal footing with the therapist perceived - not unrealistically - as professor to be in an superior position.
- As reaction to the treatment the tensions in the couple became more pronounced, the patient even considering separation to reconnect himself to more adolescent life with peer group involvement. In order to bring to the open the couple issues the therapist initiated with the patient consenting eagerly that the girl friend should attend a session.

Turning point

- This session Nr 20 led to a more pronounced verbalization of the conflicting aims of the patient who from then on increased his peer relations.
- At termination the obsessive symptomatology had decreased considerably though not disappeared completely.
- The patient felt that the treatment could have lasted longer.

Follow-up Interviews

- At the first follow-up interview eight months later the patient reported, that he had separated from his girl friend and for financial reasons had returned to his parents house. He felt relieved to be back to a more normal, more adequate life style.
- At the second follow-up another year later the patient had started to work and demonstrated a distinct quality in handling aggressive interactions especially with superiors.
- Another two years later at a telephone interview the patient proudly announced a marriage with another woman and the birth of his own son. So the short term intervention had helped the patient to rearrange his course of life.

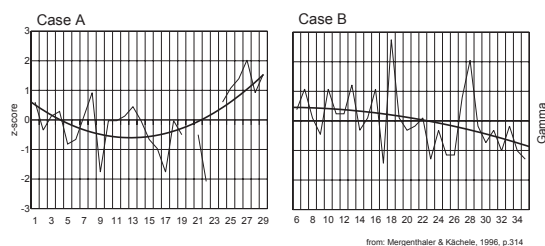
4. Analysis of transcripts

- In the following analyses the girl friends participation in session no. 20 will be treated as a special event. The statistical tests are chosen in order to test the hypothesis, that this event marks a turning point in the therapy.
- The nature of the data used in this study did not allow for a time series analysis following the SARMA model (c.f. Box and Jenkins). Correlation coefficients separate for sessions 1 through 19 ($r(b)$, b = before) and 21 through 29 ($r(a)$, a = after) have been calculated instead of and tested for differences by means of a z -transformation.
- In graphical representations a simple regression has been used for both periods separately. Furthermore, because there has been a two and a six weeks interrupt due to vacation, graphical representations will show the number of weeks in treatment rather than session numbers on the horizontal axis.
- The triadic session thus took place in the 27th week of treatment.

4.1 Patient's speech variability

- The type-token ratio and Gamma (logarithmic type-token ratio) have been calculated for each session and analyzed for correlation with text size.
- Whereas the type-token ratio clearly turned out to be dependent from text size ($r=-0.60$, $p<0.01$) Gamma was not ($r=-0.20$, n.s.). The differences in the correlation coefficients have been confirmed ($z=1.68$, $p<0.1$). So Gamma has been taken for the further data analysis.
- The flow of Gamma for the patients speech is shown in figure 4.1.
- While the first two thirds are characterized by a moderate decline the sessions after the critical event show a steep increase in the patients variability of speech. The differences of both correlations are highly significant ($z=2.83$, $P<0.01$).

4.1

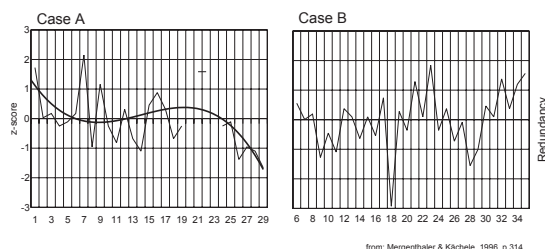


Gamma, defined as the logarithmic type-token ratio

4.2 Patient's speech redundancy

- Back to our data (figure 2), we now can specify session 5 through 9 and 14 through 19 as high redundant ones whereas around session 9 we have a baisse.
- An interesting aspect is, that the big shift in speech variability Gamma after the significant event is not that prominent in the redundancy measure.
- We can observe however, a fairly low level from session 24 through 28. It seems that this patient is doing his therapeutic work there and not in the majority of the before-sessions except session 12 which would be worth to have a closer look at.

4.2

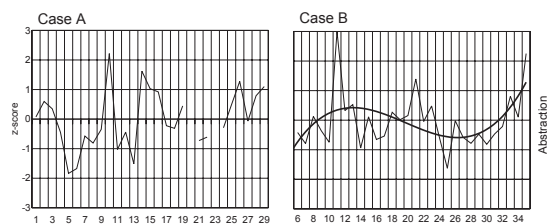


Redundancy, measured as first-order redundancy and thus mirroring the amount and distributin of repeated words in a session

4.3 Abstractness

- The number of abstract words (figure 6) is increasing within the whole period of psychotherapy.
- But only in the last third this is statistical significant.
- Abstracting usually is a necessary linguistic tool when reflecting, discussing, and describing complex interactions.
- Thus this measure shows what Gamma and Redundancy already did, namely the increasing mental activity of this patient after having had a joint therapy session with his girl friend.

4.3



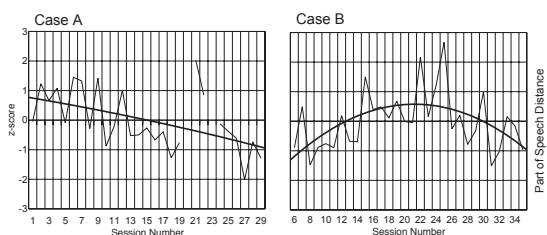
from: Mergenthaler & Kächele, 1996, p.314

Abstraction, as measured by the proportion of words with endings such as -ity, -ness, -nce, -ment, -any, -ncy, -ship, -dom, -ing, -ion, and their plural forms.

4.4 Part of speech distance

- Use of parts of speech is a grammatical measure and independent from the formal measure Gamma and Redundancy. What it shares with them is the mere fact, that humans do not control these variables when talking to each other. They hardly could, even if they would like to do so.
- On the other hand, partners in a dialog influence each other and so we can derive diadic measures from them.
- Part of Speech Distance thus will give us an idea of how much patient and therapist assimilate towards each other. A good working alliance would be accompanied with less distance and a "collaborative" behavior on behalf of both. This means, both would change their vector of part of speech classes towards that one of his partner.

4.4



from: Mergenthaler & Kächele, 1996, p.314

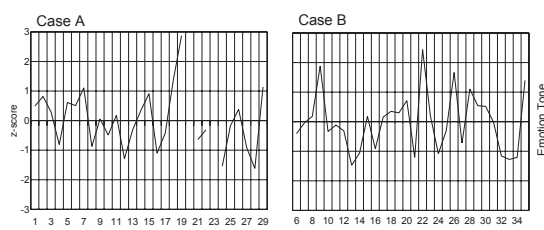
Part of speech distance, calculated as follows: first, for each session the relative frequency for each of the 13 classes of part of speech were computed for both patient and therapist. Then these frequencies were used as an input to Pearson's chi square statistic for a 2 x 13 table. Relative frequencies were used rather than the more usual absolute frequencies in order to have a measure that is independent from the number of words spoken by patient and therapist.

a surprising result

- The two phases are clearly observable as here as well (figure 3). But the patient seems to be a passive one until session 20.
- Thereafter he starts out to react on his therapist. This is the only measure we have discussed up to now, which also yielded significant findings for the therapist (figure 4). Although the patient has constant behavior before session 20, the therapist shows a clear assimilation towards his patient.
- The impact of the triadic situation is a sudden draw back to values as in the very beginning of the therapy, but then a very rapid assimilation. Now, however, from both in an active way. These findings fit well into what we would expect for a successful treatment.

4.4 Emotional Tone

- Figure 5 gives the distribution of emotion words over the course of the treatment. Not eyeballing nor statistical calculation gives raise to argue, that before and after session 20 the patients behavior would be different. Remarkable is, however, a lower mean in the second phase.
- This may be consistent with Gamma and Redundancy, which indicate working through. This usually better is done in a non emotional state.
- On the other hand, the higher emotional level in the first two thirds may indicate, that the patient was not able to become distant to the symptoms he was suffering from.



An **Emotion Tone Dictionary**, used to calculate the proportion of emotion-related words within a session.

from: Mergenthaler & Kächele, 1996, p.314

5. Discussion

- Various computer assisted measures which are different in nature have been applied to the transcripts and gave convergent findings for the patients speech.
- The only dyadic measure among these, part of speech distance, additionally was sensitive to the therapists linguistic behavior.
- All of them reveal quite clear, that the specific event of the third party session had profound impact on the therapeutic process.
- Furthermore they indicate, that this case might be seen as a successful one. This is consistent with the contents of the catamnestic interviews.