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**Computer Aided Methods in Psychotherapeutic  
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Roussos, Andrés J. ,  
Mergenthaler, Erhard y Gril, Sylvia

**Departamento de Investigaciones**  
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Universidad de Belgrano  
Zabala 1837 (C1426DQ6)  
Ciudad Autónoma de Buenos Aires - Argentina  
Tel.: 011-4788-5400 int. 2533  
e-mail: [invest@ub.edu.ar](mailto:invest@ub.edu.ar)  
url: <http://www.ub.edu.ar/investigaciones>

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## Introducción

### Informe de actividades

Entre los meses de abril y julio fui invitado a realizar un entrenamiento de post-grado en la Universidad de Ulm en Alemania, becado por el Servicio de Intercambio Académico Alemán (D.A.A.D. Deutscher Akademischer Austandiest).

Mi actividad a lo largo de este entrenamiento consistió en tareas de investigación sobre psicoterapia, realizándose una serie de estudios piloto, sobre análisis de la narrativa de pacientes en distintos tipos de tratamientos psicoterapéuticos.

Estos estudios conformaron una investigación sobre la metodología utilizada en dicha Universidad; el objetivo de los mismos apuntaba al conocimiento de la validez y confiabilidad de la misma.

Esta metodología toma como eje el análisis del discurso de pacientes o solicitantes de psicoterapia, utilizando la asistencia de computadoras para tal fin.

Dentro de los trabajos realizados a lo largo de esta práctica se incluyen las adaptaciones necesarias para el uso de esta metodología en idioma castellano, habiéndose comenzado el desarrollo de diccionarios técnicos y las distintas pruebas necesarias para el uso del software en investigaciones en nuestro idioma.

Los resultados de estos estudios realizados fueron presentados en el IV Foro sobre Investigación en Psicoterapia, organizado por el Capítulo Sudamericano de la S.P.R. (Society for Psychotherapy Research), realizado en Buenos Aires en el mes de Octubre de 1996.

En este momento se encuentran en preparación equipos de investigación, que permitan el desarrollo de las tareas iniciadas.

Esta línea de investigación cuenta con el soporte metodológico de la Universidad de Ulm.

Antecedentes del Instituto de Psicoterapia de la Universidad de Ulm:

El instituto de psicoterapia perteneciente a la Universidad de Ulm es un centro donde se realizan tareas de atención psicoterapéutica, tanto a población en general como a alumnos de dicha Universidad.

Su director, el Profesor Dr. Horst Kächele, es un eminente psicoanalista que ha participado a nivel internacional de actividades de investigación, y en la conformación de equipos internacionales orientados tanto en el estudio del proceso psicoterapéutico como de formación de profesionales para atención y tareas de investigación.

## Computer Aided Methods in Psychotherapeutic Research

### Summary of activities

The activities were divided in three parts:

An advance report was done about these parts, showing the different results obtained in each case.

The different parts are completely related conforming a whole. The division is only a functional way to show the sequence of the studies and the specific objectives of each one.

### First part

Introduction readings on the Computer Aided Methods was done.

### List of bibliographical material:

- \* Mergenthaler (1996) Computer Assisted Content Analysis
- \* Mergenthaler & Kächele (1996) Applying Multiple Computerised Text Analytic Measures to Single Psychotherapy Cases. *The Journal of Psychotherapy Practice and Research*
- \* Mergenthaler, E. (1996). Emotion-abstraction patterns in verbatim protocols: A new way of describing therapeutic processes. *Journal of Consulting and Clinical Psychology* 64: 1306-1318.
- \* Mergenthaler E, & Gril S, (1996) Descripción de las reglas para transcripción en psicoterapia- *Revista de Psicología Clínica*.
- \* Bucci, W. Converging Evidence for Emotional Structures: Theory and methods
- \* Bucci, W. et al. (1992) *Scoring Referential Activity*, Instructions for Use With Transcripts of Spoken



Narrative Texts. Ulmer Textbank.

These readings were an introduction to the «Therapeutic Cycle Model» developed by PD. DR. Erhard Mergenthaler, Director of the Informatics Section for Psychotherapy of the Psychotherapy Department of Ulm University.

Transcription rules to the addition of clinical sessions transcriptions into a data base as the UTB (Ulm Text Bank).

Spanish session interviews were transcribed according to these rules. It was the first opportunity that clinical material in this language was prepared to be analyzed by this kind of system.

Specific software called TAS was used for the analysis of this material.

The TAS, «Text Analysis System» is a computer aided system, specifically conceived for applications in the field of psychotherapy research. This program offers many different ways to investigate verbatim transcripts.

In this case it was utilized to identify key moments in transcripts from psychotherapy sessions. (The term key moment refers to one or more sessions of a treatment or to segments of a session which are seen as clinically important.)

It was necessary to develop Spanish dictionaries following specific criteria in their preparation for this language.

We started to develop:

-The Spanish Emotional tone dictionary:

Used to find the words related to emotional aspects during a psychotherapy session.

-The Spanish abstraction dictionary:

Used to find the words referred to abstraction aspects during the conversation of a session.

Therefore we had to adapt the suffix dictionary from Bucci, to the generation of this dictionary.

-The Spanish bodily dictionary:

Used to measure the amount of words related with bodily aspects, like the references of parts of the body, bodily activities (breath or eat) or bodily diseases.

This group of dictionaries was utilized for analyzing the clinical material in Spanish, likewise a general utilization in Spanish texts will be possible when the development of the dictionaries is concluded.

A research design using the text analysis techniques was done, with the assessment of the Informatics Department of the Psychotherapeutic Institute of Ulm University.

General information in Report 1

## **Second part**

A group of pilot studies was developed to learn about the reliability of the techniques in Spanish language.

These studies were done with a close co-operation of Psychologist Sylvia Gril from the Universidad de la República, Montevideo, Uruguay, present at Ulm with a DAAD's grant during this work.

We worked under the supervision of PD. Dr. E. Mergenthaler with whom we discussed our studies in daily meetings and who gave us necessary tools to develop them.

The report and the results of these studies was presented in a scientific meeting in October 1996 (the South American IV Chapter of the Society for Psychotherapy Research) with the co-authorship of PD Dr. Erhard Mergenthaler.

General information in Report 2

### **Third part**

A statistical analysis was developed and completed to measure the inter-rater reliability of different judges.

A Spanish dictionary about the Referential activity was developed. Different studies were necessary to learn about the reliability of this dictionary for measuring the referential activity

General information in Report 3

During these three studies a special program (TAS) for text analysis was applied, which was designed by Erhard Mergenthaler at the Informatics Section on Psychotherapy of the Psychotherapy Department of Ulm University. I have learnt the text analysis theory and practical usage of these programs. I intend to use these programs in Buenos Aires and to continue developing new Spanish Dictionaries for psychotherapy research.

## I First report

### **I a. Objective:**

This exploratory project is aimed, as a general objective, at finding out the way in which the therapeutic treatment designs are made. It was intended to detect patterns of action that show what kind of elements support these indications.

The starting point was the hypothesis that there is a degree of correlation between the type of material that the patient offers in his first interview and the type of treatment design made by the admitting therapist or team.

For this study we take a specific aspect to distinguish between different types of psychotherapy, as well as the time duration of the treatments.

Regarding this characteristic we can observe a group of different types of psychotherapy treatments

Three basic designs offered by the therapist is admitting team are short term, middle term, and long term therapy.

Sections of first interviews were transcribed from the recordings to carry out this study. These transcriptions consist of first interviews for admission to psychotherapy; the length of each section doesn't exceed 5 minutes.

### **I b. Definitions**

The patient speech shows different characteristics able to be analyzed. For this work we choose the techniques of «The therapeutic Cycles Model» (Mergenthaler 1993). This method analyzes the speech, detecting the use of words in terms of abstraction or emotional tone.

«Emotion in the course of a psychotherapeutic treatment can be experienced physiologically but also mentally and communicated verbally. The method restricts to indicators of emotion as they can be observed in transcripts» (Mergenthaler, 1996).

The concept emotion is understood as «emotional tone of a text» thus utterances or words will be observed that are suitable to verbally express emotion.

Abstraction linguistically seen is the ability to build abstract terms out of concrete concepts by performing a morphological transformation on single word forms (being tender- tenderness).

It is assumed that Abstraction and Emotion vary in intensity and that it will be possible to measure this flow. The possible combinations of Emotion Tone and Abstraction as expressed in language have clinical significance.

The quantitative dimension of Emotion Tone and Abstraction allows to differentiate at least four classes which Mergenthaler (1993) referred to as Emotion-Abstraction Patterns.

The resulting four patterns are:

Pattern A RELAXING: Low Emotion Tone and low Abstraction.

Patients talk about material that is not manifestly connected to their symptoms or issues. Their stance of speaking is rather describing than reflecting. Also it is a state where patients return to as often as they need to prepare themselves for the next step of the therapy.

Pattern B REFLECTING: Little emotion tone and much abstraction.

Patients present topics with a high amount of abstraction and without intervening emotions. This may be an expression of defense known as intellectualizing.

Pattern C EXPERIENCING High emotion and little Abstraction.

Patients find themselves in a state of emotional experiencing. They may be raising conflictual themes and experiencing them emotionally.

Pattern D: CONNECTING: High emotion tone and much Abstraction.

Patients have found emotional access to conflictual themes and they can reflect upon them. This states marks a clinically important moment, a key moment. Patients who will not succeed in connecting Emotion Tone with Abstraction during their therapy are not likely to improve.

### I c. Types of psychotherapy

#### **Individual therapy - short term:**

Principally this kind of psychotherapy tries to provoke a behavioral change to resolve conflicts.

This therapy has features well defined as a focalized character, avoidance to try to touch other kinds of problems besides the specific issue.

This conflict is usually determined at the beginning of the therapy, usually because the patient considers important his issue or because his environment has this belief.

Approximate duration: between 20 and 30 sessions, or between 1 month and 3 months.

#### **Individual therapy - middle term**

This therapy aims at the resolution of a limited group of problems that the patient or his environment shows before the treatment.

The difference between the short term and the medium term treatments is the purpose with the latter to work with the problems in a related way and not in an isolated form like with the short terms treatments.

The possibility for the psychotherapy action will increase, but it will always keep the specific objectives of this kind of therapy.

Approximate duration: between 30 and 60 sessions or between 3 months and 6 months

Individual therapy - long term

Doesn't have any specific previous focus to resolve before the beginning of the therapy.

The actions are directed to the different materials that the patient offers throughout the treatment.

This kind of treatment needs a great ability for insight (depending of the diagnosis) and certain possibilities to sustain the different situations provoked by the changes into the therapy.

Doesn't have a limited time or limited number of sessions.

#### I d. Methodology

A sample of the first five minutes of eleven sessions with different patients was evaluated before the development of the dictionaries.

Having only the definitions of the types of language tones two different judges did the evaluation of these cases. The aim of this activity was to find out if these sessions had predominantly an emotional or an abstraction language.

#### Analysis

**Table 1**

Types of psychotherapy	Nº of Words	Emotion words	Abstraction words	Bodily words	mean Emotion words	mean Abstraction words	mean Bodily words
unknown	630	21	20	0	3.333	3.175	0.000
short term	756	19	7	3	2.513	0.926	0.397
medium term	823	35.	13	3	4.253	1.580	0.365
medium term	725	16	16	1	2.207	2.207	0.138
medium term	572	24	21	0	4.196	3.671	0.000
medium term	841	32	10	3	3.805	1.189	0.357
medium term	781	21	13	19	2.689	1.665	2.433
long term	601	32	13	3	5.324	2.163	0.499
long term	835	18	10	1	2.156	1.198	0.120
long term	516	20	8	13	3.876	1.550	2.519
long term	837	17	6	1	2.031	0.717	0.119
long term	753	20	18	0	2.656	2.390	0.000
long term	392	14	13	0	3.571	3.316	0.000
long term	309	6	7	4	1.942	2.265	1.294

**Table 2**

Z score Emotional	Z score Abstraction	Z score Bodily	Emotion Abstraction pattern	Bodily pattern
1.542	-0.657	0.139	Experiencing	HIGH
-1.131	-0.116	-0.665	Relaxing	LOW
0.103	-0.116	1.041	Experiencing	HIGH
0.720	-0.477	-0.965	Experiencing	LOW
1.748	-0.657	0.985	Experiencing	HIGH
-0.514	-0.116	0.602	Relaxing	HIGH
0.103	2.771	-0.492	Connecting	LOW
0.103	-0.116	2.091	Experiencing	HIGH
-0.514	-0.477	-1.015	Relaxing	LOW
-0.925	1.689	0.672	Reflecting	HIGH
-1.336	-0.477	-1.137	Relaxing	LOW
1.131	-0.657	-0.405	Experiencing	LOW
0.103	-0.657	0.373	Experiencing	HIGH
-1.131	0.064	-1.224	Reflecting	LOW

**Table 3**

	Classification TAS	Classification judge 1	Agreement judge 1 & TAS	Classification Judge 2	Agreement Judge 2 & TAS	Agreement among judges & TAS
1	Emotion	Emotion	agreement	Abstract	disagreement	disagreement
2	Abstract	Bodily	disagreement	Emotion	disagreement	disagreement
3	Abstract	Abstract	agreement	Abstract	agreement	agreement
4	Abstract	Abstract	agreement	Abstract	agreement	agreement
5	Bodily	Abstract	disagreement	Emotion	*	disagreement
6	Emotion	Emotion	agreement	Emotion	agreement	agreement
7	Bodily	Bodily	agreement	*	*	*
8	Emotion	Emotion	agreement	Emotion	agreement	agreement
9	Emotion	Emotion	agreement	Emotion	agreement	agreement
10	Emotion	Bodily	disagreement	Emotion	agreement	disagreement
11	Bodily	Abstract	disagreement	Emotion	*	disagreement
12	Abstract	Abstract	agreement	Abstract	agreement	agreement
13	Abstract	Abstract	agreement	Abstract	agreement	agreement
14	Abstract	Abstract	agreement	Abstract	agreement	agreement

\* The second judge didn't use the bodily classification in this study

**Table 4**

Agreement among the different judges and the tone classifications

Cohen-Kappa Coefficient	TAS & JUDGE 1	TAS & JUDGE 2	JUDGE 1 & JUDGE 2
General Correspondence	.5520	.6333	.4407

**Table 5**

Pearson Correlation Matrix about the Z-scores of the different tones

Number Of Observations: 14

	Z score emotion	Z score abstract	Z score bodily
Z score emotion	1.000		
Z score abstract	-0.278	1.000	
Z score bodily	0.334	0.008	1.000

In this table we can observe a negative correlation between the score of the emotional tone and the abstract tone, therefore the value is not significant.

The same happens with the relation between the emotional and the bodily tone, the score isn't enough to relate both tones, while between the abstraction language and the bodily tone the relation is almost null.

### I e. Conclusions

- \* The correlation degree between the type of psychotherapy treatment and the emotion abstraction speech showed by the patients is not significant.

This result doesn't allow saying anything about the possible relations between the treatment design and the speech characteristic in terms of emotion tone or abstraction languages.

The possible reasons could be that the first 5 minutes of sessions do not present enough material to be used in a correct way for the Computer Aided Methods in Psychotherapy Research or for the dictionaries.

- \* Likewise these sections belong to the beginning of interviews showing a very low level of abstraction words. This could have an effect on the type of presentation that the patient do of his/her own problems.
- \* The agreement degree amongst the clinical judges and the TAS's was very high, showing the utilization of these techniques in Spanish language a very interesting issue to be explored.
- \* The degree of correlation observed amongst the dictionaries (table 5) was not significant.

The clinic material of this study was provided by Clínica Aigle from Buenos Aires, Argentina.

## II Second report

Approach to a computer aided method in psychotherapy research.

### II a. Objective

This study aims to show some results of our approach to a Computer assisted content analysis in the field of the psychotherapy process research.

The therapeutic Cycles Model was developed by Erhard Mergenthaler of Ulm University.

This method was originally developed to be applied to English transcripts.

As a specific task we decided to study the correlation between the clinical evaluation of sessions and the results of the data analysis of the referred methodology, trying to know about the validity of this methodology.

### II b. Theoretical background

The Emotion - Abstraction pattern and the resulting therapeutic Cycle is a method that is able to identify key moments in transcripts from psychotherapy sessions. The term key moment refers to one or more sessions of a treatment or to segments of a session which are seen as clinically important. (Mergenthaler, 1996)

According to the central importance of emotion in the psychotherapeutic process, it is assumed that the presence of Emotional Tone is one necessary prerequisite for the emerging of «key moments». The other one is Abstraction as a construct leading to the development of understanding and perception (Piaget, 1977).

This method analyzes the speech, detecting the use of words in terms of abstraction or emotional tone.

For a description of the emotional tone and the abstraction language, see paragraph 8 page 7.

For the location of the words which show the different tones, the method includes the development of Dictionaries. These dictionaries are currently available in German and English languages.

#### II b.1. The Emotion tone Dictionary

This dictionary initially was compiled from various word lists taken from literature. In particular there were the inputs of the category Emotion from Colin Martindale's Regressive Imagery Dictionary, (1975), the Vocabulary of Emotions from Storm & Storm (1987) and the Affective Lexicon from Clore (1987). Later on, more words were added.

Words meeting certain exclusion criteria were deleted from the dictionary as words with concrete aspects of sensory reference.

Only words which can be classified into at least one of the following dimensions will be included in the dictionary:

pleasure-displeasure  
approval-disapproval  
attachment-disattachment  
surprise

## II b.2. The Abstraction dictionary

In German and English language this dictionary was primarily obtained through a suffix analysis of all words. The use of specific endings (e.g. -ness, -ity) is typical for abstract word forms. It correlates significantly with the classification of texts by judges regarding the construct of abstraction. (Gillie, 1957).

It is assumed that Abstraction and Emotion vary in intensity and that it will be possible to measure this flow. The possible combinations of Emotion Tone and Abstraction as expressed in language have clinical significance, leading to the hypothesis that for a key session or a key moment the temporal coincidence of Abstraction and Emotion tone is a necessary condition. The quantitative dimension of Emotion Tone and Abstraction allows to differentiate at least four classes which Mergenthaler referred to as Emotion-Abstraction Patterns. Graphically they are represented as a combination of z-scores for Emotion Tone and Abstraction.

This method states that therapeutic process takes place stepwise in a sequence of states called Relaxing Experiencing, Connecting, Reflecting and Relaxing.

## II b.3 Patterns

The system considers significant patterns to be those showing values between -1 and 1 standard deviation.

The Therapeutic Cycle Model describes five phases that show how the therapeutic process takes place. These phases are:

Phase 1. Starting point is pattern A (Relaxing) moments where patients do not show much emotion or abstraction. They find themselves in a relaxed state, in a transitional state from one theme to another, or they are associating freely.

Phase 2: After a while emotion increases and pattern C (experiencing) will show up.

This shift can be initiated by having reported a narrative (dream, early memory) or by reporting on the symptoms they are suffering from. Patients at this time are in a state of emotional experience.

Phase 3. Ideally then the amount of reflecting will increase, either by patients own impetus or guided by therapist. Patients will reflect their recent emotional experience and thus reach at emotional insight. They are in a state of connecting Emotion tone and Abstraction showing up as pattern D (connecting)

Phase 4. As a consequence of the insight processes the emotional tension will decrease. Patients can reflect upon their new experience without being bound to emotional constraints. Pattern B (Reflecting) will show up.

Phase 5: Finally reflection will fade out as well. The cycle ends with the state of Relaxing (pattern A) which shortly after can lead to the emergence of a new cycle.

The therapeutic Cycles Model allows for both, a macro-analytic view over the course of a treatment (key sessions will show up with the pattern D -Connecting), and for a micro-analytic view describing the flow within a session (it is not expected to find that the Therapeutic Cycle occurs frequently or repeatedly within a session nor to find one in every session).

The application of this scientific approach depends on the development of suitable software. The Text Analysis program (TAS, Mergenthaler 1993), was specifically conceived for applications in the field of psychotherapy research and offers many different ways to investigate verbatim transcripts. Thus analysis can be performed separating patients' and therapists' speech, but also as a total text without this distinction. Analysis can be done for any selected segments marked within the text, as for example, units given by time markers, blocks of an equal number of words, etc.

In order to perform the text analysis TAS needs to segment the transcript in equal sized units to further comparisons of the data. The size of a scoring unit is language depended. For German these are blocks of 200 words each, in English 150 words are used. As long as representative data are missing for Spanish we decided to also stay with 150 word blocks. Determination of that size goes back to a statistical procedure which fixes the minimum number of necessary words (Mergenthaler 1985)

## **II b.4 Availability in different languages**

This method was originally developed for being applied in English transcripts and later for application to German language.

To adapt this method for Spanish transcriptions it was necessary to do a detailed analysis of the evaluation mechanism used by this methodology.

Spanish dictionaries are being developed following specific criteria in their confection for such language. Taking into account the method's characteristics it is impossible to make a literally translation of the dictionaries as the basic tools of the methodology.

It was necessary to develop Spanish dictionaries in order to be able to apply this method on Spanish transcriptions. It was also necessary to study the selecting criteria for the word input entries of these dictionaries and follow the same steps as have been done during the English's dictionaries development.

We worked with Spanish session transcripts, which were prepared according to specific rules (Mergenthaler & Gril, 1995). Transcriptions standards are indispensable in order to make not only a computer assisted text analysis, but also all text based analysis feasible and comparable.

## **II c. Methodology**

### Description of the activities

We have performed several pilot studies. The aim of these pilot studies was to study the level of agreement among the results obtained by the Cycles Model with those obtained by the evaluators in a clinical approach to the same transcripts.

II c. 1. Study A) A sample of the first five minutes of eleven sessions of different patients was evaluated before the development of the dictionaries.

This rate was based on a clinical point of view, having only the definitions of the types of language tones two different judges did the evaluation of these cases. The aim of this activity was to find out if these sessions had predominantly an emotional or an abstract tone.

The agreement between the two judges was significant (Table 2, column 3)

Then we started the confection of the lists of words that were going to be included in the dictionaries, both emotional and abstract.

This information was entered into the TAS program and the transcriptions of the patients were analyzed by the system.

The results enabled us to make a table to show the degree of agreement or disagreement among the different raters (Table 1).

The table shows each case with the tone predominance adjudicated for each rater (the TAS evaluation is included like a third rater).

To determine the degree of agreement amongst the different we used a statistical measure to nominal data called Cohen-Kappa Coefficient.

**Table 1**

The agreement among the judges' evaluation and the TAS evaluation was studied.

TAS	Classification Judge 1	Classification Judge 2	Classification Judge 1 y TAS	Agreement Judge 2 y TAS	Agreement among	Agreement the two judges and the TAS
1	Emotion	Emotion	Abstract	Agreement	Disagreement	Disagreement
2	Abstract	Emotion	Emotion	Disagreement	Disagreement	Disagreement
3	Abstract	Emotion	Abstract	Disagreement	agreement	Disagreement
4	Abstract	Abstract	Abstract	Agreement	Agreement	Agreement
5	Emotion	Emotion	Emotion	Agreement	Agreement	Agreement
6	Emotion	Emotion	Emotion	Agreement	Agreement	Agreement
7	Emotion	Emotion	Emotion	Agreement	Agreement	Agreement
8	Emotion	Abstract	Emotion	Disagreement	Agreement	Disagreement
9	Abstract	Abstract	Abstract	Agreement	Agreement	Agreement
10	Abstract	Abstract	Abstract	Agreement	Agreement	Agreement
11	Abstract	Abstract	Abstract	Agreement	Agreement	Agreement

**Table 2**

Agreement among the different judges and the tone classifications

Cohen-Kappa Coefficient	TAS & JUDGE 1	TAS & JUDGE 2	JUDGE 1 & JUDGE 2
General Correspondence	0.46	0.62	0.46

The mean kappa to the three evaluations was 0.513, the ranging from this value 0.46 to 0.62.

The mean kappa to the judge 1 was 0.46 and to the TAS and to the judge 2 was 0.54.

The agreement degree amongst the different analysis was high. The maximum degree of agreement was obtained between each judge and the TAS. The two judges obtain a lower agreement degree.

The Coefficient Cohen-Kappa to the three values was 0.51

### **II c.2. Study B) As a second study we worked with a full psychotherapy session.**

In this study the speech of the patient, the therapist and the interaction between them was analyzed following the criteria of the cycle's predominance.

New dictionaries were developed taking into account the text of this session.

A psychotherapy rater did a clinical evaluation of the text keeping the segmentation of the system (150 word block).

The aim of this analysis was to describe the presence of determinant patterns during the session. It was a global approach that would allow determining their presence - absence. but without using a selecting criteria of word counting, as the TAS would do.

At the beginning, it was decided to use the same segmentation of the TAS. The aim was to compare the clinical evaluation and the system evaluation with the highest level of accuracy, matching both results block by block, TAS and clinical approach.

The results were compared finding a low agreement between the TAS and the clinical judge. (table 3).

## II d. Analysis of the data

We found great difficulty in the evaluation to classify patterns based on the system of segmented blocks used by the TAS.

The reading of the clinical judge needed to be interrupted when it reached the word numbers stipulated by the system. Furthermore when the judge read each block the reading was influenced by the former blocks. We found a difference between the TAS and the judge's rating, when the judge worked evaluating each single block.

The difference was bound to the fact that the system uses a statistical technique called smoothing. To obtain the final scores this technique takes into account the scores of the previous and following blocks.

The system uses this technique because the segmentation by counting words doesn't represent a real meaning to human readers. It's only a design that allows putting in order the information to be able to analyze it.

In this way a moving average is done to smooth the effect provoked by the segmentation. Then each block is inserted into a sequence for its analysis.

This leads to the fact that the result obtained working block by block doesn't have a good representation degree.

A text analysis without the use of the smoothing technique was done, with the aim of comparing block by block the TAS and the judge evaluation. Then a second evaluation was done with a naturalistic segmentation in a clinical sense, not counting word as the system but trying to divide in sense units, determined by the predominance of a certain pattern, from the beginning until the end.

A double clinical analysis was done (Figure 3):

taking into account the TAS blocks segmentation.

dividing the text taking into account the predominance of patterns.

## Segmentation's tables

Table 3 Block by blocks without the use of the smoothing technique.

Table 4 Scores with the smoothing by TAS and the clinical segmentation.

**Table 3**

Block	TAS Pattern Abstraction - Emotion	Judge Pattern Abstraction - Emotion
1	Relaxing	Reflecting
2	Connecting	Experiencing
3	Connecting	Reflecting
4	Experiencing	Experiencing
5	Connecting	Experiencing
6	Experiencing	Experiencing
7	*	*
8	Relaxing	Experiencing
9	Relaxing	Reflecting
10	*	*
11	Experiencing	Relaxing
12	Relaxing	Relaxing
13	*	*
14	Relaxing	Relaxing
15	Relaxing	Relaxing
16	Relaxing	Relaxing

**Table 4**

Block	TAS pattern Abstraction - Emotion	Judge Pattern Abstraction - Emotion
1	Reflecting	Reflecting
2	Connecting	Experiencing
3	Connecting	Connecting
4	Connecting	Connecting
5	Connecting	Connecting
6	Experiencing	Experiencing
7		
8	Relaxing	Experiencing
9	Relaxing	Experiencing
10	*	*
11	Experiencing	Connecting
12	Experiencing	Relaxing
13	*	*
14	Relaxing	Relaxing
15	Relaxing	Relaxing
16	Relaxing	Relaxing

\* In these fragments the patient doesn't have any speech

The Cohen Kappa coefficient to the segmentation block by block was 0.12 , In this case the agreement between the TAS and the judge was not significant.

The Cohen Kappa coefficient to the clinical segmentation was 0.46. In this case the agreement between the TAS and the judge was significant.

It's possible to observe in these tables (3 and 4) that the use of the smoothing technique and the clinical approach segmentation show a higher degree of agreement than the fragmentation block by block analysis.

In the figures (1 and 2) it's possible see the effect of this smoothing represented by a line. The way that this technique change the values, smoothing the results, is represented by the line of extremes scores.

The objective of this technique is to provoke changes in the values of the fragmentation scores, in the example of the analyzed case, the fragment number four was changed in a complete way. Into the analysis block by block the base pattern to this fragment was Experiencing, with high Emotion and low Abstraction. But when the smoothing technique was applied this fragment was presented like a Connecting moment with a high emotion tone and high abstraction (in this case the abstraction doesn't have a value high enough to be considered a complete Connecting phase).

## Figures 1 and 2

To make this smoothing the TAS utilizes a formula to obtain a new score. In this way the score always is influenced by the follow score and is not only a partial value.

$$S = \frac{\frac{h_i + h_{i+1}}{n_i + n_{i+1}} + \frac{h_{i+1} + h_{i+2}}{n_{i+1} + n_{i+2}}}{2} =$$

$h$  = absolute frequency  $i$  = Word block number  $n$  = Total number of words

This is one of the possible ways to obtain a smoothing score. Other formulas can be used but the specific characteristic of this formula makes itself robust with regard to outliers.

## II e. Conclusions

The results suggest that it is impossible and besides it does not make much sense for a human rater to analyze a transcript session using a formal segmentation as it was used in this study with word blocks of 150 words each. A possible cause maybe that the rater can't work in that way because he/she is naturally influenced by the thematic speech sequence that is being analyzed.

The TAS, as a computer assisted content analysis, in a first moment, does such analysis in a segmented way. We observed that the TAS' analysis, when done just block by block doesn't necessarily match with the judge's rating.

The use of the smoothing technique is one of the common issues between this methodology and the clinical rating because as we stated previously, the judge can only read each block within its context.

We can consider that the method does not restrict itself to only counting isolated words from a context. With the use of this statistical technique the information is smoothed, and the TAS evaluation gets closer to the judge's interpretation.

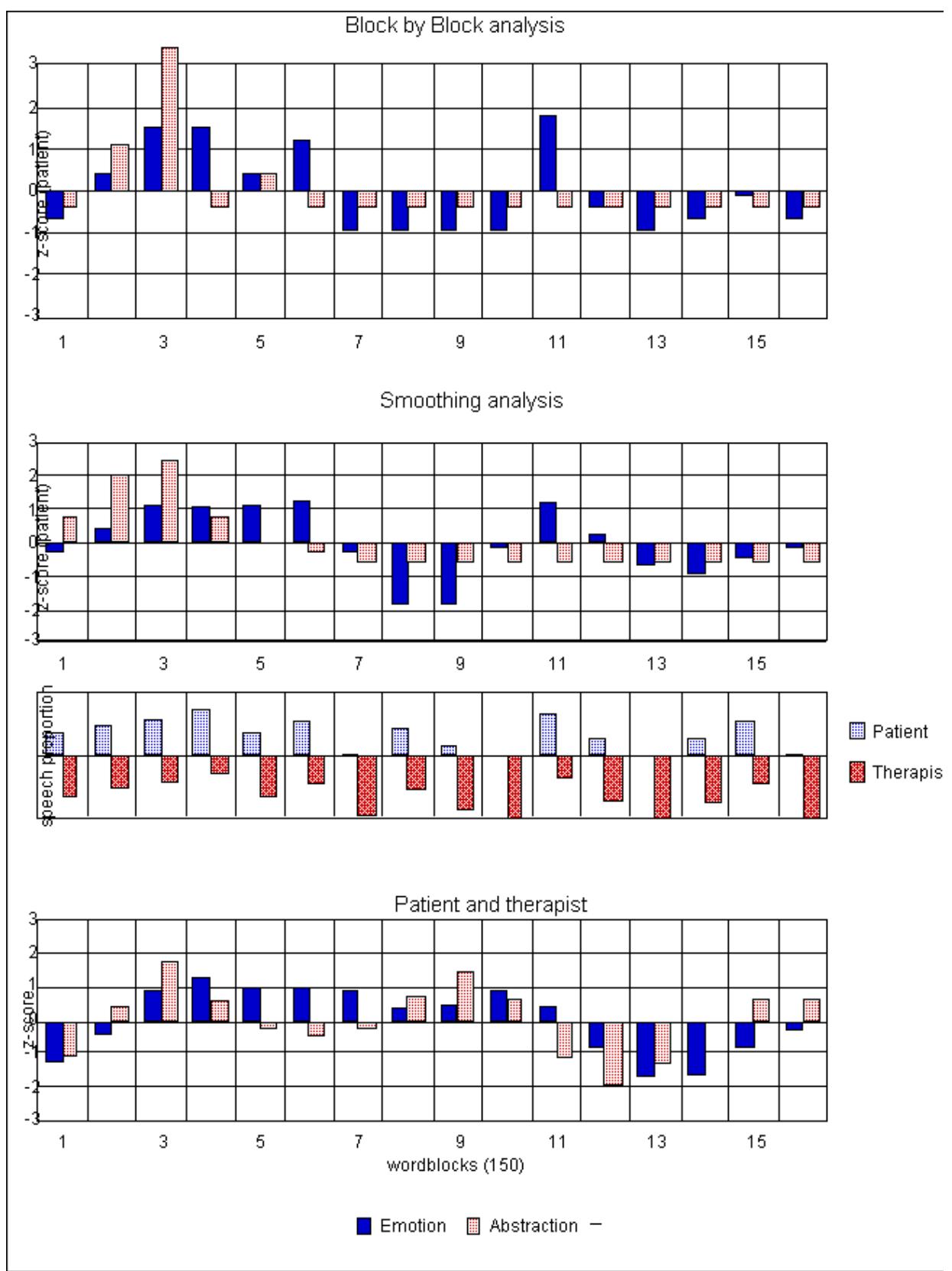
The system analyses the data and distributes it in a sequential reading way.

This result depicts the TAS as an instrument that enables speech analysis through graphical means. The data is presented showing patterns throughout a single session or in a complete treatment.

It is interesting to observe that the highest agreement obtained was between each clinical judge and TAS's. The agreement between the two judges was lower, showing an habitual difficulty in the psychotherapeutic practice: obtaining agreements in the evaluation of clinical text.

This implies that a computer aided content analysis provided by a clearly defined methodology as the method presented here, can be a useful tool to obtain major agreement among psychotherapists.

Both the computer aided content analysis system and the clinical judge are then able to detect significant patterns -based on tones' predominance- during the session that is analyzed.

**Figure 3**

The clinic Material of this Study was provided by

Aigle Clinic, Buenos Aires, Argentina

Dra. Clara López Moreno

### III Report three

#### III a. Objectives

This study aims to show some results of our approach to a Computer assisted content analysis in the field of the psychotherapy process research.

As a specific task we decided to study the degree of reliability among different clinical evaluations, trying to know about the reliability of this methodology. The statistical technique utilized was the Cohen Kappa coefficient, a basic summary of this methodology is presented here.

#### III b. Cohen Kappa Coefficient

This technique is used to measure the inter-rater reliability, the election of this kind of measure was a product of the type of values that we handle in these studies. All the elements were evaluated like nominal scores.

The following steps were done to obtain this coefficient.

Contingency tables of speech fragmentation

	Rel	Refl	Exp	Con	
Rel	a 1-1	a 1-2	a 1-3	a 1-4	r1
Refl	a 2-1	a 2-1	a 2-3	a 2-4	r2
Exp	a 3-1	a 3-2	a 3-3	a 3-4	r3
Con	a 4-1	a 4-2	a 4-3	a 4-4	r4
	c1	c2	c3	c4	D=
					M=

	Rel	Refl	Exp	Con	
Rel	3	0	2	0	5
Refl	0	1	0	0	1
Exp	1	0	1	1	3
Con	0	0	1	3	4
	4	1	4	4	D=8
					M=13

**Figures table 3**

**Figures table 4**

#### Formula

$$\text{E} = \sum_{i=4}^4 \frac{r_i c_i}{M} = E$$

#### Formule 1

$$E = \frac{a*e + b*f + c*g + d*h}{M} = E$$

$$E = \frac{4*5 + 1*1 + 4*3 + 4*4}{13} = \frac{49}{13} = 3.77$$

$$\kappa = \frac{D - E}{M - E} = \kappa$$

$$\kappa = \frac{D - E}{M - E} = \frac{8 - 3.77}{13 - 3.77} = \frac{1.23}{9.23} = 0.46$$

k =

k = 0.46

D = Diagonal observed agreement

M = Total of fragments evaluated

E = Agreement estimated

r = rows

c = columns

### **Obtention of the Kappa-Cohen with three scores**

$$\Sigma M = m \quad \Sigma Et = e \quad \Sigma Dt = d$$

$$\kappa = \frac{d - e}{m - e} = \kappa$$

### **III c. Conclusion**

The Cohen Kappa coefficient is a good technique to measure the inter-reliability of different judges.

In the case to measure three or more than three judges, the mean Kappa showed the same accuracy in that the method expressed in the formula 2, and the simplicity in the confection of this score turns this measure an ideal way to obtain this inter-reliability degree amongst the nominal data of different judges.

### **III d. Referential activity dictionary.**

The referential activity is defined as «the activity of the system of referential connections between verbal and non-verbal representations, as reflected in language style» (Bucci, 1993)

A version of the referential activity dictionary to Spanish language was developed, with this dictionary different clinic cases were analyzed trying to learn about the reliability of this Spanish version.

Two short stories with different characteristics were designed to be included into the text analyzed. These stories weren't previously measured to know their Referential Activity.

The first of these fragments was a story with a clear description of a specific situation. As this situation fits the definition of a narrative we expect CRA to show peaks when the fragment is inserted into the transcription.

This fragment was placed into the patient's speech to try to observe if the measurement of the referential activity will be influenced to some change and in which direction this change would happen. (figure 3).

The second story explained the reasons why this activity was performed. The fragment was inserted inside the text.(figure2).

In figure number 1 we can observe the original patient's speech without any addition.

The place to add the fragments was selected by the score, in both cases the CRA in this moment was close to the 0 value.

The idea was that expected movements after these additions increased the referential activity in the case of the description of the activity and decrease the CRA in the explanation of the reasons.

Both fragments showed the expected movements.

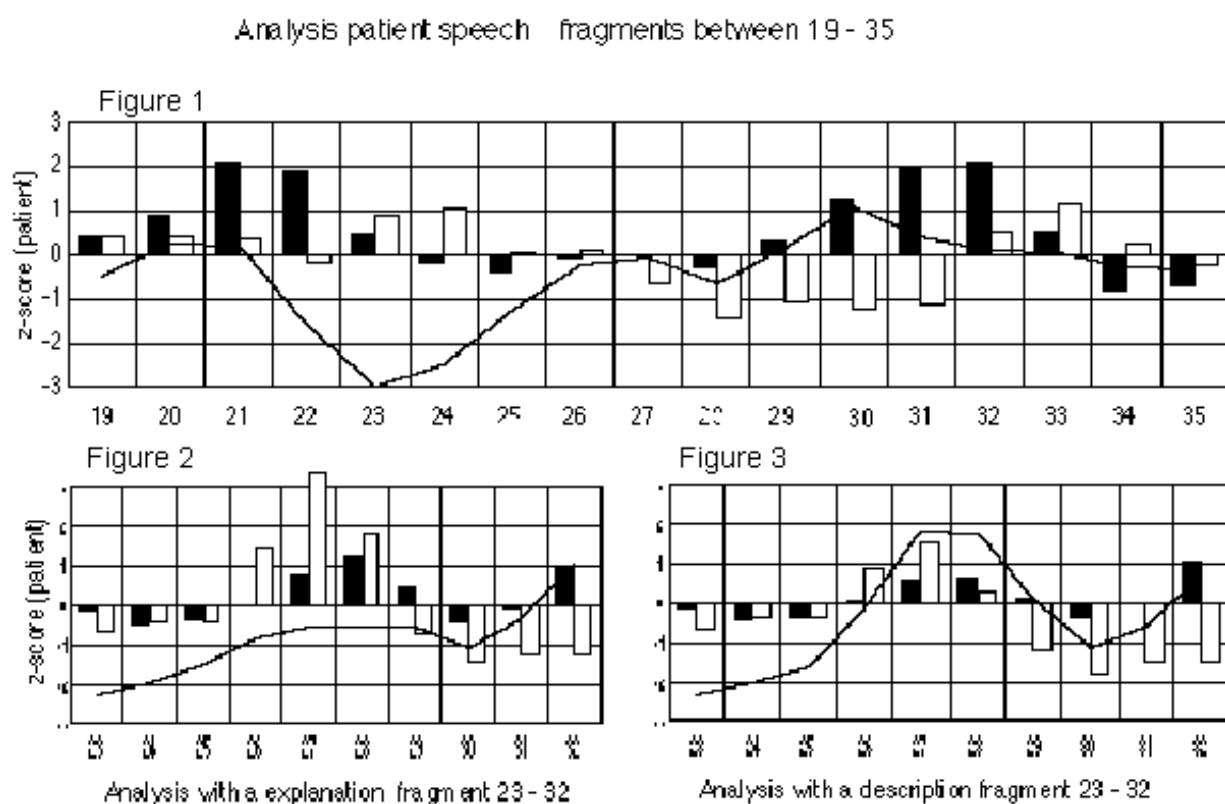
### III e. Conclusions

These results conform a rather dramatic finding because the addition of a different text into the speech of a patient is a new experience and allows thinking in a high degree of accuracy to analyze transcriptions with the CRA.

It's even more amazing that the fragments used, were speeches of different persons.

The results are very interesting, also because it is a test to find out about the reliability of the CRA Spanish dictionary.

**Figure 1, 2 & 3**



With the addition of these fragments the global results of the case were changed (Figures 4, 5 and 6).

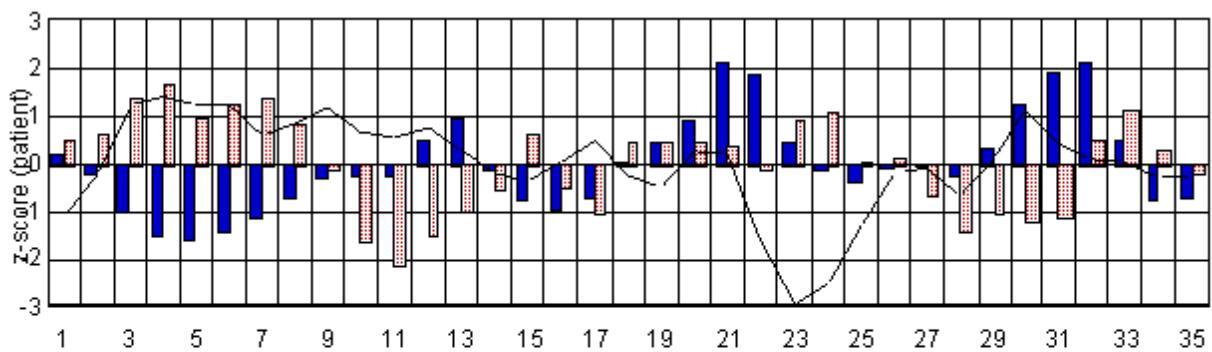
The smoothing technique assimilates the new data and puts it into the sequence distributing these values throughout the global analysis.

For example: we can observe in figure 4, block 14 a Referential Activity value close to 0. If we observe the block14 figure 6 the value of the CRA is close to -0.5. This value was influenced by the new added fragment.

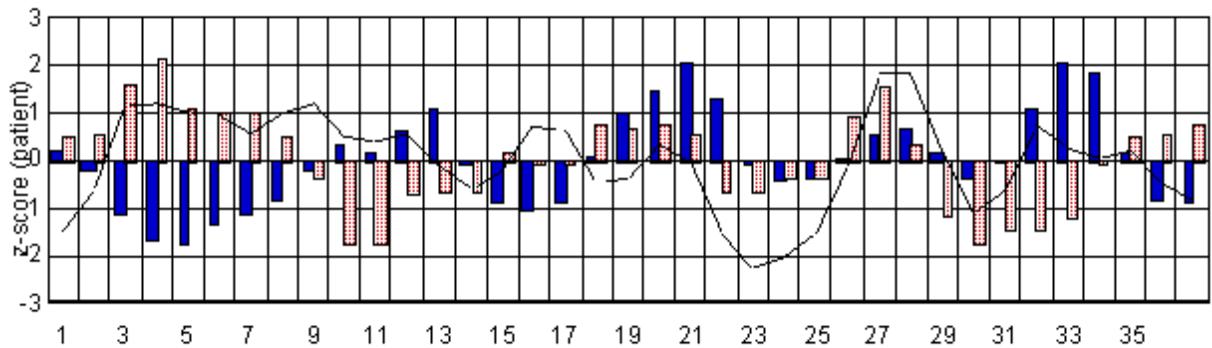
### **Figures 4, 5 & 6**

La numeración de la base de los gráficos corresponde a la fragmentación que realiza el sistema.

Analysis of the patient speech



Analysis and a short story with a description



Analysis and a short story with an explanation



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