H Y P E R -T
A tool for the analysis
of clinical interviews

Franz Caspar

Institute of Cognitive Science
University of Colorado, Boulder and
Clarke Institute of Psychiatry, Toronto

Abstract

HYPER-T-which stands for "hypothesis-generation-processes evaluation and reconstruction tool- is a system or a tool which has been developed to trace the *hypothesis generation processes* of psychotherapists. It incorporates the *flexibility* of computer-implemented *hypermedia systems*, allowing one to easily explore and build up a complex set of quite different types of information. This flexibility is a requirement for successfully following the fragile traces of previous information-processing operations remaining in the therapists' memories following a session with a client: the more rigid and time consuming the attempts to do so, the more destructive are the interferences created by the researcher. It is argued that a HYPER-T-supported access to therapists' memories corresponds much more than any other existing research tool to how a therapist (or human being) thinks spontaneously. A detailed description of the system is provided in the framework of a more comprehensive research project.

Another advantage of the flexibility of information exploration is discussed as well. In an exploration phase a researcher screens the data in his search for conspicuous details and for regularities. He does this in the absence of otherwise instructive algorithms. In such a phase it is crucial to have *easy access* to pieces of information and to bring them together within a limited period of time. This kind of access *supports the development of hypotheses by the researcher* about patterns and regularities in the data, prior to the availability of an explicit concept which defines them. A hypermedia system can not only be better adapted to the thinking of a *therapist* as a research object, but also to the thinking of the *researcher* considering data. A part of this paper is dedicated to the description of HYPER-T's possibilities to support the *analysis of protocols from discourse comprehension* in an exploration phase.

Finally, the discussion addresses the question of whether such hypermedia systems could be used for the development of *expert systems* as well.

---

1. Association and hypothesis generation in the mind of psychotherapists

We assume that the domain of research described here has similarities to other domains. The following description of the *context* in which HYPER-T is applied may facilitate the reader's understanding if some of the points made here are of relevance to their own domain.

Psychotherapy research has generally failed to demonstrate a clear superiority or inferiority of one or another of the most significant theoretical orientations of psychotherapy. This may be due mainly to the common methodology applied in comparative psychotherapy studies, rather than to the real absence of such outcome effects (e.g., Grawe, 1988). Whereas the existence of outcome differences is a controversial topic among psychotherapy researchers, there is little doubt that there are significant differences in the therapy *process*. Therapy process differences are partly the result of different "tools" (i.e., therapeutic interventions) which are utilized to facilitate change in the client. However, the selection of specific therapeutic interventions, in a narrow technical sense, as well as the manner of explicit and implicit communication with a client, depends on *the picture the therapist develops of the client* in general and of his or her problems. *Hypothesis generation processes* are, therefore, a *pivotal part of the therapy process* (e.g., Shaw & Dobson, 1988).

The core literature belonging to each approach -the "prescriptive" rules stating how a therapist *should* look at his client- suggest that there *must* be differences. Every practicioner would, however, say that he does not really follow the once learned rules in everyday practice. The point has been made that with increasing experience therapists from different orientations come closer and closer to each other in many respects. This may be true to some extent, and at a high level of abstraction, but at least some empirical studies have been able to demonstrate a clear difference between therapeutic orientations (e.g., Orlinsky & Howard, 1987, Stiles, Shapiro & Elliott, 1986, Ambühl, 1987, Grawe et al., 1986, Thommen et al., 1988).

What differentiates the thought processes of therapists, or do differences in fact exist ? These are *open empirical questions*. There is no research to date which provides clear answers to these questions, and while there may be many reasons for this lack of research, one reason is certainly obvious: such research is *very difficult to conduct*.

So far, in potentially relevant research, data about a therapist's (or another professional's) thinking have mostly been collected and compared with theoretical models about how the thinking *should* occur. Usually the results look unfavorable for the professionals in terms of revealing a seemingly simplistic or even distorted way of processing information (see, e.g., Dowie & Elstein, 1988). No attempts have been made, to my knowledge, to do more

justice to the professionals by, in a first step, *reconstructing* the hypothesis-generation processes *in detail* and *as accurately as possible* and by evaluating such a detailed model in a second step.

In *problem-solving research*, on the other hand, very convincing attempts have been made to reconstruct thought processes in the problem-solver's mind. However, most of the research has, been conducted in relatively simple or at least artificial situations with little similarity to a psychotherapist's situation in an interview with a client. While the value of problem solving research in general is beyond all question, direct insights about therapists' thinking cannot be derived from it and the opportunity to borrow appropriate research methodology for our project is *limited*.

We assume that therapists of different therapeutic orientations and various levels of experience differ not only in the *content* of what they think (e.g., "oedipal problem" vs. "reinforcement of behavior XY") but also in the kind of *processes* involved (e.g., quickly linking the client's information to theoretical frameworks vs. more inductive collecting of information). Furthermore, we assume that an attempt to "measure" differences with variables which remain at the surface of the dialogue will lead to superficial results, at best. Therefore, quantitative variables in a comparison between therapists should be derived from, or at least be accompanied by, a *thorough qualitative analysis*.

Attempting to formulate an *accurate* and at the same time *comprehensive picture* of psychotherapists' thinking processes implies the need to *combine several methodological types of access* to the phenomena, each of which has it's strengths and it's limitations: on the one side are experimental studies, which are not discussed in this contribution, and on the other are single-case reconstructions describing what occurred in the mind of an individual therapist in a specific interview. The reconstruction is based on a dialogue between the researcher and the therapist immediately following the therapy session. The single-case reconstruction is the main topic described in this paper's first section. Several methodological details related to, for example, the use of video stimulated recall, will not be addressed here.

Throughout the remainder of the article, the word *"interview"* refers to the therapy session. The word *"reconstruction"* refers to sessions between the researcher and the therapist following the therapist's interview with the client, during which the researcher records his notes directly into the system.

The following may help to illustrate the kinds of *tasks* confronted by the therapist and by the researcher. In an initial interview, the *therapist* may obtain some information about the client and his problem which is usually not very comprehensive or well elaborated. The client provides explicit and implicit information about himself and his problems, not only

on the channel of verbally expressed content, but on a nonverbal and pragmatic channel as well. The therapist may or may not use the latter types of information explicitly, but certainly they have an impact upon him. The therapist has learned some theories in the recent or more distant past and he has seen a number of clients himself, or knows cases from observing other therapists, or from case reports. Utilizing this more or less explicit and more or less accessible background knowledge, the therapist tries to integrate many pieces of information: he may formulate hypotheses early in the interview, allowing him to concentrate on significant aspects but possibly distracting him from other pieces of information; he may, at times, be busy constructing his own behavior and, therefore, have little capacity left for processing incoming information; and so on.

Following the session, a *researcher* would try to reconstruct the hypothesis-generation-processes during segments of the interview, taking into account that in the reconstruction the therapist, to some extent, attempts to see and present himself the way he thinks the researcher or his teachers would expect him to be in a session. In addition to communicating that the researcher would not judge the therapist but rather make a collaborative effort to reconstruct what actually happened in the interview, it would be useful for the researcher to *compare* the therapist's *introspective report* to what was independently *observed* by others (i.e., the researcher and/or independent observers) through a one-way mirror or on the videotape. The researcher would also compare the introspective report with his own general model of such processes. Although the validity of the information gained by introspection cannot be assumed on its own, the introspection nevertheless remains a pivotal source of information. The reliability of this source depends, however, on the *ratio of "real memories"* of the original processes which occurred in the interview *to less accurate reconstructions*. Research shows that highly automatized processes, which are not heeded while they occur, can hardly be remembered, and that later interferences destroy any remaining fragile memories (Ericsson & Simon 1984). Fortunately, written transcripts of the dialogue, or tapes of the session (i.e., "video/audio stimulated recall") can provide memory aides in terms of giving cues and a context. The therapist can review this material in several steps.

How can a researcher *keep track* of all these different kinds of information during a reconstruction session? He could simply write down whatever the therapist tells him during the reconstruction, however, problems may arise if the therapist presents information in a nonlinear fashion, for example, referring to an initial statement in the dialogue and then jumping to another at the end. The researcher would probably handle such a situation by skipping to the end of his transcript, rather than risk losing information by telling the therapist "not now, we will come back to this statement later". Yet, when the subject/therapist does not refer to a statement in the interview but elaborates on a piece of introspection provided

earlier, will the researcher be able to find it fast enough in his notes? Or would the researcher insist on elaborating this piece of introspection earlier, adhering to a more systematic path through the reconstruction session? Such a method would avoid backtracking but it would probably destroy other memory traces which were more easily accessible to the therapist at that time? How can the researcher *integrate* his observations of the therapist's behavior during the interview with the introspective report? Does he really want the therapist to explain the second anxiety hypothesis of Freud (or the loss of reinforcement theory by Lewinsohn) and risk losing other memories? Or would he rather just assume that he and the therapist share the same understanding of standard elements of the theoretical background to which the therapist may refer, even though there is reason to believe that both have a rather idiosyncratic understanding, which may lead to wrong conclusions later? Obviously more questions of this nature exist but these examples are probably enough to illustrate the situation from both a therapist's and a researcher's position.

2. Hypermedia

Before the HYPER-T-system is described, this brief chapter will introduce some features of *Hypermedia-Systems*[1].

We are accustomed to information represented and presented in a *linear mode*. Reading an article in a newspaper, listening to a radio program, etc., usually implies following the flow of information as it is presented. With a scientific article the situation is less restricted in that, for example, a reader may decide to go on reading the regular text or to check a footnote or reference instead. However, in everyday life information is basically presented in a linear format.

There are several reasons -which cannot be discussed here in detail (see e.g. Conklin, 1987)- for assuming that the *human mind does not function in a linear way* and, therefore, the presentation of information in a linear format may be considered less than ideal. It is a common experience to diverge one's focus from a written text or from a movie in order to follow a different path in one's mind instead. Similarly, one may experience an association to another article or book while reading and wish to check the reference before continuing with the original text.

"Hypermedia" provide ways of organizing and presenting complex sets of various kinds of information in a *more flexible format*. The reader does not have to follow a prescribed

---

[1] For readers interested in a more comprehensive introduction, the article by Conklin (1987) can be recommended as an excellent introduction and overview. Many introductory books are available for specific systems, like HyperCard, Notecards, etc.

pathway through the information; in fact such a path may not even exist. It is the decision of the reader as to which information he wants to process next. Indications about the availability of information, and about what could be useful to read, may be provided but the decision of what to read next is the reader's to make. In hypermedia, it is no easier to follow a standard pathway as it would be easier in the "non-electronic" world to go on reading one volume at a time of a multi-volume series, or to go on reading one file instead of getting another one from the shelf. In hypermedia, switching between several files and types of information (like text or illustrations) is encouraged because no additional effort is required: switching can literally be done by simply hitting a key on the computer keyboard or pushing a "button" on the computer screen with the "mouse"[1].

The information in a hypermedia system is usually written on *electronic "cards"*. In very simple applications the information may just consist of names, addresses, and telephone numbers, for example. At the other end of the scale of applications are much more complex types of information, as the HYPER-T application will illustrate. Several types of cards may exist in one system, grouped into *"stacks"*. Cards may share information or they may share *"fields"*, i.e. containers, into which information can be stored on a single card. Cards may contain not only passive information but *active programs* as well. The easiest way to activate these programs (for example, in Apple's HyperCard) is to press a *button*, which is an area on the card, using the mouse. Such programs may do a variety of things: in this context, commands to create new cards and buttons, to jump to other cards (in the same or another stack), or to transfer information from another place to a card, are the most relevant features. Concrete examples outlined below will clarify these concepts for readers who are unfamiliar with hypermedia systems.

Hypermedia systems are easily accessible. Every Macintosh buyer receives the HyperCard system, at no additional costs, with the computer. Although the presentation of information with hypermedia has great advantages in many applications, it is far from being a solution for all of the problems (Fischer et al., 1988). One reason is that users may become *confused* as a result of the *flexibility* with which the information is represented (see, e.g., Smolensky et al., 1987). Some readers may enjoy the flexibility but there is no assurance that at the end each reader will have read *all* relevant information, thus highlighting a disadvantage in shifting the responsibility of information organization from writer to reader.

The example of presenting information to a reader or listener has been used here to provide a general idea of the basic concepts in hypermedia systems. I will come back to the problem of losing orientation in a hypermedia system later. The main application discussed in this

---

[1]   For further explanation see below.

paper does not, however, deal with the transfer of a set of information preexistent in a HyperCard format to a receiving person. The purpose of HYPER-T is rather to support the *acquisition* and *organization* of information which has *not been previously incorporated in* the system.

3. HYPER-T: A tool for the reconstruction of information-processing during therapy sessions

3.1 Requirements

The goal of creating a *comprehensive model of the hypothesis-generation processes* in an interview requires a combination of (at least) the following types of information:

- background information about the client and about the therapist
- statements from the client and the therapist in the interview
- spontaneous introspective reports by the therapist related or unrelated to specific statements in the therapy dialogue
- video stimulated introspective reports by the therapist, mostly related to specific statements
- notes made by the researcher or additional observers (in order to guarantee independence) about conspicuous therapist and client behavior
- prepared theoretical standard elements to which the therapist may refer (e.g., "second Freudian anxiety hypothesis",...) and which can be used to verify the meaning of his statements or as defaults (i.e., substitutes as long as specific information is missing)
- prepared graphical formats which help quickly organize typical categories of information (e.g., the therapist's explanation for the client's problems), and which may contain defaults as well
- researcher's notes comparing and bringing together different types of information
- later: quantitative variable values which are derived from the information about one interview, as mentioned above, and which serve in the comparison between several subjects. These values should be accessible for statistical operations without additional manual transfer.

The format in which this information will be organized must be *standardized* to some extent in order to allow an *immediate orientation* and to *provide a frame* into which only the actually *idiosyncratic* information needs to be written. In this way, time is saved during the reconstruction by omitting or providing what is common to most therapists or interviews. The format must, on the other hand, be flexible enough to provide adequate space for idio-

syncratic information without imposing a forced choice situation, and to support exploration within the expanding pool of information.

The amount of time needed to do reconstructions is, in any case, large. For this reason the very interesting work of Elliott and others on reconstructing critical events in psychotherapy together with therapist and client lead to developing a *"brief* structured recall" (Elliot & Shapiro, 1988) method from the original, more time consuming method. The contribution of time saving computer support is thus essential not only in order to access memories as soon as possible, but also to keep reconstructions feasible. The more time the computer can save, the more therapists will be motivated to participate in a study, and/or the fewer the psychologically interesting traces that have to be sacrified.

3.2 HYPER-T and other tools for qualitative analysis

Most of the remainder of this paper is dedicated to concretely presenting the tool which has been developed to meet the outlined requirements. We assume that increased experience will make the cards more complete and will change many details, but that the general principles will remain the same.

HYPER-T has been developed with the HyperCard, and HyperTalk language on an Apple Macintosh computer. Our experiences with this soft- and hardware were (almost) exclusively positive, however, a comparative evaluation of advantages and disadvantages with other systems has not been made. Todd et al. (1988) have presented a more traditional system, designed to conduct qualitative analyses on narratives from psychotherapies. Todd et al.'s system serves parallel purposes to some extent and it contains, in part, types of information similar to HYPER-T. Their system seems to be advanced in terms of supporting the selection of cases from a pool and of supporting qualitative analyses. On the other hand, flexibility in the sense described above plays a less important role for these authors. Still, future possibilities implementing their system with hypermedia are being considered by them.

More recently, TMR, a German HyperCard application for "Textmontage and Rating" has been developed by Klusmann[1]. Its purpose is to bring together pieces of texts (i.e., in general, transcripts from diagnostic or therapy dialogues), and to support ratings. Although as yet we have no experience with combining TMR with Hyper-T, we are optimistic that either the two can be combined in a later phase of evaluation, or TMR bears ideas which could be integrated into an version of Hyper-T extended for evaluation purposes.

---

[1] As far as I know, there is no formal publication so far. The author's address is: Dr. Dietrich Klusmann, Abt. Med. Psychologie, Universitätsklinik Eppendorf, Martinistr. 52, 2000 Hamburg 52, W Germany.

There are other hypermedia applications which bring many pieces of information together on a screen in an even more individualized format than HYPER-T. Whereas with HYPER-T some switching to other cards or fields is necessary, a system designed by Smolensky et al. (1987) draws a complete picture of a logical argumentation on one screen. In a way, this corresponds even more to our ideal of having all relevant pieces of information together in a manner which is optimally adapted to each single case. On the other hand, the individualized satisfaction of a variety of layout-constraints leads to changes in the picture on the screen from case to case. Compared with the more standardized HYPER-T format, this requires much more adaptation if a user wants to gain some orientation within a picture. Certainly, the question of how much structure one should provide remains one of the pivotal questions in the development of hypermedia systems (Fischer, in Fischer et al., 1988). A combination of HYPER-T with features from compatible systems, such as the ones just mentioned, remains attractive.

Generally, there seems to be an amazing discrepancy between the level of curiosity and expectations related to Hypermedia for the future of qualitative research (Pfaffenberger, 1988), and the number of actual contributions and developments. For many MacIntosh users, HyperCard is something neat to play around with, but they are not aware of its range of applications. It appears that useful and creative applications exist but that more time and efforts are needed to share ideas and to evaluate advantages and disadvantages of systems which partly overlap with their purposes.

The following picture gives an overview to the *various types of cards* used in Hyper-T to fill in all the information from a reconstruction session. Procedure and cards will be described in detail below:
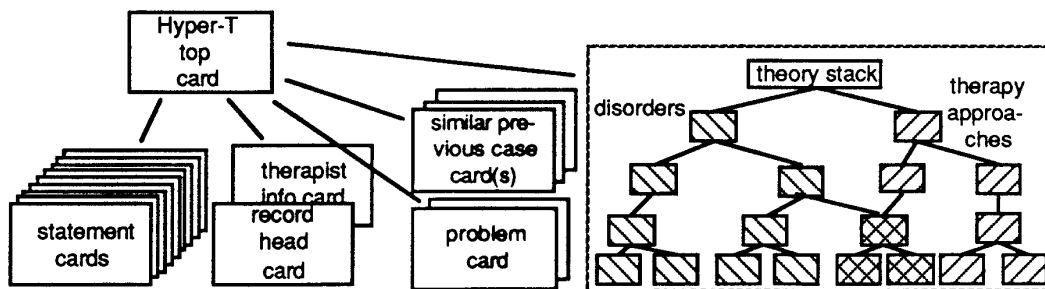
picture 1: overview to types of card used in HYPER-T. The cards in the theory stack are organized as partly overlapping hierarchies. Not every card in the theory stack is actually used for every reconstruction. Further explanations are on the following pages.

General information about hypermedia cards and some basic definitions were provided in the second chapter of this paper. On all the following cards, *fields* (which contain information) are shown as *rectangles*, and *buttons* (which contain programs) are shown as *shadowed circles or rounded rectangles*. A special type of button, which causes a *jump to the next or previous card*, is shown as a *shadowed arrow*. A few *spaces with other types of information*, written directly on the cards without using containers, have a *rounded, but not shadowed rectangle* as a border.

3.3. Hyper-T Top card

The Hyper-T Top card serves the purpose of facilitating the preparation of new stacks for a new record, and for keeping track of and getting easy access to existing records. The buttons in the lower left part of the card are essentially used to make copies of a "generic" version of each stack and to write information related to the respective individual record on these copies. During the creation of the new stacks, the user is asked to provide information about the record, such as client's, therapist's, and researcher's names. He has to write each piece of information only once, and Hyper-T copies it automatically to all locations where it is required. The buttons in the upper left part give access to the generic stacks. The right half is reserved for keeping track of the records. Each time a new set of stacks for a new record is prepared, it is automatically registered, and a button is created on the extreme

left of the respective line. This button gives access to the individual "record head" (see below).

3.4 Record head and therapist information cards

The *record head* card gives access to all other stacks and cards of an individual record. In addition, it contains information about a client and a therapist which is *linked to a particular interview-record or research "case"*. The fields "record #", "date of record" and "therapist name or code" do not require further explanation. The (command-)button "additional therapist info" can be used to jump to the more comprehensive therapist information card shown below. This occurs by moving the arrow on the Macintosh screen over the button and clicking the mouse, which activates the command. The same steps apply to "go" buttons which provide transfers to the cards and stacks indicated on the button names, and described below. The field "client name or code" and the remaining fields contain information about this client to which one might return during the reconstruction phase with the therapist or later during data evaluation.

Actually, the program behind the "therapist info" button is originally quite complex. It provides an easy way of using only one therapist information card for several records if one therapist volunteered with several interviews. However, this original program is replaced by a simple "go" command as soon as the user has filled in the required information. Unless he looks into the button script, a user is never confronted with these programming details and is not even necessarily aware that the program looks completely different when he presses the same button for the second time.

therapist information		address	Clarke Inst. of Psychiatry

go Hyper-T Top

Clarke Inst. of Psychiatry
250 College Street
Toronto, Ontario M5T 1R8
(416) 979-2221

			these buttons lead to record heads→		links	clients	names / codes	rec #	n of similar
name or code used for record	Sigmunde Skinner				①	Chris Neverhappy		007	
real name if not used for record	Beth Fisher				②				
training background	Cognitive Behavior Therapy, Clinical Diagnostic				③				
academic degrees	Ph.D.				④				
orientation	CBT, experiential			
psychotherapy training	CBT, especially with depress.			
psychotherapy partial training	client centered, Gestalt			
years of practice	2			
% if part time				
total n of clients	15			

additional comments

video available, is used to one-way mirrors
Would possibly volunteer with another client in
May. Bring coffee and cookies!

never leave this card without pressing the "hide" button !   (**hide fields**)   (**show hidden fields**)
if you want to use this button
you need the password

The *therapist information* card contains several fields which do not require additional explanation. One card may be used to store information for several research records if the same therapist volunteered as a subject with several clients. The buttons on the left side of the clients' names allow an easy jump to the respective client's statement-stack.

To guarantee confidentiality of information except for the therapist's and client's codes and the record number, all other fields can easily be hidden and protected by a password if a larger number of people need access to the stack, e.g., for rating purposes.

The record head card can serve as a switchboard between all cards and stacks of a single record. Other than that, access to these two types of cards is probably not frequently required because researcher and therapist will easily remember most of the information contained in them, and because only a limited number of links to this information will have to be made explicit during the reconstruction session. It is convenient to have the information which they contain included in the HYPER-T system but this is not really a necessity. The same applies to an *"introspective report I"* card which is placed in the same stack and used for unstructured information taken from the first, unstructured run of recall (see below). The opposite is true for the following cards:

3.5 Statement cards

The *statement cards* are the *backbone of the system*. It is possible to represent any kind of information the therapist provides, at any time, on different cards, however, the transcript of the therapeutic discourse provides a *framework* which helps to locate most of the therapist's statements during the reconstruction. For *each interview* analyzed there is *one stack of corresponding client statement cards*. The information about one interview is contained in *several stacks with several types of cards* (see below), but the *client statement stack contains the majority of information* about one interview. The "card #" field contains the client statement number, and there is one card for each client statement in the interview or segment to be analyzed. The "record #" field contains the number of the record. Therefore, number "32" on the sample card characterizes the whole stack, whereas a different number is assigned to an interview with another client. Usually, the stack begins with one card, and as the client's and therapist's statements are filled in turn by turn, new cards are created with the "create new card" button. The appropriate card number is assigned automatically. The "go" buttons allow an easy jump to the cards described above. The field "statement time" contains, in minutes and seconds, the real time at the end of the statement, measured from the beginning of the session, as transcribed from the audio- or videotape. The shadowed arrows are also buttons. If pressed, they present Card 10 or Card 12 in this example, i.e., if it is pressed while Card 11 is on the screen. The first large field contains the *transcript of the client's statement*. The second field contains the *therapist's statements*. These

fields are "scrolling bar"-fields which allow the researcher to insert more text into the field than actually fits into the space graphically provided. The arrows at the top and bottom of the scrolling bar on the right side of the field can be operated with the mouse to scroll the text up and down behind the window provided by the field[1].

For the following fields a brief explanation of the *procedure* is necessary.
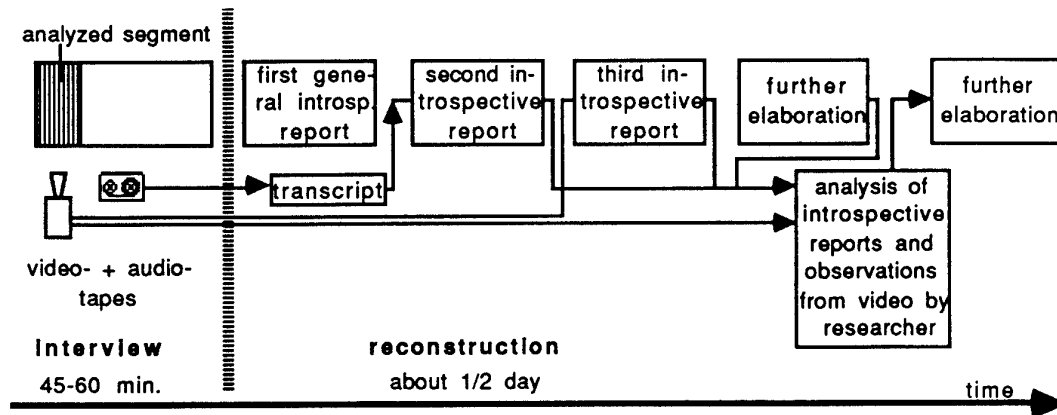
picture 2: overview to the reconstruction procedure.

Under the current setup the therapist is *first* asked to report whatever he can remember about his hypothesis-generation processes during the interview, *without a chronological or thematical order*. This is written on the above mentioned cards which are not described here because they do not have a very interesting format. If only one compatible computer is available, the information is written on ordinary paper and transferred later. This is because during this first part of the interview, a third person types the text from the client's and therapist's statements into the respective fields using a MacIntosh computer[2]. After the first part of the reconstruction, the therapist is confronted step by step with transcript, video- or audiotape, and, if the schedule allows, with a preliminary comparison of the introspective type of information with observational data.

In line with this procedure, the next field, "introspective report II", contains the report by the therapist during a *second run* in the reconstruction, i.e, when *confronted with the transcript* of the client's and therapist's statements only. Actually we use an even more refined

---

[1] Each field could be of the scrolling-bar type. However, this type of field requires slightly more storing space, as well as graphical space on a card, and should therefore only be used when necessary. I was unable to determine exactly how much text fits into a field of this type. There are limitations, but it works with a few pages of text. However, as scrolling consumes time the text should rather be distributed over several cards than having text of, as a rule of thumb, more than 1.5 times the visible content of a field on a regular base.

[2] The transcription follows specific rules, however, this is of minor interest for this paper. See also comments on transcribing in chapter 4.

procedure in which the information contained in the "therapist statement" field is hidden while the therapist reports what he remembers based on the client's statements. Then the therapist's own statements made during the interview are presented to him as well and any additional comments are added in the "introspective report II" field, after inserting a "#"sign as a separator. Buttons which are invisibly located on the left side of the field provide a convenient hiding and showing possibility.

The field "introspective report III" contains utterances made during a *third run*, which refers to *video-stimulated recall*. Statements made during the third run, although related to the same client and therapist statements during the interview, may differ from those made during the second run: video stimuli can facilitate remembering phenomena which were not accessible without stimulation, on the other hand, previously available memories decay, or are not reported again. The reason for presenting the transcript first is the observation that, unavoidably, therapists make *new* observations and inferences when they see the videotape which has of course a negative impact on their actual memories. Usually, the therapist's answers in the "introspective report II" field are hidden in the beginning, and only made visible to save time if the therapist seems to repeat himself. Again, buttons for hiding and showing are invisibly located on the left of the field.

The therapist's statements from the first run (if it really seems worth switching to this other type of card which is not described here and if the information from the first run is actually typed into the system already) and from the second run, and the transcripts of the client's and therapist's statements may be *presented to the therapist* in the third or in subsequent runs *as additional stimuli* and in order to *avoid rewriting mere repetitions*. Of course, contamination is possible, however, as it is not necessary for our project to strictly separate information from several runs, contamination is of minor concern. Hiding and showing fields can easily be done by simple commands which, in addition, can be written as macros to be activated with a single keystroke.

Independently of the therapist's introspection, the researcher can include in the "conspicuous observation from video" field what *he* thinks (or what additional observers think independent of the researcher's view) is conspicuous in the verbal and nonverbal behavior of the client. These observations may or may not be similar to those made by the therapist. This field provides information for later evaluation regarding information the therapist *ideally could* have payed attention to, as a background for looking at what he *actually* heeded. The "therapist's action" field contains information about the therapist's behavior related to the client's statement. It complements the "therapist statement" field by including observations about the therapist's nonverbal behavior and a description of his actions, in case this is not sufficiently clear from the transcript. This, the previous, and the
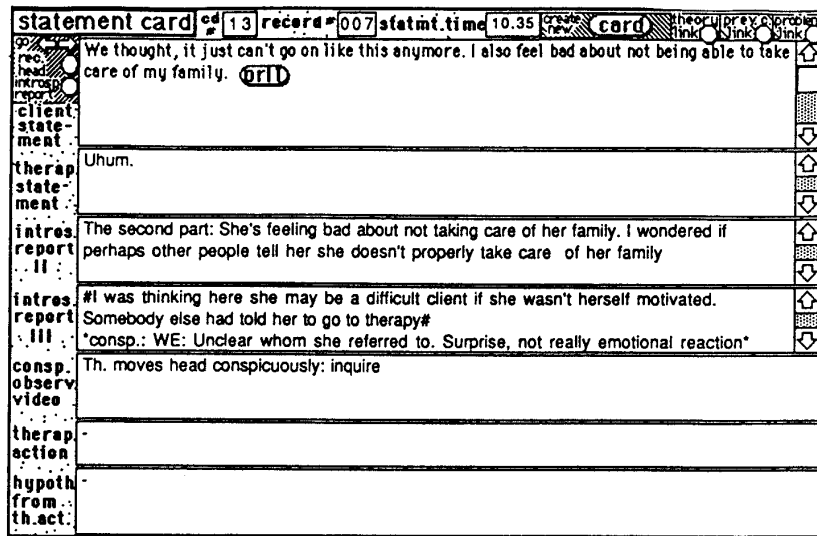
next fields are filled in by the researcher. The last field, "hypotheses from therapist's actions" is used by the researcher to develop hypotheses about what might be behind the therapist's actions, independently from what the therapist says.

This attempt at *combining several types of data* instead of relying only on introspective or observational data is based on the assumption that neither of these sources on its own adequately provides a comprehensive picture of what is taking place. Moreover, a *general "perspective" model* is needed to provide guidelines on how to combine the data and highlight phenomena of interest. The need for such a model is, however, another issue and will not be discussed in this paper.

The buttons on the right above the card serve evaluation purposes and are explained in chapter 3.9.

Cards 12 and 13 give some further illustration of client statement cards:

```
statement card  cd# 13  record# 007  statmt.time 10.35  create new card   theory link / prev.c link / problem link

client        We thought, it just can't go on like this anymore. I also feel bad about not being able to take
state-        care of my family. (or?)
ment

therap        Uhum.
state-
ment

intros        The second part: She's feeling bad about not taking care of her family. I wondered if
report        perhaps other people tell her she doesn't properly take care of her family
.II.

intros        #I was thinking here she may be a difficult client if she wasn't herself motivated.
report        Somebody else had told her to go to therapy#
.III.         *consp.: WE: Unclear whom she referred to. Surprise, not really emotional reaction*

consp.        Th. moves head conspicuously: inquire
observ
video

therap        -
action

hypoth        -
from
th.act.
```

Whenever the therapist makes comments which do *not* have a *direct link to the concrete statements of the client*, the researcher has to decide if it is more appropriate to *immediately* enter the respective information in another type of stack (e.g. the "psychopathology" stack, see below) or if the comments reflect memories which will not decay so quickly, enabling the researcher to explore them *later*. For each card it is always possible to create buttons while taking notes which allow jumps to other cards holding information linked to the information to which the button is related.

The "create theory link", "create previous case link", and "create problem link" buttons in the upper right of the card serve the purpose of easily establishing links to their respective cards. Pressing these buttons leads to the creation of a new link button which will, if pressed, cause a jump to wherever the user wants. The user can determine the location of each link button near the text to which it is related in a simple fashion by pointing to the desired place with a mouse-controlled arrow. Again, the programs behind the buttons are not simple, but the user is not exposed to this. Everything is designed to make the record as convenient and as time-saving as possible.

Examples of such buttons are shown on cards 11 to 13. The "pc" (previous case) button allows a jump to the "previous case" stack (see below). If one wants to understand the impact of a previous case (or a theory) at a given moment, more exploration is needed beyond the simple statement that there was such an impact. However, because this exploration includes mainly information in the therapist's *long-term memory*, this exploration is *less urgent* than following the client's statements. Thus, one will first *establish a link*, and *elaborate the respective card later*. An experienced HyperCard user can create a button and estab-

lish a link within a couple of seconds. This is much faster than taking regular notes, is still understandable after a period of time and can later be presented to the therapist for further elaboration if necessary.

A "prl" (problem link) button links the piece of introspective report where the button is inserted, to the therapist's explanation for the respective client's problems. Again, this explanation can be elaborated upon later, with the link to the concrete details in the discourse already established.

As has hopefully become clear, the *gradual extension* of recorded information is made very easy by such a system. An important factor is that previous information is always at hand without the need to move a lot of paper. The possibility of rapidly presenting information to the therapist if the researcher wishes to do so, saves valuable time while the sand-glass of forgetting in the therapist's memory runs down. The time factor is, however, not the only advantage of HYPER-T: as mentioned before, the more the researcher can follow and *support the therapist's memory access in a flexible way*, the *fewer interfering mental processes* he will trigger.

3.6 Similar previous case card

The next card to be commented upon is the *similar previous case* card. The theoretical background of this card lies in models of lawyers', physicians', psychologists', and other persons' thinking which suggest that the reasoning of these professionals is also, if not more influenced by *memories of previous cases as opposed to theories* they once learned

(for an overview with bibliography, see Kolodner, 1988). The "similar previous case" card contains, as the name indicates, information about previous cases that have similarities with the current case, as remembered by the therapist. It has been said above that the case-based kind of knowledge is stored in long term memory. Therefore, one should not waste time early in the reconstruction by elaborating on details but merely establish a link with the statement-related information (as in Card 12) and elaborate information about the relevant previous case later.

Again, "create link" buttons allow a convenient connection with other cards, in particular with the statement card(s) with which the memory of a previous case occurred.

To trace reasons why the therapist made an association to this particular previous case and to hypothesize whether the analogy is either reasonable or an over-generalization, we need information about similarities and differences between the cases, and about any impact the association may have on the therapist's information processing. It is possible to have as many cards of this type to which the therapist may refer as there are earlier patients.

A therapist might insist that previous cases do, of course, have an impact but that rather than actually referring to concrete persons, he has derived rules or schemata which are activated during an interview. In such a situation the rules are explored and described on theory cards (see below) instead of on similar previous case cards.

3.7 Problem card

The next card to be described is the *problem* card. Here the therapist's hypothetical *explanations for the client's problem(s)* are filled in. Data may be entered in an *unsystematic fashion* whenever relevant information surfaces during the reconstruction. Towards the end of the reconstruction session (i.e., without necessarily being directly related to the flow of the client's statements), this card is reconsidered in a more systematic way. The process of how the therapist came to his hypotheses about the client's problem(s) is reflected only by *links to the statement cards*, otherwise the problem type of card is *independent of the time dimension* in the dialogue. The main purpose of this card is to represent the therapists' *psychopathological hypotheses* at the end of the interview in a *comprehensive format, providing a frame* for representing that information which is generally considered important for understanding a problem (i.e., causal factors, maintaining factors, consequences, etc.). As the example shows, there may be many buttons representing links to other cards. The function of these buttons and how they are created with the "create ..." buttons has been described with the "statement" cards above.

The "stl" (statement link) buttons are *created together with the other information written into the fields*. As an illustration, the therapist's understanding of a depressive episode does not need to be specified here, even though he may have quite a different understanding than the researcher or other therapists. A link can be made to standard or idiosyncratic theory elements where the meaning of "depressive episode" is elaborated upon. Probably this will occur later because of the reasons discussed above. As an example of a statement link, the "depressed mood" is not elaborated here; the "stl1" button provides a precise link to the observation on the client statement stack without requiring further notes.

3.8 Theory cards

Another general type of card provides *standard elements of possibly relevant theories* (or knowledge -we do not mean scientific theories in a narrow sense). Whereas the psychopathology card provides only a frame to fill in information, the basic idea of the theory cards is to *go further in having standard elements prepared* before the reconstruction with a therapist begins. Of course there are implicit assumptions in the frame provided on the psychopathology card, such as that a disorder usually has causal factors and consequences. On the *theory cards*, the theoretical elements are much *more explicit and elaborated*. Theory cards should prevent researcher and therapist from spending too much time tracing the sources of ideas and assumptions in the theoretical knowledge base of a therapist, assuming that theories are not "applied" in a direct manner. In the interview situation, the therapist refers instead to *"primitives"*. Primitives are basic concepts of thinking which were once

formed with the impact of theories but are, to a large extent, independent from them at the present time (e.g., DiSessa, 1987 (for mathematics), Boshuizen et al., 1988 (for medicine)). The therapist may be able to present to the researcher an elaborated reference to an elaborated theory in order to comply with what he assumes are the researcher's expectations. But again, such communicative and mental acts have a *destructive impact upon the therapist's memory*, which, aside from validity arguments, is a sufficient reason for trying to capture theory elements *on whatever level the therapist actually used them*. Again, information which seems to be stored in long-term memory should be elaborated as late as possible in the reconstruction session.

Capturing these elements requires, *first*, communicating to the therapist the real, *quite open, expectations* of the researcher with as little influencing as possible. *Second*, we need a *prepared structure and prepared theory elements* in order *to save time and prevent unnecessary mental activity* on the therapist's part during the reconstruction. To recognize a theory element prepared by the researcher and presented to the therapist during the reconstruction requires much less mental activity than explaining the same element from scratch. This can be assumed to be true even when the therapist reacts with a "no, that's not exactly what I meant, it's rather ..." and provides a more idiosyncratic explanation. Of course, only frequently occurring references to theories can be predicted and prepared in advance, but in spite of that the preparation is probably a good investment in the long run. As more and more interviews are analyzed with the system, the base of prepared elements gradually increases. *Third*, a *hierarchical organization* of the theory elements provides a helpful aid to *retrieval*. If a therapist referred to a theory only in a general way, he should not be bothered by being confronted with all its specific details. It should rather be possible to jump quickly to the *appropriate level of resolution* with each single reference to a theory.

The theory elements are organized in a system with two overlapping hierarchical structures: one hierarchy is built along *main types of disorders*, the other along *therapeutic approaches*. On the top level of the latter hierarchy there is a card for "psychodynamic", "humanistic", "behavioral" and "cognitive" approaches which are then divided into more specific sections.

```
┌─────────────────────────────────────────────────────────┐
│ (theories (psychodynamic))                                │
│ reference      ( first anxiety hypothesis )(............)  │
│ to basic       ( 2nd anxiety hypothesis  )(............)   │
│ freudian       (other button link w.theory)(............)  │
│ theories       ┌─────────────────────────────────────┐   │
│                │ field for idiosyncratic information  │   │
│                └─────────────────────────────────────┘   │
│ reference      ( Jung )( Sullivan )( Klein )(others gen.) │
│ to significant ( Adler )( Kohut )( A. Freud )(others short)│
│ other authors. ┌─────────────────────────────────────┐   │
│                │ field for idiosyncratic information  │   │
│                └─────────────────────────────────────┘   │
│ reference to   ( depression )( anxiety )(obsess.comp.)( others )│
│ specific       ┌─────────────────────────────────────┐   │
│ psychopathol.  │ field for idiosyncratic information  │   │
│ models         └─────────────────────────────────────┘   │
└─────────────────────────────────────────────────────────┘
```

This card, as an example out of this stack, serves mainly as a "switchboard" for jumping to more specific elements. The buttons ("first anxiety hypothesis", etc.) serve as switches to the respective elements. If the therapist explains a rather *idiosyncratic point of view* and if no further references are made, the *fields* are used to record his report. Other cards of this type serve the same purpose for a variety of psychodynamic backgrounds, such as references to Kohut, Adler, Weiss, etc.[1] Jumps to the other hierarchical dimension (types of disorders) are possible from this type of card as well. At the top level of the disorder-type hierarchy are items like "depression", "anxiety", etc.

```
┌─────────────────────────────────────────────────────────┐
│ (depression theories)                                     │
│              ( psychodynamic )                            │
│              ( cognitive beh. th. )                       │
│              ( learning theory )                          │
│              (learned helplessness)                       │
│              ( biological )                               │
│              ( others )                                   │
│ (diagnostic systems)                                      │
│              ( DSM III )                                  │
│              ( others )                                   │
└─────────────────────────────────────────────────────────┘
```
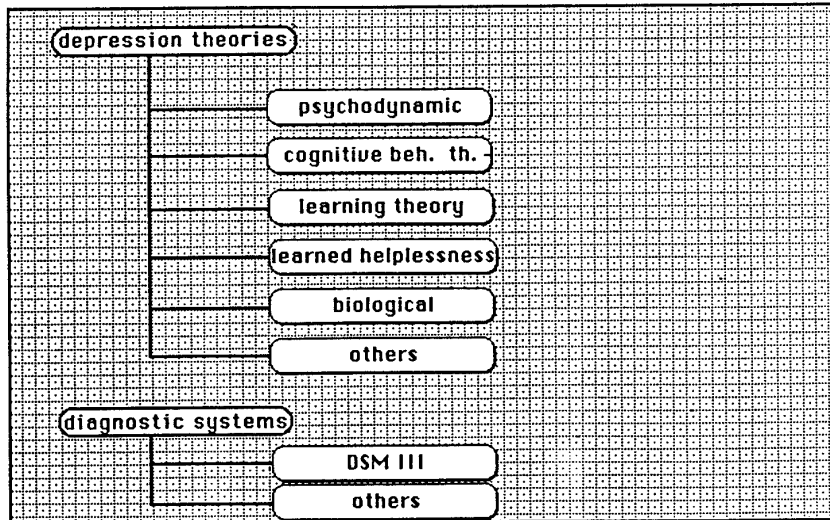
[1]   Because these and the following names of clinical authors are used for illustrative purposes only, being more or less randomly chosen, no bibliographical references are made.

```
┌ depression ┐

   Theories Cognitive Behavior Therapy

  Cognitive Triade     (Beck)

           negative ──────────── self
           expectations
                                 others
           (Beck)
                                 future

  Irrational Thoughts    (Ellis)
                                  ┌check + additional information┐
           ( gen.: Ellis )
           ( spec.: Hauck)
```
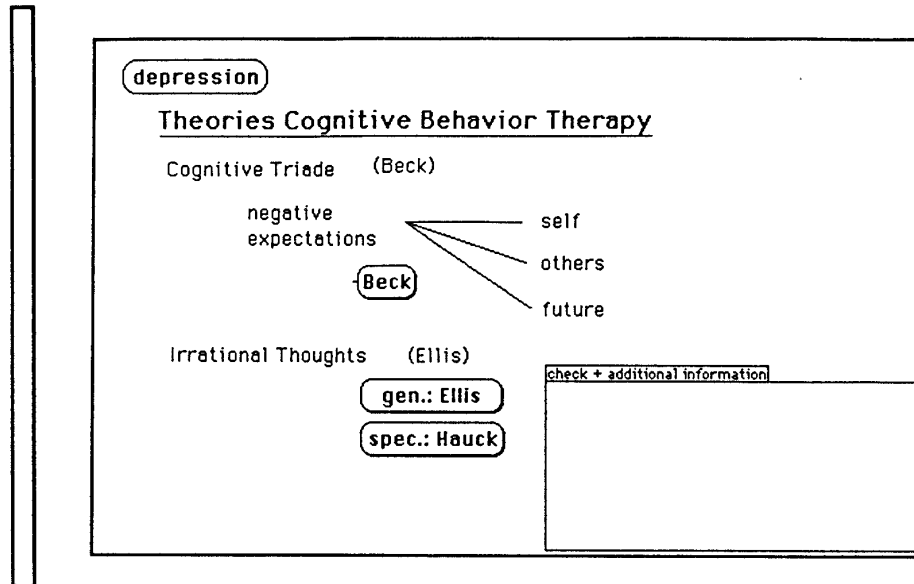
This is an example card out of the "disorder theory" stack. If the therapist verifies his view at a very general level, for example "I thought of the 'cognitive triad' sensu Beck", it is possible for the researcher to check this statement with the card shown in the picture. If the therapist is more specific, the researcher can use the buttons in order to switch to more precise information about approaches emphasizing the "irrational ideas" aspect, as elaborated by Ellis, or more specifically for depression, by Hauck. If, in another case, the researcher wants to get more specific about the Beck approach, he may press the "Beck" button and jump to this card:

This card provides more information from Beck's ideas about dysfunctional thinking in the client's present situation. More information about the idiosyncratic view of this therapist can be added in the empty field. Further cards serve similar purposes, but they rather trace the development of the client's depressive kind of thinking in the past. The "development"-button can be used for a convenient jump to these cards. The "Beck" card is, by the way, an example for cards which are part of both hierarchies mentioned above.

Finally, it should be mentioned that according to our experience, theory cards are used in only part of the reconstructions: many therapists insist that their primitives are very condensed and simple. Of course, in such situations it does not make sense if the researcher also insists and tries to tempt the therapist with a number of cards. It is much better to simply write down the therapist's answers on a neutral card, unless one wants to reconstruct a theoretical background, rather than actual memories.

The theory stack is currently still in the process of being elaborated, and provisional theory cards are used to keep track of theory-related information.

3.9 Results of a reconstruction session and reports

The *result* of a reconstruction session or several such sessions with the therapist is a *stack of new client statement cards and a number of checked or modified cards of the other types* mentioned above, with many links among them. After the information about an interview has been *accumulated*, it has to be *evaluated*. It is relatively easy to imagine how one could write a report based on this information, supported again by the possibility of jumping back and forth within the data. Further efforts will, however, be required to elaborate strategies for deriving quantitative data from qualitative reconstruction data. In principle, the methodology developed for the analysis of protocols can be used. HyperCard's potential for *introducing additional fields* on the cards described above, in order to *fill in intermediate results* derived from the information on a single card, can be used to *collect values from the cards for the purpose of statistical analyses*. This is achieved by a few simple commands and *without retyping the data.*. At the top of statement card 11 (see above) buttons are visible which can show and hide additional fields (not visible on the pictures) containing intermediate results. These buttons are normally hidden behind the menu-bar on SE MacIntoshes, and they can easily be hidden on MacIntosh IIs if desired for cosmetic reasons.

There may be occasions when it would be preferable to have all information of one type or a few types (e.g., client's statements, therapist's comments in the second run, etc.) together on one sheet of paper, thus separating written information among many cards seems to

be disadvantageous. But HyperCard *supports printing "reports"* with one or more fields put together from all cards of a stack so that nothing has to be typed a second time:

Report		
Overview client statements, record 32		
<u>card</u>	<u>statmt.time</u>	<u>statmt. text</u>
⋮	⋮	⋮
03	03.05	I must tell you, it wasn't easy for me to come here.
04	03.35	I don't know what to begin with
05	03.55	Well, I've been really down in the dumps for a couple of weeks (starts wringing his hands)

picture 3: report

Returning to an issue mentioned previously, the general problem of *losing orientation* with the flexibility of a HyperCard system does not play a significant role with the application described above. Perhaps it needs to be explicitly emphasized that it is not the therapist/subject who operates the system during the reconstruction session but the researcher who is familiar with the system. The researcher must have developed a thorough understanding of the system's structure and have available the skills necessary to enter notes in the fields quickly, create buttons within seconds, etc. It requires only a few days practice with such a system to acquire these skills.

Maybe it should also be mentioned explicitly that, although the researcher will of course try to avoid biases, objectivity is not the major concern with this methodological type of research. It has been argued repeatedly why flexibility is so pivotal and it may have become clear that this flexibility is unavoidably linked with some variance stemming from the researcher. However, as mentioned above, the methodological philosophy of the project of which HYPER-T is a part, is to pursue and *combine a variety of methodological approaches*, rather than endangering the strengths of each method by making compromises. It should also be emphasized that HYPER-T allows information to be easily accessed on which empirical observations conclusions are grounded, thus making arbitrariness traceable if it occurs.

A last but very important point: *flexibility* is required *in an additional sense* to what has been discussed above. If the researcher wants to catch the "real" processes, he has to study interviews in the therapists' familiar settings (if one abstracts for a moment from the special

requirements for the recording and observation of the interview). Therapists may be willing to work in a laboratory which provides video and computer equipment, but the therapists would be in an unfamiliar environment. Most therapists would, in addition, not be willing to bring their "real" clients to such a place. Furthermore, the goal of having considerable variability in therapeutic orientations and levels of experience leads to a search beyond the limits of a single institution or, most likely, a single city. The therapists must be willing to expose themselves to the researcher, yet most of them will not do this in the absence of a special relationship with the researcher or a mediator. Data must therefore be *collected from several places*: the colleagues with whom the author has this kind of relationship are spread over the German-speaking part of Europe and over North America, meaning that the *computer equipment has to be quite small and transportable*. Ideally, it should be possible to take the core unit, with the sensitive hard disk, into the cabin of an airplane as the hard disk, especially, is quite sensitive to shocks. Apple's Macintosh equipment meets these requirements: the Macintosh Plus or SE are small enough for cabin luggage and, moreover, a printer (e.g. ImageWriter) can be checked in as regular luggage. Needless to say, not all transportation is airborne, but also car and train travel is easier with handy equipment. It is probable that the speed of a Macintosh Plus or SE becomes a problem with large data sets. A computer with the performance of a Macintosh II but the size of the smaller models has been announced by Apple (and actually been delivered since version 1 of this report has been written).

In sum, if the question "is hypertext a technology in search of a problem?" (Fischer et al., 1988) is justified at all, then at least HyperCard has found a problem for which it is an adequate solution in many respects. Using HYPER-T makes clear how right Fischer is when he states that "paper is passive and can only serve as a repository for information, whereas computer systems can be active and assist us in searching, understanding, and creating knowledge in the course of cooperative problem solving processes" (in Fischer et al, 1988. p.2)

## 4. An application of HyperCard for analyzing protocols from discourse processing

In the project for which HYPER-T has been developed the single-case reconstruction of a particular therapist's hypothesis generation processes in a particular interview is not the only task. Certain aspects of hypothesis generation can be better studied by giving *several subjects* (which may be therapists or not) *the same stimulus material*. The data in this case are *not* client statements (as on the client statement cards described above) with links to a

large number of comments or introspective reports stemming from one therapist. Instead, client statements with links to *less comprehensive comments stemming from many subject-observers*, form the data set (see picture 4). Even though one would not do as excessive a reconstruction with each subject observer as one would with a single therapist, quite complex material is analyzed nevertheless.
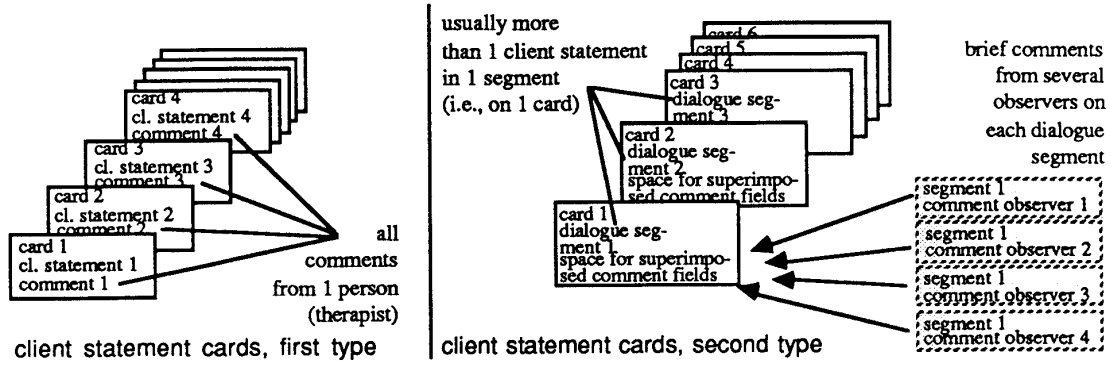
picture 4: comparison of client statement cards, first type, and second type

The following is a very brief description of how HyperCard can be used to represent those kinds of data and to get an overview of them.
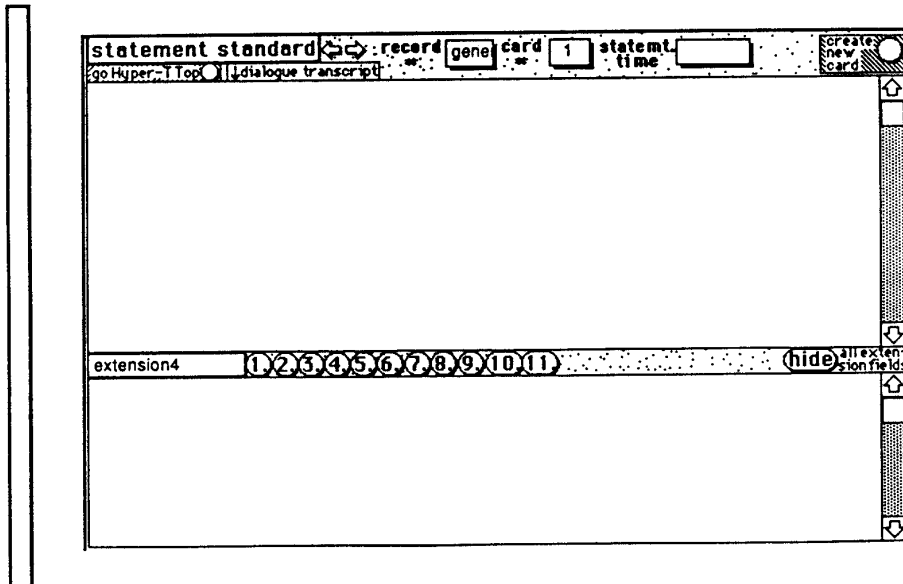
The card in the picture is also named "client statement" card, as above, but it looks somewhat different. Arrow buttons,"create new card" button "record #", "card #", and "statement time" fields need no further explanation. The "client statement" field on each card may contain single statements by the client. It may contain a larger number of statements, as well: if one, for example, presents the therapeutic dialogue to the subjects with a videotape it may make more sense to present a longer segment from the therapeutic dialogue in order to prevent the observers from losing the context of each statement. In this case, the text itself is typed following the rules of the "Ulmer Textbank" (Mergenthaler, 1985). For example, pauses are expressed by "-", and emphasis by the client or therapist on a word by an "!" after the word. The therapist's statements (different from the Ulmer Textbank) are in "[...]".

The observer's comments are called *"extension"* to emphasize the fact that they are not merely a condensed version of the information provided on the tape or in the transcript, but rather *something created by the observer who uses his knowledge base, refers to earlier statements, etc.*

In order to *enter the comments from several observers* related to the respective dialogue segment, we use the buttons in the middle, numbered 1 to 11 in the middle of the card. Pressing such a button changes the number in the observer field (e.g., "extension1" to "extension7") and it brings the desired extension text to the window below. It is necessary to associate an extension with a particular observer because on *one card* there are usually comments from *several observers*, although only one observer's comment is visible at a time in the "extension" window. There are actually as many fields as there are observers but the fields are *superimposed*. Typing an observer number brings this observer's field to the top position. This system may sound complicated, however, it is *more efficient* than creating one stack for each observer and jumping to another stack each time a comparison is to be made between the observers. Furthermore, a copy of the dialogue transcript is not required for each observer.

So far everything described in this chapter is not much more than another way of recording transcripts and comments, extensions, or protocols, whichever term one prefers. If *algorithms* are available to analyze these data, this method of representation may not be of much value unless one uses it in connection with an automatized method of collecting quantitative values from the cards (see 3.9). The advantage of the system proposed here becomes apparent as soon as one is in a "botanizing phase" or *exploration phase*[1] of research during

---

[1] Klaus Grawe once called this phase "Botanisierphase" (botanizing phase). Although the English verb "botanize", included, for example, in the Merriam-Webster Dictionary with a very similar meaning, seems to be less familiar than the corresponding verb in German, I could not renounce mentioning this word. In German it is beautifully

which one roams, looks at the data, compares the data and then attempts to develop hypotheses about regularities contained therein. In such a phase it is crucial to have flexible and fast access to whatever pieces of information one wants to view. Speed is less important if concepts are available; then one can scan a large set of information and bring together all relevant pieces of information matching the concept. If such concepts are unavailable it is more probable that they will be developed if the necessary pieces of information are *in close spatial and temporal proximity*. The representation of information in a *linear fashion* may allow pieces of information to be brought together *along one "dimension" at a time*, i.e., either all elements of the original discourse, or all extensions from several observers related to one segment of the dialogue, or all statements from one observer, related to the whole dialogue. Hypermedia, in the format described above, add the possibility of bringing together information *across these dimensions*.

For someone who has never worked with these kind of data it may be difficult to understand what this is all about. The following example may help explain. Certain kinds of information do not usually lead to immediate inferences by the observers. Usually this is the case with nonverbal or pragmatic information (i.e. *how* he says or expresses something, as opposed to *what* he says), unless there is a unique observation which speaks for itself. If a client speaks about his wife in a slightly nasty fashion, or if he shows a little bit of tension each time the therapist introduces a particular issue, this may be noticed and written down earlier by one observer, another may do so at later time. If one examines the protocols or extensions by client segments, one will see the statement with only one observer's comments, but not the other's, in spite of the fact that a second observer has made a similar comment linked to a later client statement. If, on the other hand, one looks at the extensions of one observer over the whole dialogue and then looks at the extensions of the next observer, etc., one may not even notice that the respective comments were made at a different times. Once such a comment has been found with one observer, one can easily examine and compare the data, hence there is a greater chance of finding out that some observers never mention a particular observation while others comment earlier or later. Having discovered such a phenomenon the researcher probably would like to find other independent or dependent observer-variables which may be related to the differences just mentioned. Again one has to browse around and again, the easier this is, the greater the chance of discovering relevant regularities.

If one already holds *clear concepts or hypotheses*, it depends only on the motivation to check everything with no time restrictions. In that case, a researcher can intentionally store

---

connected with associations of hiking in the nature and collecting samples, only directed by heuristic rules, intuition and chance.

one piece of information in memory until he has collected all other significant pieces and then drawn, or rejected a conclusion. If a *concept is not available and not sufficiently elaborated*, and if it could be created only under the condition that the *pieces of information which are needed to create it are in the working memory concurrently*, then it matters whether time is lost and whether valuable working memory space is wasted by processes which have only to do with making information accessible but which do not contain potentially relevant information themselves.

To summarize the application for discourse comprehension protocols, a hypermedia application can *facilitate and speed up data analysis*. In addition, if clear concepts and hypotheses do not exist, or if one wants to look at the data beyond them, easy access is not just a question of efficiency and convenience but *might determine if one is able to make sense of the data at all.*

5. A possible use for expert systems

The author of this paper has little claim to being an expert on expert systems. Therefore, the following statements should be looked at with reasonable skepticism. He has, however, spent considerable time becoming familiar with expert systems and the problems associated with them, and this has lead to some thoughts which relate the hypermedia application described above to expert systems in general.

Expert systems can be developed *relatively easily* when the thinking of the respective experts follows, to a large extent, *rules* which are either already explicit or *which can easily be made explicit by the experts*. However, in many cases the experts' thinking does *not really follow explicit rules*. It might be possible to formulate rules from what the experts say, whether or not it makes sense to assume that these kinds of rules are in fact similar to the ones which are applied by the experts implicitly. If a system which is developed this way performs as well as, or even better than, the human experts, the developers of such a system will probably be satisfied. This is at least true for those who are interested only in an efficient system and not in the issue of how the experts "really" function.

It is, however, easy to imagine a case of professional thinking which can not be covered in a satisfactory way by explicit "if-then rules" and similar types of simple processes. This is, in fact, the case in every domain which is complex, and in which not only consistent routine performance is required but also *exceptional and/or creative performance*.(Hammond, 1988; Hamm, 1988). Again, it may be possible to catch *parts* of this type of performance and of the *processes* responsible for it by simply talking with the exceptional professionals

and deriving rules from this communication. However, it seems unlikely that such a system covers *more subtle kinds of performance in a comprehensive way.*

There is a fair probability that all considerations about reconstructing psychotherapists' thinking as described above apply -mutatis mutandis- to the thinking of experts in general. There remain a number of problems to be solved, for instance how to introduce intuitive and emotionally influenced types of thinking into expert systems, but it seems that we must at least begin with *attempts to reconstruct experts' thinking in a sufficiently differentiated way* which is similar to that described for psychotherapists in this paper. If rules were easily accessible there would be little reason to spend the time and energy required for the application of a system such as HYPER-T; if not, it might be productive to spend time thinking about such an application.

To prevent misunderstandings: a Hyper-T-like tool would, of course, not replace expert systems. It would rather serve the purpose of getting access to non-rule-based ways of experts' thinking as a *basis for developing* realistic expert systems.

At the end of this report which is in many ways enthusiastic about possibilities provided by computer support, two cautious remarks may be necessary. First of all, for every application, costs and payoff have to be carefully assessed. There is no justification for using computers simply as modern means of demonstrating a researcher's potency (Pfaffenberger, 1988). Second, the use of computers does not per se make the procedure more objective, nor does it make the researcher's interpersonal skills and background knowledge superfluous. Intimate knowledge of the studied domain is still a necessary condition for reasonable results.

References:

Ambühl, H. (1987). Psychotherapie im Lichte der Verwirklichung therapeutischer Heuristiken, unveröff. Dissertation, Universität Bern

Conklin, J. (1987). Hypertext: An introduction and survey. Computer, 20,9, p. 17-41

DiSessa, A.A. (1987). Phenomenology and the evolution of intuition. in: C. Janvier (ed.): Problems of representation in the teaching and learning of mathematics, p.83-96, Lawrence Erlbaum, Hillsdale, N.J.

Dowie, J. & Elstein, A.(eds): Professional judgment. Cambridge University Press, Cambridge, Mass.,

Elliott, R. & Shapiro, D. (1988) : Brief structured recall: A more efficient method for identifying and describing significant therapy events. British Journal of Medical Psychology, 61, 141-153

Ericsson, A. & Simon, H.A. (1984). Protocol Analysis. Verbal Reports as Data. Cambridge, Mass.: MIT Press

Fischer, G., Weyer, S.A., Jones, W.P., Kay, A.C., Kintsch, W. & Trigg, R.H. (1988). A Critical Assessment of Hypertext Systems. Human Factors in Computing Systems, CHI'88 Conference Proceedings (Washington, D.C.), ACM, New York, p 223-227

Grawe, K. (1988). Zurück zur psychotherapeutischen Einzelfallforschung. Zeitschr. f. Klin. Psychol, 17 (1), S.1-7

Grawe, K., Caspar, F., Müller, H.P., Ambühl, H.-R., Arnold, E. & Mezenen, U.: The Bernese comparative treatment study: Design and results of process-outcome analysis. Paper presented at the Annual meeting of the Society for Psychotherapy Research, Ulm.

Hamm, R.M. (1988): Clinical intuition and clinical analysis: Expertise and the cognitive continuum. In: Dowie, J. & Elstein, A.(eds): Professional judgment. Cambridge University Press, Cambridge, Mass., p. 78-108

Hammond, K.R. (1987): Information Models for intuitive and Analytical Cognition, Center for Research on Judgment and Policy, University of Colorado at Boulder, Report #281, to be published in: A. Sage (ed.): Concise encyclopedia of information processing in systems and organizations. Oxford, Plenum Press

Kolodner, J. (1988). Case-based reasoning (ed.). Proceedings of a DARPA workshop, Clearwater Beach, Florida

Mergenthaler, E. (1985). Textbank Systems: Computer Science in the Field of Psychoanalysis. Springer, New York

Orlinsky, D.E. & Howard, K.J. (1978): The relation of process to outcome in psychotherapy. In: S.L. Garfield & A.E. Bergin (eds.): Handbook of psychotherapy and behavior change. New York, Wiley

Pfaffenberger, B. (1988): Microcomputer applications in qualitative research. Sage Publications, Newbury Park, CA

Shaw, B. & Dobson, K. (1988). Competency judgments in the training and evaluation of psychotherapists. Journal of Consulting and Clinical Psychology, 56, 5, p. 666-672

Smolensky, P., Bell, B., Fox, B., King, R. & Lewis, C. (1987): Constraint-based hypertext for argumentation. Techn. Report, Dept. of Computer Science, Unviversity of Colorado at Boulder

Stiles, W.B., Shapiro, D.A. & Elliott, R. (1985). Are All Psychotherapies Equivalent? American Psychologist. 41, 2 165-180

Todd, D.M., Jacobus, S. & Boland, J. (1988) Computer assisted qualitative analysis as a tool for psychotherapy researchers. Paper presented at the annual meeting of the Society for Psychotherapy Reserach, Santa Fe

Thommen, B., Ammann, R. & von Cranach, M. (1988). Handlungsorganisation durch soziale Repräsentation. Huber, Bern

Address:

Dr. Franz Caspar   after September 1989:
Clarke Institute for Psychiatry   Psychologisches Institut der Universität Bern
250 College Street   Gesellschaftsstr. 49
Toronto, Ontario M5T 1R8   3012 **Bern**
CANADA   SWITZERLAND

Colleagues who intend to use similar systems are encouraged to get in contact with the author because not every methodological detail could be reported here and improvements of the system are going on.