MULTIMEDIA TRANSCRIPTION

OF THINK-ALOUD DATA

ON THE L2 READING PROCESS

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Abstract

This paper focuses on the methodological problem of precisely and concisely transcribing think-aloud data on the EFL reading process. Although the use of think-aloud protocols is widely spread in L2 reading strategy research, the respective methods of transcription do not seem to be refined to the necessary degree. All too often, transcripts of think-aloud during L2 reading have been produced according to standards of written language only. Using three empirical examples from a study on the EFL reading process as mental action (Schramm 2001), this paper explores the specific transcription challenges posed by videotaped think-aloud data on L2 reading. From a discourse analytical position, it suggests to not only transcribe verbal communication, but to also document aspects of non-verbal communication (e.g. gesturing and pointing) and actional activities (e.g. underlining and writing) during reading. In particular, it proposes to integrate related materials such as the read texts or the subjects' notes as well as videos of gestures and recordings of voices into a multimedia transcript.

INTRODUCTION

For the past two decades, L2 reading strategy research has relied extensively on think-aloud data (e.g., Block, 1986, 1992; Davis & Bistodeau, 1993; Hosenfeld, 1977, 1979; Li & Munby, 1996; Sarig, 1987; Schrader, 1996; Schramm, 2001) which, in accordance with Ericsson and Simon (1984, pp. 32ff.), can be defined as the verbalization of non-verbal mental representations from short-term memory. Typically in these studies, L2 readers are asked to "report exactly what they [are] thinking while reading and [are] cautioned against trying to explain or analyze their thoughts" as, for example, in Block (1986, p. 469).

Think-aloud studies have provided valuable insights into the strategies used by L2 readers. It is important, however, to bear in mind that think-aloud is only one approach in a broad range of methods of data collection in reading research. Another simultaneous method that has been used in applied linguistics is miscue analysis (e.g., Devine, 1988) where subjects are asked to read an L2 text out loud, and the analysis focuses on the readers' deviations from the text. Cohen, Glasman, Rosenbaum-Cohen, Ferrara, and Fine (1979) provide a third example of simultaneous

data; they had subjects underline difficult structures and words. More frequently, though, L2 reading researchers have used successive methods, i.e. they have collected their data not during, but after the reading process. They have, for example, elicited summaries (e.g., Amer, 1994), extensive recalls (e.g., Devine, 1988), visualizations of text content (e.g., Carrell, Pharis, & Liberto, 1989), answers to comprehension questions or multiple-choice questions (e.g., Anderson, 1991), completion of cloze-tests (e.g., Clarke, 1980), evaluations of text comprehensibility (e.g., Carrell, 1983), retrospective data and general reports in interviews or questionnaires (e.g., Barnett, 1988) as well as translations (e.g., Bensoussan, 1990). Therefore, think-aloud protocols present only one particular method of collecting data on the L2 reading process.

The methodological issues concerning think-aloud data have been discussed in the larger context of an intense debate on introspection in general (s. Afflerbach, 1999; Deffner, 1984; Ericsson, 1988; Ericsson & Simon 1984, 1987; Faerch & Kasper 1987; Garner, 1988). As Ericsson & Simon (1984) point out, introspection, which had been considered *the* method in the beginnings of psychology in the late 19th century, fell into disgrace at the beginning of the 20th century when behaviorists considered it unscientific and decided to take an experimental approach to psychology instead. Therefore, introspective methods were rare in psychological research for several decades. In their review of criticism of such studies, Ericsson & Simon (1984) summarize the arguments against introspection as (i) the *effect-of-verbalization* argument (i.e. that verbalization changes the cognitive processes, (ii) the *incompleteness* argument (i.e. that the protocols are incomplete and, therefore, do not fully shed light on the cognitive processes) and (iii) the *epiphenomenality or irrelevance* argument (i.e. that subjects report on parallel activities that are independent of the actual mental processes). After their detailed discussion, they conclude:

> Our examination of two of the most vigorous challenges to the usefulness of verbal reporting leaves intact our belief that such reports – especially concurrent reports, and retrospective reports *of specific cognitive processes* – provide powerful means for gaining information about such processes. The concurrent report reveals the sequence of information heeded by the subject without altering the cognitive processes, while other kinds of verbal reports may change these processes. In retrospective reports of specific processes, subjects generally will actually retrieve the trace of the processes. In other

forms or retrospective reporting, subjects, instead of recalling this information, may report information that they have inferred or otherwise generated. (Ericsson & Simon 1984, p. 30; italics in original)

Since this rehabilitation of introspective approaches in cognitive psychology, applied linguists have also been inspired to use them. The discussion of introspection in research on second language acquisition has focused especially on the issue of which methodological choices produce valid and reliable introspective data. From this discussion, Faerch and Kasper (1987) have distilled six criteria for a classification of introspective methods:

1. Object of introspection [...].
2. +/- related to concrete action.
3. Temporal relationship to action [...].
4. +/- informant training.
5. Elicitation procedure [...]
6. +/- combination of methods. (Faerch & Kasper, 1987:11)

One of the most frequently discussed aspects is the third criterion, the temporal relationship to action. Faerch and Kasper (1987) distinguish (i) simultaneous introspection (for verbalization during attention), (ii) immediate retrospection (for verbalization from short-term memory) and (iii) delayed retrospection (for verbalization from long-term memory); while other authors use comparable concepts, though with a different terminology. Cohen and Hosenfeld (1981) as well as Cohen (1984, 1987a, 1987b), for example, refer to (i) as self-revelation or think-aloud, to (ii) as self-observation by introspection and to (iii) as self-observation by immediate or delayed retrospection. Another major focus of interest has been the fifth criterion, the issue of elicitation procedures, for example the questions whether introspective data should be self- or other-initiated (see Cavalcanti, 1987) and what role the interaction between experimenter and informant or between informants plays (see Haastrup, 1987).

Taking into consideration how challenging it is to transcribe verbal data, though, it is rather surprising that the detailed discussion of methodological issues involved in introspective data collection has hardly focused on the transcription of the elicited data. While awareness of transcription problems and discussion of different transcription systems abound in the field of discourse analysis, applied linguists in L2 reading research, so far, have rarely addressed the issue explicitly.

Therefore, this paper focuses on transcription of think-aloud data on L2 reading, and especially on chances for methodological refinement provided by the use of multimedia transcription. The term *multimedia transcription* is used to refer to transcripts that not only provide verbal information, but images, sound files, and/or video data as well. Using empirical examples from Schramm's (2001) study, this paper discusses some of the specific challenges in transcribing such data and suggests solutions. It proposes to integrate related materials such as the texts or the subjects' notes as well as videos of gestures and recordings of voices into a multimedia transcript.

To explore the chances for methodological refinement in transcripts of think-aloud data on L2 reading, the second section will look at two conventional transcripts that have been produced in this field. The third section will briefly introduce the *Heuristic Interpretative Auditory Transcription* (H.I.A.T.) system, which has provided the empirical examples discussed in this paper. The fourth section will then turn to the multimedia transcripts of these empirical examples of videotaped think-aloud data. In particular, it discusses challenges in transcribing (i) aspects of verbal communication which are often neglected in transcripts of think-aloud studies on L2 reading (e.g. features of spoken discourse and quotations), (ii) non-verbal communication (e.g. pointing and gesturing), and (iii) actional activities during reading (e.g. underlining and writing).

CHANCES FOR METHODOLOGICAL REFINEMENT

Figures 1 and 2 show two conventional transcripts of think-aloud data on L2 reading. They are to illustrate the impresssion that, although the use of think-aloud protocols is widely spread in L2 reading strategy research (see Block, 1986**,** 1992**;** Davis & Bistodeau, 1993; Hosenfeld, 1977, 1979**;** Li & Munby, 1996**;** Sarig, 1987; Schrader, 1996; Schramm, 2001), the methods of transcription are not refined to the degree that is common in discourse analysis. Most of the time, the transcripts have been produced according to standards of written discourse only.

> *Excerpt from think-aloud protocol:*
> "I read the first paragraph and then I ask myself, 'What is that about?' I know it is a [an] introduction, but I have to read again to get the meaning of the introduction. [pause] I am not very sure so I have to read again to check whether it is right. *You*

know, when I start reading, immediately the picture in my mind is about revolutions. *Well, third world, it* includes China, of course. <u>...</u> *Well*, <u>um</u>, the second paragraph is short, but it is very important, *you know*, because it is the purpose of the article. *You see*, the author did not state clearly *that, that* is the purpose *or what,* but we can judge by ourselves that is the purpose."

Figure 1: Conventional transcript of think-aloud data on L2 reading (Li & Munby 1996:213f.; italics and underlining not in original, K.S.)

The first example (figure 1) – from an empirical paper – can be considered quite typical. The authors do not discuss the problem of transcription explicitly, but they do provide a sample transcript. Note from the three underlined text elements that the transcriber has indicated pauses and filled pauses. From certain features (see elements in italics in figure 1), it is clear that this transcript is meant to represent spoken discourse. However, the conventions used to document it are obviously those of written discourse. No attempt has been made at transcribing paralinguistic information, non-verbal communication or actional activities. For their analysis, the authors were interested in the verbal data only.

Text excerpt:
"La vida diaria (daily) de un pueblo es tranquila, casi monótona. Nadie tiene prisa (Nobody is in a hurry). Los hombres se levantan temprano y van al trabajo. [...]"

Excerpt from think-aloud protocol:
"(He reads aloud one sentence.) The daily life . . . of the town is tranquil . . . tranquil . . . *casi montana* . . . *casi* (He turns to the glossary.) almost . . . *montana* (He repeats the word, spells it out, and then returns to the text.) The daily life of the town is tranquil . . . always . . . *manotano* . . . (He turns to the glossary.) monotonous (He turns back to the text.) The daily life of the town is tranquil . . . and always monotonous. *Nadie tiene* . . . Nobody is in a hurry. The men . . . *se levanta* (He turns to the glossary, repeats *levanta*, and spells out the first letters as he scans the columns.) to get up (He turns back to the text.) [...]"

Figure 2: More detailed transcript of think-aloud data on L2 reading (Hosenfeld 1984:237; italics in the original)

The most detailed transcripts of think-aloud data in this field were already provided in the pioneering work on L2 reading strategies by Hosenfeld (1977, 1979, 1984). Figure 2 shows a short quote from a Spanish text that she used and the corresponding excerpt from a think-aloud protocol. Note that Hosenfeld not only documents pauses with dots, but that she also uses brackets to present information on reading aloud, on turning to certain text elements, and on repeating a word as well as spelling out letters. She also marks Spanish text elements in italics. This clearly is a more detailed documentation of the L2 reader's think-aloud data than the

transcription given in the first example. Hosenfeld's attempt at transcribing actional activities is especially noteworthy because she was the first researcher to present any think-aloud data on L2 reading. However, a closer look at her transcript reveals several ambiguities listed in table 1.

Element of think-aloud protocol	Lack of clarity
(1) "(He reads aloud one sentence.)"	Which sentence does he read aloud?
(2) "The daily life . . . of the town is tranquil . . . tranquil . . ." the first time?	Is this a repetition or a repair? Does the reader sound uncertain or certain when he says "tranquil" for time and the second
(3) "*Nadie tiene* . . . Nobody is in a hurry."	Is the reader translating the Spanish text element on his own or is he reading the English translation from the textbook?

Table 1: Potential for methodological refinement in Hosenfeld's (1984) early think-aloud protocol

So far, most researchers in this field have not explicitly discussed their transcription of think-aloud data. When they provide examples, however, it is obvious that they have produced basic transcripts only (e.g., Block, 1986, pp. 493f.; Davis & Bistodeau, 1993, p. 462; Schrader, 1996, p. 284). As Dechert (1987) points out, this might stem from the fact that the introspective approach was originally taken over from cognitive psychology, which usually does not require specific information on language-processing for its analyses. For studies on L2-related issues, however, the detailed transcription of aspects of spoken discourse like pauses, intonation, or variation in the rate of speech permits great potential for insight into mental processes as scholars like Afflerbach & Johnston (1984) or Dechert (1987) have already pointed out in the 1980s. The same is true, this paper will argue, for the documentation of non-verbal communication and actional activities during think-aloud.

The documentation of non-verbal communication can greatly enrich the transcripts by providing, for example, information on subjects' pointing to specific text elements and on their gesturing. The documentation of subjects' pointing provides the analyst with additional information on the subjects' mental focus and helps him or her to interpret verbal utterances (e.g., deictic expressions like "this" or "here") more reliably. Equally important, gestures

communicate the mental representation of subjects as do verbal utterances, and their additional documentation therefore yields richer, more reliable data.

The documentation of actional activities can prove just as useful for specific analytic goals: It not only makes it possible to reconstruct subjects' turning in specific directions, which again provides information on their focus, but also to trace their successive underlining and note-taking. In contrast to a documentation of underlined text and notes only, which does not give any indication about the timewise relationship of underlining and writing with the verbalized thought processes, the documentation of these actional activities allows reconstructing the subjects' text focus, their successive knowledge construction, and the interaction between text, pre-knowledge, and mental model. This provides rich data for a process-oriented analysis that does not only focus on the product of comprehension, but inquires especially into the process of knowledge construction.

THE H.I.A.T. SYSTEM

The H.I.A.T. system has been used and refined in German and Dutch discourse analysis since the 1970s. It thus provides an elaborate and proven system to document spoken discourse (Ehlich & Rehbein, 1976, 1979, 1981a, 1981b; Ehlich, 1993; Rehbein et al., 1993; Rehbein 1995). Equally important, the corresponding software ("syncWRITER", "EXMARaLDA")[2] has been developed, tested and improved for more than a decade. It allows for the multimedia integration of collected materials such as the studied texts or the subjects' notes as well as videos of their facial expressions and recordings of their voices.

H.I.A.T. is based on a score notation like those used in musical compositions arranged for several voices. This allows for a representation of different speakers' verbal actions in several lines, one below the other, like those of Mary and Anne in the simple example shown in figure 3(i). The different lines in a simultaneity area thus precisely show the timewise relation of the utterances or their simultaneity.[3] Depending on the planned analysis, the line of action of a single actor can be split into several lines. Besides the speaker's line, H.I.A.T. also provides lines for non-verbal communication (N.V.C.) and actional activity (A.C.) as well as for

(i) Transcript of verbal communication only

1	Mary	Hi, how are you?	<u>Great</u>. ((1s)) I went
	Anne		Fine, thanks. How about you?

2	Mary	to the movies with Bret yesterday night.	Oh yeah.
	Anne		[Oh, rea:lly?] ((laughs))
	Comm		*[sounds quite surprised*

3	Mary	Just a second. ((--- 4 s ----))
	Anne	Which movie did you see?
		((-------------------- Telephone rings. ------------------------))

(ii) Transcript of verbal & non-verbal communication including actional activities

1	Mary	Hi, how are you?	<u>Great</u>. ((1s)) I went
	NVC-Mary	o--- hugs Anne ---o	o--- smiles -—o
	AC-Mary		o--------- walks into living
	Anne		Fine, thanks. How about you?
	NVC-Anne	o--- hugs Mary ----o	
	AC-Anne		o---------- walks into living

2	Mary	to the movies with Bret yesterday night.	Oh yeah.
	AC-Mary	room -----------o	
	Anne		[Oh, rea:lly?] ((laughs))
	NVC-Anne		% opens MO in surprise
	AC-Anne	room --------------------------o	
	Comm		*[sounds quite surprised*

3	Mary	Just a second. ((--- 4 s ----))
	AC-Mary	o gets up and leaves the room o
	Anne	Which movie did you see?
		((-------------------- Telephone rings. ------------------------))

AC = Actional activities
NVC = Non-verbal communication

Figure 3: Simple H.I.A.T.-illustrations (not empirical data)

intonation which is not included in this example (see figure 3ii). Table 2 shows some important H.I.A.T.-conventions for the transcription of phenomena of spoken discourse. Although H.I.A.T. was originally developed for the transcription of discourse between two or more speakers, the system can easily be applied to monologues, such as think-aloud data, as well. The next section will show in detail how H.I.A.T.'s underlying aim of representing simultaneity can be used for the purpose of transcribing think-aloud data on reading.

/	repair
…	abortion of an utterance
((xs))	pause of x seconds
•	short pause under 1 sec.
• •	medium pause under 1 sec.
• • •	long pause under 1 sec.
x:	„x" lengthened
´	rising intonation
`	falling intonation
( )	not or not exactly comprehensible [or discernible][a]
"x x x"	in speaker's track: is reading aloud [or in A.C.-line: is writing][b]
°-----°	time stretch of non-verbal activity[b]
%	extremely short time stretch of non-verbal activity
<u>xxx</u>	„xxx" spoken with emphasis

[a] Explanations given in square brackets are not original H.I.A.T.-conventions, but have been introduced by Schramm (2001). They are based on the respective H.I.A.T.-conventions which are mentioned in front of the square brackets.
[b] Note that H.I.A.T. usually uses "o---o" instead of "°---°".

Table 2: Some important H.I.A.T.-conventions

CHALLENGES IN TRANSCRIBING THINK-ALOUD DATA ON L2 READING

Subjects who think aloud during reading not only utter their thoughts, but also perform several non-verbal activities like turning the pages, underlining, writing, and gesturing. Consequently, it is helpful to include N.V.C.- and A.C.-lines in the transcripts. In Schramm (2001), the activities of the subjects' hands were quite complex – partly because they had been asked to point at the end of the line which they were reading. In order to document the reading process in a clear and easy-to-read manner, the transcripts thus consisted of up to eight different lines. These different lines can be seen in figure 4.

Verbal communication

The speaker's line documents the verbal communication. Two problems relevant for the documentation of verbal think-aloud data on L2 reading are how to transcribe features of spoken discourse and subjects' quotations from the text.

(1) speaker's line: verbalization (in the original languages, i.e. German and English)
(2) IL: interlinear translation of verbalizations into English
(3) NVC (HAr): non-verbal communication of the right hand
(4) NVC (HAl): non-verbal communication of the left hand
(5) NVC: all remaining non-verbal communication (especially facial)
(6) AC (HAr): actional activity of the right hand
(7) AC (HAl): actional activity of the left hand
(8) AC: all remaining actional activity (especially movements of the torso and head)

Figure 4: Lines used in the transcripts of think-aloud data in Schramm (2001)

Features of spoken discourse

Although L2 reading researchers have not often transcribed features of spoken discourse, the need to do so has been pointed out in the methodological discussion (see also Dechert, 1987). For example, Afflerbach & Johnston (1984, p. 315) maintain:

> Verbal reports are usually transcribed and then analyzed in protocol form. This method can present serious problems if the differences inherent in spoken (verbal report) and written (verbal report transcript) discourse are not considered. In the course of giving verbal reports, subjects make great use of spoken discourse features that may be lost in a transcription. The range of these features is wide, including intonation, inflection, pauses, and variation in the rate of speech. Thus, there is the need to account for features of spoken discourse when transcribing and analyzing verbal reports. Utterances using sarcasm, rhetorical questioning, and the like need to be adequately accounted for.

The following examples serve to illustrate the transcription of features of spoken discourse. Figure 5 shows think-aloud data from a German psychology student whose pseudonym is Jörg and who is reading an English text from a psychology textbook (Atkinson et al. 1993). Please note from the IL-translation line that Jörg first reads aloud some of the text in score areas (S.A.) 65-67, and then makes this utterance: "• Brightness and colors um ((2s)), (hm, hm) I think I've seen this uh before in the last chapter about • • um • • rods and c/ (hm, hm) and cones (in the,) in the eye ((1s)) um • • which, as we know, can take in light intensity as well as color." (S.A. 66-71) He then continues reading the text aloud.

| 65 | Jörg | ((schluckt, 1s)) | "The image projected on our retina" • "is a |
| | IL-Jörg | ((swallows, 1s)) | "The image projected on our retina" • "is a |

66	Jörg	[m:osaic]", ja, "mosaic" • "of varying brightnesses" • "and
	IL-Jörg	[m:osaic]", yes, "mosaic"• "of varying brightnesses" • "and
	NVC (HAr)	°---------- IF moves -------°
	Comm	[hesitant, rising intonation

67	Jörg	colors." • "Somehow" • "our perceptual system"... • Brightness
	IL-Jörg	colors." • "Somehow" • "our perceptual system"... • Brightness
	NVC (HAr)	°------------ moves -----------
	NVC	°--- HE l-r-l ----

68	Jörg	and colors ähm ((------------------ 2s ------------------------)), (hm hm)
	IL-Jörg	and colors um ((------------------ 2s ------------------------)), (hm hm)
	NVC (HAr)	--- moves ----------------------------------
	NVC	------ HE l-r-l --------° °-------- pursed LI, swallows, nods slightly -----° °– HE r-l-r –

69	Jörg	das äh kommt mir bekannt vor aus dem vorigen Kapitel grad
	IL-Jörg	I think I've seen this uh before in the last chapter
	NVC (HAr)	------------------------------ moves --
	NVC	------------------------------ HE r-l-r --

70	Jörg	über • • ähm • • Stäbchen und Z/ (hm, hm) und Zäpfchen (im,)
	IL-Jörg	about • • um • • rods and c/ (hm, hm) and cones (in the,)
	NVC (HAr)	------------------------------------ moves ------------------------------------
	NVC	---------°

71	Jörg	im Auge, ((1s)) ähm • • die eben sowohl die Lichtintensität als
	IL-Jörg	in the eye ((1s)) um • • which, as we know, can take in light
	NVC (HAr)	--------------------- moves --
	NVC	°--------------------- HE r(-l) ---------------------

72	Jörg	auch die Farbe aufnehmen können. "Somehow our perceptual
	IL-Jörg	*intensity as well as color."* "Somehow our perceptual
	NVC (HAr)	-------------------- moves ---------------------°
	NVC	--------------------- HE r(-l) ---------------------°

| 73 | Jörg | system organizes |
| | IL-Jörg | *system organizes* |

AC   = Actional activities
IL   = Interlinear translation
NVC = Non-verbal communication

Figure 5: V.C.-examples in Jörg's transcript (translated from: Schramm 2002:CD-ROM, fig. 6.5)

The examples in figure 5 show seven aspects of spoken discourse that have been documented in this transcript:

(1) non-verbal sounds like swallowing or sighing by using double brackets (see S.A. 65),

(2) relevant intonation by stating it in the external comment line (see S.A. 66),

(3) abortions of utterances by using "..." (see S.A. 67),

(4) not clearly comprehensible utterances or parts of utterances by using single brackets (see S.A. 68)

(5) repairs by using slashes (see S.A. 70),

(6) special emphasis by underlining the stressed syllables (see S.A. 71), and finally

(7) pauses and filled pauses by stating the duration of pauses of one or more seconds in double brackets, by transcribing planning indicators like "um" or "hm" and by using up to three symbols "•" for short, medium and long pauses under one second (see S.A. 71).

An important feature of the used program syncWRITER (see Grießhaber, 1992) is that it allows for the integration of video data. So, if the video data are digitalized and segmented into mini-sequences of utterances, they can then be integrated into the multimedia transcript and syncronized at the specific places in the speaker's line. They thus become easily accessible for repeated listening in the process of analysis or in the critical reception of a published analysis.

To document these paralinguistic aspects of spoken discourse in think-aloud data on reading also seems to be important because the emotions displayed by trusting subjects can prove extremely valuable when analyzing the reading process. Tina's transcript illustrates this point. In figure 6 we see her becoming bored with the textbook material because she already knows most of it. Note that she explicitly expresses her impatience and boredom at two points in the transcript: In S.A. 322f., she remarks: "Yes, and then • spontaneous activity, but I've done all of this already." A few moments later, she complains: "[...] yes, that's obvious that it can be placed somewhere else, too. (Do you think we are that) stupid?" (see S.A. 327f.).

In this transcript, we see examples of changes in loudness (S.A. 317) and also of emotional states that have been noted in external comments regarding the quality of her voice: "slightly tense" in S.A. 322 and "appears irritated or angry" in S.A. 325. The corpus analyzed in Schramm (2001) included numerous instances of emotional reactions in response to even the matter-of-fact textbook used in that study. Clearly, individuals differ in the degree to which they display their emotions, and different settings induce more trust towards the experimenters than others; but if the data reveal emotional states, it can be helpful for specific analytic purposes to include this information in the transcripts. For example, when readers use fix-up strategies to solve comprehension problems, they do not always verbalize evaluations of the course of action they have taken, i.e. whether they feel that their attempts are promising and successful or frustrating and unsuccessful. However, the emotional quality of their voices, combined with their facial gestures, often allowed Schramm (2001) in her corpus to infer the readers' evaluations, which are essential for the analysis of comprehension monitoring. Another example of when such data on emotional voice quality can be helpful is the reading aloud of text elements by subjects. In such cases, the documentation in the verbal line informs the analyst about the reader's focus only, but it is highly relevant for the interpretation whether the subject reads the text aloud with disbelief, frustration, excitement, or satisfaction. An external comment on the reader's voice can provide this additional data for the researcher to infer the mental processes related to that particular text focus and can provide evidence for or against specific options of interpretation.

316

Tina	was man • sieht. ((3s)) ((stöhnt, 1s)) ((schnalzt, 1s)) "amplified"
IL-Tina	what you • see. ((3s)) (sighs, 1s)) ((clicks tongue, 1s)) "amplified"
NVC (HAr)	-------------------- (L32) mr -------------------° °-------------- (L33) r --------------

317

Tina	"on an oscilloscope" ((---------- 1s --------)) ((1s)) ["which converts
IL-Tina	"on an oscilloscope" ((---------- 1s -------)) ((1s))["which converts the"].
NVC (HAr)	---------- (L33) r -----------°
AC	°-tips HE to look at F4-4/pict t -° % HE back to text
Comm	[in a low voice]

318

Tina	the"]. Ja. Das (ist) dann hier oben. Halt nur wie das dann
IL-Tina	Yes. That (is) up here then. Just only how it is then
NVC (HAr)	°---------- F4-4/pict t ------------° °-- at HE ---

319

Tina	abgeleitet wird. Das ist genau das gleiche, was ich gestern
IL-Tina	converted. That is exactly the same as I did yester-
NVC (HAr)	-----° °------------------------ (L34) r ------------------------------
NVC	% raises HE and nods °------- frowns -----

320

Tina	gemacht habe, (Oszilloskop). ((2s)) ((stöhnt, 1s)) ((------ 4s -------))
IL-Tina	day, (oscilloscope). ((2s)) ((sighs, 1s)) ((------ 4s -------))
NVC (HAr)	------------------ (L34) r -------------° °----------------- (L34-35) r --------------------°
NVC	----- frowns -----° °- movements of MO —°
AC	% HE back to text

321

Tina	Ja. Spikes and waves kommen dann. Allerdings hier "spikes"
IL-Tina	Yes. Then, spikes and waves appear. However, here only
NVC (HAr)	°---------------- (L35) r -------------------------° °----- (L35) mr -----° °----------
NVC	% sits up straight % raises HE, then tips it to r for

322

Tina	nur. ((1s)) ((stöhnt, 1s)) ((2s)) Ja, und dann • [spontane
IL-Tina	"spikes"((1s)) ((sighs, 1s)) ((2s)) Yes, and then • [spontaneuous
NVC (HAr)	----------------- (L35-37) r --------------°
AC (HAr)	°------ underlines "spontaneous
NVC	a short while
Comm	[slightly tense]

323	Tina	Aktivität], aber das hab ich doch alles schon mal gemacht.
	IL-Tina	*activity], but I've done all of this already.*
	AC (HAr)	activity" ----°
	NVC	°------------------------- frowns-------------------------------°

324	Tina	• Ist doch langweilig auf die Dauer. ((3s)) "A fast train". Ja, ja. ((1s))
	IL-Tina	*• This is boring after a while. ((3s)) "A fast train". Yes, yes. ((1s))*
	NVC (HAr)	% raising °------------------------------ (L37-39) r -----------------------------
	AC (HAr)	%pushes book away from her a little
	NVC	[-°bobs HE-°]
	Comm	*[appears bored*

325	Tina	Und dann halt, [daß ein (Neuron) zu einem ((schnalzt, 1s))
	IL-Tina	*Well, and then [that a ( ) to a ((clicks her tongue, 1s))*
	NVC (HAr)	---------------------- (L37-39) r ----------------° °palm open, moves to r, falls
	Comm	*[appears irritated or angry*

326	Tina	Stimulus]. Eigentlich neu(ral) ((1s)) stimulus. ((2s)) ((3s)) "can be
	IL-Tina	*stimulus]. Neu(ral) ((1s)) stimulus to be exact. ((2s)) ((3s)) "can be*
	NVC (HAr)	down ------° °----- (L38) r ----
	AC (HAr)	°------------------------ "neural stimulus" -------------°

327	Tina	moved", ja, ist doch klar, daß sie auch noch woanders hin kann.
	IL-Tina	*moved", yes, that's obvious that [it] can be placed somewhere else, too.*
	NVC (HAr)	- (L38) r -°
	NVC	°------- smiles ironically or screws up face and bobs HE -------°
	Comm	*[German pronoun "sie" probably refers*

328	Tina	(Haltet ihr uns für so) dämlich? ((4s))
	IL-Tina	*(Do you think we are that) stupid? ((4s))*
	NVC (HAr)	°----------------- F4-4/text ------------------------
	Comm	*to German equivalent of "electrode"*

Figure 6: V.C.-examples in Tina's transcript (translated from: Schramm 2002:CD-ROM, fig. 6.35)

Subjects' quotations from the text

Think-aloud data on L2 reading often include subjects' quotations from the text, and it is helpful to mark these quotations precisely. According to the H.I.A.T. conventions, quotation marks indicate such reading aloud of text passages. Where such quotations occur, it can also be useful to include the specific text element in the multimedia transcript for comparison. In Jörg's transcript, for example, it would be convenient to be able to see the text in S.A. 65 so as to be able to compare his reading aloud with the original text. Note in figure 7 that a mini-picture of the corresponding text has been integrated into the multimedia transcript. The transcriber or analyst using the syncWRITER sofware, can easily access it for analytic purposes by double-clicking on it.
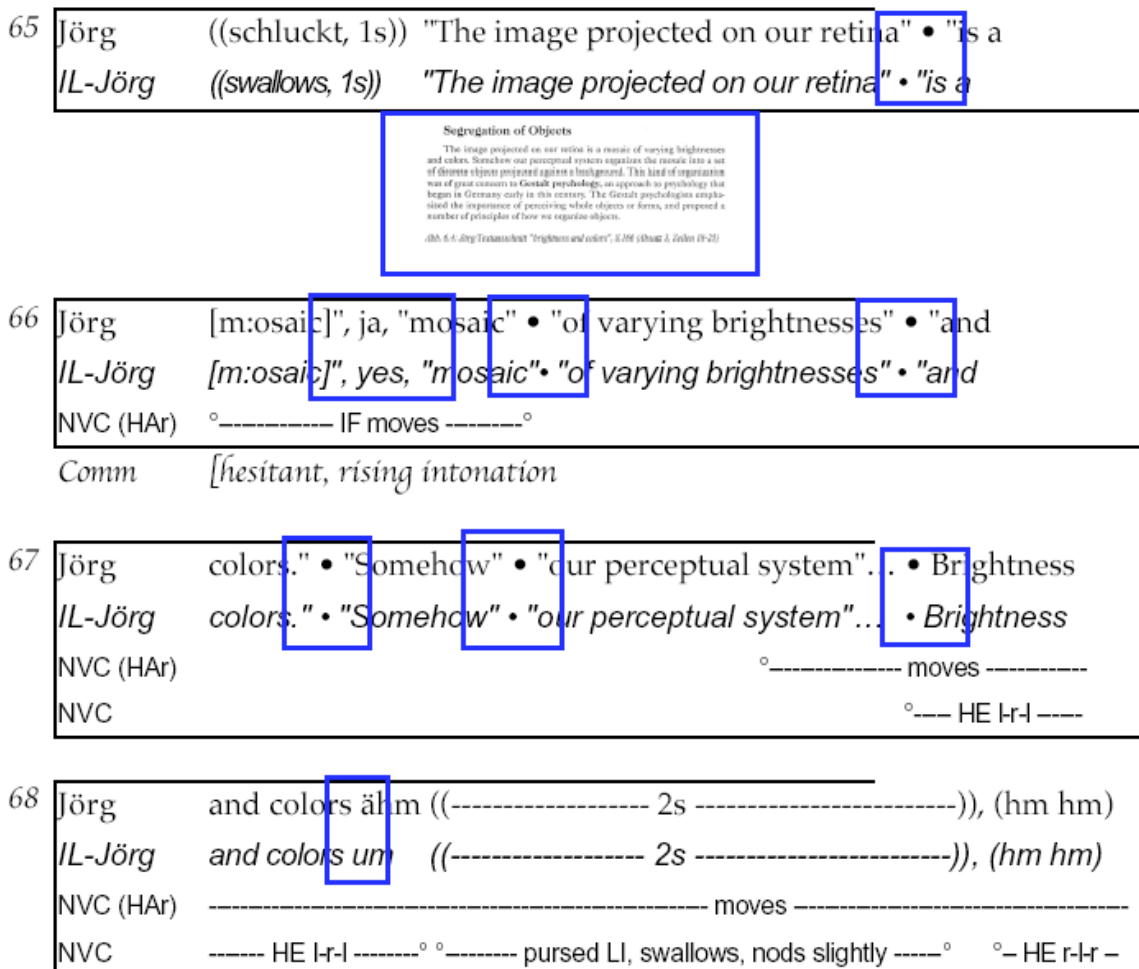

Figure 7: Integration of text into multimedia transcript and use of quotation marks for reading aloud

When subjects read aloud, they sometimes deviate from the original; this phenomenon has been systematically exploited by miscue analysis of reading. To represent such deviations and the skipping of text passages, Schramm (2001) suggests using quotation marks only for passages that are identical with the original. That is why the pauses in Jörg's transcript in S.A. 65f. and also the German "ja" have not been included within quotation marks (see figure 7). This particular example is so self-evident that it might not seem to be important. However, this convention proves helpful for analysis when subjects use the language they are reading in to also think aloud. Interestingly enough, the German native speakers in Schramm (2001) sometimes used English phrases in their think-aloud which were not read aloud from the text, but – as the analysis showed – were reproduced from their memory. In such cases, a convention *not* to put these utterances into quotation marks is useful.[4] An example can be seen in S.A. 67f.: Jörg stops reading the text aloud and repeats "Brightness and colors." These words do not appear in quotation marks because Jörg is not looking at his book, but instead moves his head to the left, right and again to the left. As his subsequent utterance also shows, he has noticed that these two words act as cues for a whole domain of knowledge that he has already constructed when he studied the preceding chapter. Of course, a multimedia transcript can provide the mini-video sequence of such an utterance, too, so that an interpretation like this one can also be evaluated by studying the video data.

Non-verbal communication

The N.V.C.-lines document videotaped information on non-verbal communication. The transcription of Schramm's (2001) corpus especially required means for the documentation of the readers' pointing to specific text elements and their use of gestures. To represent dynamic movements of non-verbal communication (and also of actional activities) by means of the static device of written symbols in a transcript, one needs to provide: (i) a verbal classification of the action, (ii) information on its duration, (iii) information on the part(s) of the body involved, and (iv) information on the relation to objects of reference. In order to keep the transcripts in Schramm (2001) as concise as possible, the abbreviations listed in table 3 were used to refer to parts of the body (cf. aspect iii) and to refer to specific text elements that readers look at or point to during an utterance (cf. aspect iv).

P	page		->	turns pages forward
¶	paragraph		<-	turns pages backwards
L	line		x-y	from x to y
F	figure		FI	finger(s)
T	table		LF	little finger
r	right		TF	thumb
l	left		HE	head
t	top		MO	mouth
b	bottom		NO	nose
m	middle		TO	torso
mr	to the right of the middle			
ml	to the left of the middle			
mt	on top of the middle			
mb	at the bottom of the middle			

Table 3: Abbreviations used in Schramm (2001) for the transcription of non-verbal communication and actional activities

Pointing to specific text elements

The reference system shown in figure 8 was used to document the subjects' pointing to specific text elements. The page number is given in the book (e.g., "P102"). Paragraphs and lines are counted from the top of the page to the bottom starting with the number one (e.g., "¶3," "L32"). Figures and tables are referred to by "F" and "T" respectively, and the information after the slash indicates whether this refers to the picture, or the text of the figure or the table (e.g., "F2-6/pict"). The lines of table and figure texts are also counted starting with 1. The abbreviations for left, right, top, bottom and middle and their combinations refer to the unit mentioned in front of it, for example a page or a line (e.g., "L32 r"). Pages are divided as shown in figure 8(i) into nine sections. Lines are split up into five sections as shown in figure 8(ii). Finally, paragraphs, figures and tables are split up into fifteen sections as shown in figure 8(iii).

Using this system of reference to the text, the N.V.C.-lines of the hands document the subjects' pointing. In Schramm's (2001) video data corpus, it cannot be clearly seen which lines the readers point to exactly.[5] Nevertheless, this information can be partly reconstructed in the analysis. To achieve a better readability of the transcript, such reconstructed information has been incorporated. It appears in brackets, which corresponds to the H.I.A.T. convention to put incomprehensible parts of utterances into brackets. Thus, brackets in the N.V.C.-lines indicate that this information is not clearly discernible in the video.

(i)　　*referring to positions on the page (e.g., "P45 l m", "¶3", "L7", "F2-7/pict")*

l

m

t

to deal with emergencies. The hypothalamus has been called the "stress center" in recognition of its special role in mobilizing the body for action.
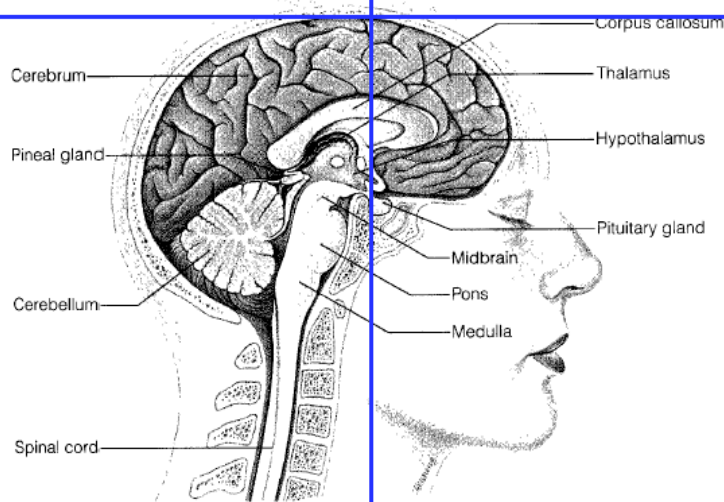
The hypothalamus, as noted, plays a key role in governing sexual behavior. There is even evidence to suggest that homosexuality is related to the structure of this part of the brain. If one measures the volume of a specific group of cells in the anterior region of the hypothalamus, its size is found to be more than twice as large in heterosexual men as in women. However, for homosexual men the size of this group of cells is equal to that for women (LeVay, 1991). This research suggests that the size difference may not only correlate with sexual orientation but play a role in causing it. Either interpretation—cause or consequence of an individual's sexual orientation—raises the possibility that a biological difference is a factor in homosexuality.

RETICULAR SYSTEM A network of neural circuits that extends from the lower brain stem up to the thalamus, traversing through some of the other central core structures, is the reticular system. This system plays an important role in controlling our state of arousal. When an electric current of a certain voltage is sent through electrodes implanted in the reticular system of a cat or dog, the animal goes to sleep; stimulation by a current with a more rapidly changing waveform awakens the sleeping animal.

The reticular system also plays a role in our ability to focus attention on particular stimuli. All of the sense receptors have nerve fibers that feed into the reticular system. The system appears to act as a filter, allowing some of the sensory messages to pass to the cerebral cortex (to conscious awareness) while blocking others. Thus, our state of consciousness at any moment appears to be influenced by a filtering process in the reticular system.

m

Limbic System

Around the central core of the brain are a number of structures that together are called the **limbic system** (refer back to Figure 2-6). This system is closely interconnected with the hypothalamus and appears to impose

Corpus callosum
Cerebrum
Thalamus
Pineal gland
Hypothalamus
Pituitary gland
Midbrain
Cerebellum
Pons
Medulla
Spinal cord

b

FIGURE 2-7
Human Brain *This schematic drawing shows the main structures of the central nervous system. (Only the upper portion of the spinal cord is shown.)*

(ii)   referring to positions in a line (e.g., "L 32mr")

L21 l	L21 ml	L21 m	L21 mr	L21 r
The reticular system also plays a role in our ability to focus attention on				

(iii)   referring to positons in a paragraph (e.g., "¶3 r t")

	l	ml	m	mr	r	
	The reticular system also plays a role in our ability to focus attention on particular stimuli. All of the sense receptors have nerve fibers that feed into					t
	the reticular system. The system appears to act as a filter, allowing some of the sensory messages to pass to the cerebral cortex (to conscious awareness)					m
	while blocking others. Thus, our state of consciousness at any moment appears to be influenced by a filtering process in the reticular system.					b

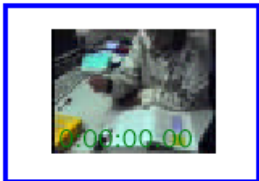*Figure 8: Text reference system used in Schramm (2001)*

Tina's transcript includes several examples of static pointing in S.A. 316-320 (see figure 9). These have been transcribed by simply stating the text element. In S.A. 316, for example, "(L32) mr" means "line 32, middle-right position." However, to represent a movement, the transcriber has noted the beginning and the end of the movement and a hyphen in between as in S.A. 320: "(L34-35) r."

When trying to transcribe such movements, the question arises as to where it makes sense to divide these continuous movements. As criteria for the division, the following proved to be useful for the analytic purposes of Schramm (2001): (i) pointing across the end of a line, (ii) stopping for a while at a certain text element, and (iii) using clearly perceptible differences of speed in the pointing process.
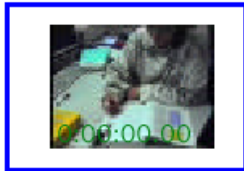
316

Tina	was man • sieht. ((3s)) ((stöhnt, 1s)) ((schnalzt, 1s)) "amplified"
IL-Tina	*what you • see. ((3s)) (sighs, 1s)) ((clicks tongue, 1s)) "amplified"*
NVC (HAr)	------------------- - (L32) mr ------------------° °-------------- - (L33) r -----------

317

Tina	"on an oscilloscope" ((---------- 1s --------)) ((1s)) ["which converts
IL-Tina	*"on an oscilloscope" ((---------- 1s -------)) ((1s))["which converts the"].*
NVC (HAr)	-------- - (L33) r ------------°
AC	°-tips HE to look at F4-4/pict t -° % HE back to text
Comm	*[in a low voice*

318

Tina	the"]. Ja. Das (ist) dann hier oben. Halt nur wie das dann
IL-Tina	*Yes. That (is) up here then. Just only how it is then*
NVC (HAr)	°-------- - F4-4/pict t ----------° °– at HE --

319

Tina	abgeleitet wird. Das ist genau das gleiche, was ich gestern
IL-Tina	*converted. That is exactly the same as I did yester-*
NVC (HAr)	-----° °---------------------- - (L34) r ------------------------------
NVC	% raises HE and nods °------ - frowns -+----

320

Tina	gemacht habe, (Oszilloskop). ((2s)) ((stöhnt, 1s)) ((------ 4s -------))
IL-Tina	*day, (oscilloscope). ((2s)) ((sighs, 1s)) ((------ 4s -------))*
NVC (HAr)	-------------- - (L34) r ------------° °------------- - (L34-35) r ------------------°
NVC	----- - frowns ----° °- movements of MO —°
AC	% HE back to text

321

Tina	Ja. Spikes and waves kommen dann. Allerdings hier "spikes"
IL-Tina	*Yes. Then, spikes and waves appear. However, here only*
NVC (HAr)	°--------------- (L35) r ----------------------° °---- (L35) mr -----° °----------
NVC	% sits up straight % raises HE, then tips it to r for

322

Tina	nur. ((1s)) ((stöhnt, 1s)) ((2s)) Ja, und dann • [spontane
IL-Tina	*"spikes"((1s)) ((sighs, 1s)) ((2s)) Yes, and then • [spontaneuous*
NVC (HAr)	---------------- (L35-37) r --------------°
AC (HAr)	°------ underlines "spontaneous
NVC	a short while
Comm	*[slightly tense*

323	Tina	Aktivität], aber das hab ich doch alles schon mal gemacht.
	IL-Tina	activity], but I've done all of this already.
	AC (HAr)	activity" ----°
	NVC	°------------------------ frowns----------------------------°

324	Tina	• Ist doch langweilig auf die Dauer. ((3s)) "A fast train". Ja, ja. ((1s))
	IL-Tina	• This is boring after a while. ((3s)) "A fast train". Yes, yes. ((1s))
	NVC (HAr)	% raising °----------------------------- (L37-39) r -----------------------
	AC (HAr)	%pushes book away from her a little
	NVC	[–°bobs HE-°]
	Comm	[appears bored

325	Tina	Und dann halt, [daß ein (Neuron) zu einem ((schnalzt, 1s))
	IL-Tina	Well, and then [that a ( ) to a ((clicks her tongue, 1s))
	NVC (HAr)	--------------------- (L37-39) r ----------------° °palm open, moves to r, falls
	Comm	[appears irritated or angry

326	Tina	Stimulus]. Eigentlich neu(ral) ((1s)) stimulus. ((2s)) ((3s)) "can be
	IL-Tina	stimulus]. Neu(ral) ((1s)) stimulus to be exact. ((2s)) ((3s)) "can be
	NVC (HAr)	down –------° °------ (L38) r ----
	AC (HAr)	°------------------------ "neural stimulus" ------------°

327	Tina	moved", ja, ist doch klar, daß sie auch noch woanders hin kann.
	IL-Tina	moved", yes, that's obvious that [it] can be placed somewhere else, too.
	NVC (HAr)	- (L38) r -°
	NVC	°-------- smiles ironically or screws up face and bobs HE -------°
	Comm	[German pronoun "sie" probably refers

328	Tina	(Haltet ihr uns für so) dämlich? ((4s))
	IL-Tina	*(Do you think we are that) stupid?* ((4s))
	NVC (HAr)	°---------------- F4-4/text ------------------------
	Comm	*to German equivalent of "electrode"*

Figure 9: N.V.C.-examples in Tina's transcript (translated from: Schramm 2002:CD-ROM, fig. 6.35)

Gestures

Gestures of the hands are also documented in the corresponding N.V.C.-lines of the hands. In Jörg's transcript, we see characteristic movements of the hands in S.A. 66 and 67ff. (see figure 10). It is easy to see in these two instances that the movements are related to some mental processes, even though this short sequence taken by itself does not allow us to determine them. The detailed analysis of a larger corpus, however, allows for a better understanding of how these gestures relate to specific mental processes. Based on Schramm's (2001) corpus, subtle movements of the right hand as seen in Jörg's transcript externalize mental search processes. Therefore, they are closely related to the gesture of looking away in deliberation to the upper right hand corner.

In Tina's example, we see a raising of her hand in S.A. 324 and another gesture in S.A. 325f. (see figure 9). Note that two mini-pictures of the corresponding video sequences can be integrated into this example; double-clicking on them in a syncWRITER file will open the digitalized video segments which are synchronized with the respective utterances. Also, subjects in Schramm's (2001) corpus often use gestures to communicate aspects of their mental models. Thus, the transcription of such gestures and the multimedia integration of the corresponding digitalized video sequences can provide valuable data.

The same is true for gestures of the torso, head and face, which can be found in the general N.V.C.-line. Consider, for example, Jörg's pursed lips, swallowing and slight nodding in S.A. 68 or the head movements in S.A. 67-70 and in S.A. 71f. (see figure 10). In Tina's transcript (see figure 9), note how she raises her head and nods, then frowns in S.A. 319f.. Also interesting to note are the movements of her mouth in S.A. 320. In S.A. 321, she sits up straight

| 65 | Jörg | ((schluckt, 1s)) "The image projected on our retina" • "is a |
| | IL-Jörg | *((swallows, 1s)) "The image projected on our retina" • "is a* |

66	Jörg	[m:osaic]", ja, "mosaic" • "of varying brightnesses" • "and
	IL-Jörg	*[m:osaic]", yes, "mosaic"• "of varying brightnesses" • "and*
	NVC (HAr)	°---------- IF moves -------°
	Comm	*[hesitant, rising intonation*

67	Jörg	colors." • "Somehow" • "our perceptual system"… • Brightness
	IL-Jörg	*colors." • "Somehow" • "our perceptual system"… • Brightness*
	NVC (HAr)	°----------- moves ---------
	NVC	°--- HE l-r-l ----

68	Jörg	and colors ähm ((------------------ 2s -------------------------)), (hm hm)
	IL-Jörg	*and colors um ((------------------ 2s -------------------------)), (hm hm)*
	NVC (HAr)	--- moves --------------------------------------
	NVC	----- HE l-r-l -------° °------- pursed LI, swallows, nods slightly ----° °-- HE r-l-r -

69	Jörg	das äh kommt mir bekannt vor aus dem vorigen Kapitel grad
	IL-Jörg	*I think I've seen this uh before in the last chapter*
	NVC (HAr)	--------------------------------- moves ---
	NVC	--------------------------------- HE r-l-r ---

70	Jörg	über • • ähm • • Stäbchen und Z/ (hm, hm) und Zäpfchen (im,)
	IL-Jörg	*about • • um • • rods and c/ (hm, hm) and cones (in the,)*
	NVC (HAr)	----------------------------------- moves --
	NVC	---------°

71	Jörg	im Auge, ((1s)) ähm • • die eben sowohl die Lichtintensität als
	IL-Jörg	*in the eye ((1s)) um • • which, as we know, can take in light*
	NVC (HAr)	-------------------- moves --
	NVC	°-------------------- HE r(-l) --------------------

```
72  Jörg        auch die Farbe aufnehmen können. "Somehow our perceptual
    IL-Jörg     intensity as well as color."          "Somehow our perceptual
    NVC (HAr)   -------------------┌ moves ┐-------------------°
    NVC         -------------------┤ HE r(-I) ├-------------------°
```

```
73  Jörg        system organizes
    IL-Jörg     system organizes
```

Figure 10: N.V.C.-examples in Jörg's transcript (translated from: Schramm 2002:CD-ROM, fig. 6.5)

and raises her head, then tips it to the right for a short while. When analyzing the video, one cannot but realize that this non-verbal communication is closely related to the mental processes we are trying to reconstruct. In this category, Schramm (2001) most frequently documented shaking of the head, nodding, frowning, suddenly sitting up straight or suddenly withdrawing the head as an externalization of increased attention, and looking away in deliberation.

Actional activities

Finally, actional activities of subjects during reading and thinking-aloud can also be documented in a multimedia transcript. Especially helpful for an analysis of L2 reading strategies are the documentation of the subjects' turning of pages, underlining and writing as well as their turning towards specific directions (concerning the transcription of handwriting, see also Smith, McEnery & Ivanic 1998).

Turning pages

When documenting a reading process, it can be helpful to have a symbol for the turning of pages. In Schramm's corpus (2001), subjects often turn back to previous pages to look up aspects they have read in preceding chapters or notes they have written in the margins. Two arrows are used respectively. The symbol "<- P7" means "turns back to page 7," and "-> P8" means "turns page forward to page 8." Again, it might be useful at such points to integrate these pages into the multimedia transcript for easier accessibility.

150

Ute	((------------- 1s ----------)) (Nee,) ich muß erst noch weiter lesen.
IL-Ute	((------------ 1s ----------)) (No,) I will have to read on first of all.
NVC(HAr)	°-------------------------- ¶2 r ---------------
NVC	% grimaces, HD turned to r °-------------------- shakes HD --------------°

151

Ute	((4s)) ((--- 5s --------
IL-Ute	((4s)) ((--- 5s --------
NVC(HAr)	-----°
AC (HAr)	°puts gray pencil aside, shifts red pencil and underlines "electrical

152

Ute	---)) ((- 3s -)) ((10s)) ((---------
IL-Ute	---)) ((- 3s -)) ((10s)) ((--------
NVC(HAr)	°¶2 m-r ° °¶2 r °
AC (HAr)	impulses must make their way to the brain via connecting neurons"° °-under-

153

Ute	------------------------------------- 2s -------------------------------
IL-Ute	------------------------------------- 2s -----------------------------
AC (HAr)	lines "first transmitted to bipolar cells, and from bipolar cells to other

154

Ute	------------------------------------)) ((- 2s -)) ((---------------- 2s ------------))
IL-Ute	------------------------------------)) ((- 2s -)) ((---------------- 2s ------------))
NVC(HAr)	°¶2 r °
AC (HAr)	neurons called ganglion cells°
AC	°HE (F 4-10), leans back, HE turns to F4-8°

155

Ute	[(Ach) so]. ((- 12s -)) ((2s)) Ich versuch, mir grad vorzustellen,
IL-Ute	[(I see)]. ((- 12s -)) ((2s)) I'm just trying to picture in my mind
NVC(HAr)	° - F4-8 rb - ° °- ¶2 (t-b) -°
AC (HAr)	°------------- puts red pencil aside ----------------°
NVC(HAl)	°LF F4-8 rb°
AC (HAl)	°---------------------- rests HD in HA ----------------------
Comm	[in a very low voice

156	Ute	wie jetzt diese transduction wirklich geht. Da(s) sind die ((3s))
	IL-Ute	*how this transduction really works.* *Those are the ((3s))*
	AC (HAr)	°-------- picks up gray pencil ---------° °------------------- "photo-
	AC (HAl)	--- rests HD in HA ------------------------

157	Ute	[(receptors)]. ((1s)) ((2s)) ((----------- 7s ----------)) ((1s)) ((2s)) (s)
	IL-Ute	*[(receptors)]. ((1s)) ((2s)) ((----------- 7s ----------)) ((1s)) ((2s)) (s)*
	AC (HAr)	receptors" --------------° °"(chemical substances)"° °--- "rods [&]
	AC (HAl)	-- rests HD in HA ----------------------
	Comm	*[in a very low voice* *[not*

158	Ute	((- 3s -)) ((2s)) ((6s)) Ja, ich glaub, jetzt hab ich s verstanden. Jetzt
	IL-Ute	*((- 3s -)) ((2s)) ((6s)) Yes, I think I've understood now.* *Now*
	AC (HAr)	cones -"° °draws arrow "process to neural impulse"° °------- puts gray pencil
	AC (HAl)	---------------------------------- rests HD in HA ---------------------------------
	Comm	*completely discernible in copy*

159	Ute	kann ich weiterlesen. ((1s))
	IL-Ute	*I can read on. ((1s))*
	AC (HAr)	aside and picks up red pencil -----°
	AC (HAl)	---------------- rests HD in HA -------°

Figure 11: A.C.-examples in Ute's transcript (translated from: Schramm 2002:CD-ROM, fig. 6.55)

Underlining and writing

The action lines of the hands also supply information on the subjects' handling of objects like pens, notes, dictionaries, or rulers. Especially important is the representation of underlining text elements, writing notes in the margin, and taking excerpts. A third transcript from a subject called Ute shows how she underlines and takes notes (see figure11).

In this example, quotation marks have been used in the A.C.-lines to represent underlining and writing. The use of quotation marks only in S.A. 156-158 therefore means that Ute is writing, whereas the use of "underlines" plus quotation marks in S.A. 151-154 documents that she is underlining the corresponding text elements. This convention was chosen in reference to the H.I.A.T.-convention to document reading aloud in quotation marks in the speaker's line.

A closer look at the transcript reveals that Ute decides in S.A. 150 that she "will have to read on first of all." She then underlines a number of text elements with a red pencil, and finally looks at figure 4-8 and tries to integrate the information into her mental model. To support this mental integration, she makes notes in the margin which can be seen in figure 12. It is interesting for the analysis, however, to realize that she develops these notes in the margin in a certain order: First, she writes down "photoreceptors," then "chemical substances," then "rods and cones," and finally "process to neural impulse." Again, the multimedia integration of her corresponding segmented video data and of her notes in the margin into the transcript facilitates reading and analyzing the transcript.
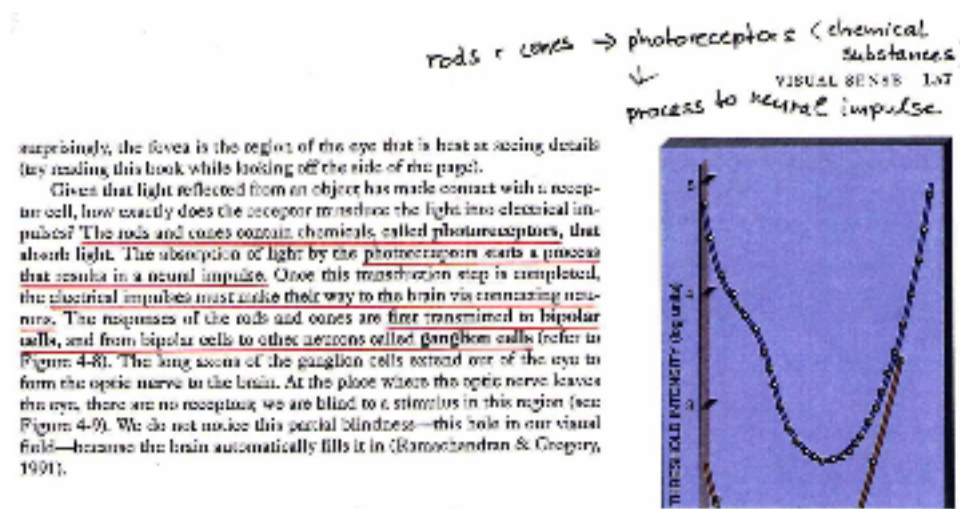
Figure 12: Ute's notes in the margin (original text in Atkinson et al. 1993:137)

Turning in specific directions

The last actional activity to be briefly mentioned is turning the torso and head or face to look in specific directions. We can see an example in Ute's transcript in S.A. 154: Her head turns to F4-8, then back to the text. The data Schramm (2001) collected do not always show what the subjects are looking at. Therefore, this information has only been included in the transcripts at points where subjects suddenly turn their torso or head or where it seems to be important for the analysis for particular reasons.

This type of documentation can help the analyst in at least two ways. First of all, it allows him or her to reconstruct the in-take of information as it is regulated by the reader. For research on metacognitive reading strategies, i.e. research that focuses on the planning, regulation, and

control of the reading process, this information in itself is of great interest. In Ute's case, for example, the transcript indicates that she reaches some understanding (see "(I see)." in S.A. 155) while she is looking at the lower right part of figure 4-8. Note that Ute does not verbalize anything in S.A. 151-154. Without the documentation of non-verbal communication and actional activities, one would only know that there was a pause of 28 seconds between her decision to read on in S.A. 150 and her insight in S.A. 155. Due to the documented non-verbal communication and actional activities, however, it is possible to precisely study her regulated and monitored attempts at solving a comprehension-problem, and also to identify the text element that helps her to understand.

Secondly, think-aloud protocols differ vastly in their degree of explicitness. Oftentimes, utterances that are grammatically incomplete and quite typical for think-aloud are more characteristic of inner speech than of verbal communication. While pragmatic context is essential for any understanding of utterances, it is thus even more important for interpreting verbal data in think-aloud protocols. The documentation of changes in the readers' perception allows the researcher to reconstruct at least a partial context of the readers' utterances, and it can therefore foster a more adequate understanding of the verbal data.

CONCLUSION

A comparison of the multimedia transcripts presented in this paper to the two examples of conventional transcripts discussed in the second section clearly shows the possibility of methodological refinement: Paralinguistic aspects of verbal communication, non-verbal communication and actional activities can be systematically integrated into transcripts of think-aloud data of the L2 reading process if needed. Such additional information provides not only the context for the interpretation of the verbal utterances in think-aloud protocols that can otherwise be hard to interpret with regard to the mental processes, but this information itself can actually enable the researcher to trace the readers' navigation through the text, their evaluation of the reading process, and their mental models at different stages of knowledge construction.

The examples presented here also illustrate the possibility of integrating the texts, the written notes of subjects and segmented digital video data. The combination of traditional transcript with graphic and video data has a twofold advantage. Viewed from one vantage, the transcript can point the reader of an analysis who is watching the video data for the first time to special aspects which might not otherwise be striking. It also provides easy access to information like the texts or notes at points where they are needed. From the reverse vantage point, the video obviously makes it easier for the reader to reconstruct the information from the transcript. It also provides a check on the appropriateness of the transcript which is usually produced by one or two persons only.

The greatest disadvantage of such detailed multimedia transcripts is probably the fact that it is extremely time-consuming and therefore costly to produce them. In the three examples discussed in this paper, the ratio of authentic time to transcription time ranges from 1:84 for Ute's transcript and 1:95 for Tina's transcript to a rather exceptional 1:245 in Jörg's transcript. This means that, for example, Tina's transcript took roughly 3 hours and 45 minutes of transcription and correction time. Consequently, these detailed transcriptions are usually only feasible for a limited number of well-chosen sequences, and the decision concerning how much detail is needed largely depends on the analysis that is to be done.

Thus, this paper does not intend to criticize the use of basic transcripts of only verbal data where these transcripts match the analytic goals. Instead, it is hoped that reading researchers who deal with think-aloud data may find this approach helpful for some of their analyses. This paper is motivated by the fact that such detailed documentation has so far rarely been provided by L2 reading researchers nor has it been discussed at any length as a research tool (for one of the few exceptions, s. Dechert & Sandrock 1986). Based on the detailed study of the video data, Schramm (2001) found this kind of transcription of think-aloud data to be vital for her analysis of the L2 reading process, and in the circular process of interpretative analysis, it turned out to be extremely helpful for her reconstruction of reading as mental action. It enabled her to go beyond listing reading strategies and instead to describe the orchestration of strategies by L2 readers in distinct, hierarchically organized mental actions.[6] The aim of this paper is thus twofold: First, it wishes to share the methodological efforts invested into finding ways of systematically documenting think-aloud data on L2 reading in a precise and concise manner.

Secondly, it aims to make other researchers in this field aware of the option to use such potentially rich data gained in thorough video documentation and detailed multimedia transcription. As with any research tool, its usefulness will depend on the goals of a specific research project. Such detailed multimedia transcription might prove especially helpful in further research on metacognition and strategy use in L2 reading as well as on the teaching of L2 reading strategies.

NOTES

1. I would like to thank three anonymous reviewers for their insightful comments. I am also very grateful to Birgit Beile-Meister and Tara Zend for native-speaker editing of earlier versions of this paper.

2. The program "syncWRITER" is dual platform (for HIAT-DOS, s. Becker-Mrotzek et al., 1989; for HIAT-MAC, s. Grießhaber, 1992) and can be purchased at the company "med-i-bit GmbH" in Hamburg, Germany. In the meantime, the even more powerful tool "EXMARaLDA" is available from the following website: www.rrz.uni-hamburg.de/exmaralda (also see Rehbein, Schmidt, Meyer, Watzke & Herkenrath 2004).

3. Two lines of comments are used: The internal line of comment represents events which cannot be attributed to any of the participants (e.g., "Telephone rings." in score area 3 in figure 3). It does this in the timewise relation of the simultaneity area. The external line of comment, on the other hand, is placed outside the timewise relation of the simultaneity area and is used for comments of the transcriber such as "sounds quite surprised" (see score area 2 in figure 3).

4. This shows once again that transcribing is not simply a reproductive, but a highly analytic process that requires circular revision in the course of the analysis. For a more general understanding of transcription as an interpretative practice, see Mishler (1991).

5. Much more detailed data could be collected with an infrared light device documenting their eye movements. Future studies of the L2 reading process might want to consider this possibility to substantially improve the quality of their think-aloud data.

6. For a report of the results of Schramm (2001) in English, see Schramm (forthcoming): Mental action in academic reading. How L2 readers plan, regulate and control knowledge transmediation.

TRANSCRIPTS

Jörg's transcript (translated and slightly revised from: Schramm 2001:CD-ROM, figure 6.5)
    280395/Diss/Jörg/THA/brightnesses and colors/0:30 min/Schramm
    0896/0197/Sony MDS JE 520, Sony MDS JE 530/1:245/Hoffmann, Schramm

Tina's transcript (translated and slightly revised from: Schramm 2001:CD-ROM, figure 6.35)
    051295/Diss/Tina/THA/oscilloscope/2:22 min/Schramm
    0197/0497/Sony MDS JE 520, Sony MDS JE 530/1:95/Schmöcker, Schramm

Ute's transcript (translated and slightly revised section from: Schramm 2001:CD-ROM, figure 6.55):
    290395/Diss/Ute/THA/transduction/3:46 min/Schramm
    0197/0497/Sony MDS JE 520, Sony MDS JE 530/1:84/Schramm, Schramm

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