Investigating Inner Speech and Higher Psychological Functions through Speech Profiles

Anke Werani

The starting point of the cultural-historical view is that individual consciousness and all other higher mental processes – speech included – have a social genesis. The ability to speak and all language activity are central to social and individual life. First, an introduction to cultural-historical psycholinguistics is given. Second, inner speech is stated as reference point for many mental processes: it is an important ability central to our consciousness (generally) as well as necessary for higher psychological functions (specifically). Inner speech combines communicative and cognitive skills. Therefore, an extended concept of inner speech is drawn up, which takes into account the intensive examination of inner speech in Soviet psychology as well as the latest discussions. Third, speech profiles are used as point of entry for empirical research into the relationship between speaking and thinking. General results from a study of this kind are presented, dealing with speech profiles in problem solving. Four Speaking-Thinking-Types are introduced. They are characterised as pragmatic type, talkative type, doubting type, and taciturn type. These different types show different problem solving strategies. The connection between speech profile and thinking is obvious. Fourth, possibilities and difficulties to work with speech profiles are discussed.

1. Introduction

Since the discipline of psycholinguistics was founded 1954 in the U.S. (Osgood & Sebeok 1954), there are manifold topics in which psycholinguists are engaged, all focusing on the object of research: how to come up to language and speech. Psycholinguistics is an interdisciplinary science which was developed out of philosophy of language, psychology, linguistics, sociology, mathematics, computer sciences to name just the most important ones. As young discipline psycholinguistics oscillated between psychological and linguistic issues; one consequence was

that psycholinguistics was partly seen as an auxiliary science of both linguistics and psychology.[1] Furthermore, the development of psycholinguistic theory was mainly influenced by structural linguistic approaches. The main topic of the latter is the study and description of language structures, encompassing, for example, phonology, morphology, syntax, semantics, and pragmatics. Fundamental questions include what is universal to language. With this interest language is understood as an abstract phenomenon, mostly described without regarding the context. On the side of psychology the main influence on psycholinguistics is the cognitivistic paradigm. Both of these theoretical foundations isolate the individual from sociality (Knobloch, 2003). This is for us the principal point to think differently, because language and speech are exclusive preserve of speaking human beings. To use language and speech is a fundamental social process, it is socially based. Furthermore, speaking is always a directed process – directed to someone else or to oneself - and it takes place in a specific context, which is constitutive for meaning. Thus, speaking is a central phenomenon in constructing oneself at each moment.

Cultural-historical theory is therefore used as point of entry with human sociality as a basic moment of all human activity, speech activity included. Embedding language and speech in cultural-historical theory leads to the construction of cultural-historical psycholinguistics. In the tradition of Humboldt (1827/ 1995, 1830-35/ 1995) and Steinthal (1851, 1881/ 1972, 1970) the discussion about language and speech in respect of psychological functions intensified in the 1920s and 1930s (e.g. Bühler 1934/ 1990; Vygotsky 1934/1987). Following this tradition, it is an attempt to found psycholinguistics at the border passage between linguistics and psychology. Following Sappok (1999) Vygotsky is the founding father of cultural-historical psycholinguistics. Vygotsky focuses on research into higher psychological functions as specific human abilities, always embedding these abilities in sociality. He highlights the important role of speech in higher psychological functions, and thus it is the core of cultural-historical psycholinguistics. Referring to the important role of speech he pointed out that „speech is not only a means to understand others, but also a means to understand oneself" (Vygotsky 1930/ 1997, p. 95). By way

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[1]   The history of psycholinguistics is summarised for example by Knobloch (2003) and Hörmann (1981).

of summary, I will outline three primary elements of cultural-historical psycholinguistics. It is (1) The role of social activity, (2) The dialectical principle of development, (3) The topic of speech and higher psychological functions; all three cornerstones are connected to each other.

(1) The role of social activity. The starting point of Vygotsky's basic assumptions is social activity. He assumes that each higher form of behaviour and therefore all higher psychological functions develop out of collective, social behaviour. From this point of view, psychological study has to be extended from one subject to at least two subjects sharing psychological abilities (Vygotsky, 1930a/ 1985, 1931/ 1987). All culture is therefore a result of common social life and human activity (Keiler 1997). To use speech signs is a specific and central source of social behaviour. The origin of each higher psychological function is a collective, social, interpsychological function. Children share these processes with others (e.g. joint attention) and they need time in order to take on the role of some other and to adapt the complex system of processes to themselves (Vygotsky 1930a/ 1997). This process, by which shared activity turns inside and grows into psychological functions, is called interiorization. All interiorized social connections construct the social structure of personality. What is actually interiorised and how this process functions is a very complex issue and needs further research (Valsiner & van der Veer 2000).

In short, higher psychological functions are fundamentally social. Each psychological function was at first a social relationship between two subjects. Focus is not an individualized human being (cf. the aspect of 'I-*ness*', *Ichigkeit*, Bertau, this volume) but always human beings in their social environment.

(2) The dialectical principle of development. Vygotsky's historical method includes both phylogenetic and ontogenetic views of human's development and especially their higher psychological functions. Evolution changes dramatically with the use of tools: using tools results in social-historical development improving the standard of living, not only technological tools are used but also psychological tools, such as language. Language becomes a useful tool for thinking; there is an analogy to technical tools (directed at material production). Vygotsky describes this perspective as follows:

"The most essential feature distinguishing the psychological tool from the technical one is that it is meant to act upon mind and behaviour, whereas the technical tool, which is also inserted as a middle term between the ac-tivity of man and the external object, is meant to cause changes in the object itself. The psychological tool changes nothing in the object. It is a means of influencing one's own mind or behaviour or another's. It is not a means of influencing the object. Therefore, in the instrumental act we see activity toward oneself, and not toward the object" (Vygotsky 1930b/ 1997, p. 87).

Vygotsky extends this description by considering 'psychological tools' as an essential means of control and regulation of behaviour and psychological functions (cf. Vygotsky 1930b/ 1997; Keiler 2002). Speech is seen in its mediating function. Regarding the dialectical principles development is a continuous dynamic process accompanied by developmental leaps; this process leads to new qualities in behavior and psychological functions. Concerning the different functions Vygotsky is convinced that the change of the links between the functions is important for the change of each function itself. Therefore, on new levels of development groupings occur that never existed before.

The starting point for this dialectical notion is the unity of physical and psychological processes. This unity is the basic assumption for consciousness and behavior, and in regard of this consideration, consciousness is not entirely an intrapsychological function, and behavior is not entirely an extrinsic, interpsychological function. Consciousness and behavior alternate and interfuse each other and lead to continuous changes of the individual and of society. From this point of view, development is not restricted to childhood and adolescence; it is a process, which spans the whole life of individuals.

(3) The topic of speech and higher psychological functions. Against the mainstream of behaviorism in the 1920s, Vygotsky reintroduces the study of consciousness to psychology; he was convinced that consciousness is an undeniable fact of psychological processes and that psychological research is bound to the study of consciousness. At that time, Vygotsky was turning against reductionistic, biological views and against behaviorism. In his opinion, linguistically mediated processes, i.e. speech processes, are the basic principle for development of consciousness.

They become essential for example in voluntary awareness or voluntary memory, but also in all other aspects of thinking (Hildebrand-Nilshon, 2004). The sophisticated functions of speech are important for the mediation of psychological functions. The ability to speak allows two directions, the first is directed towards the outside to someone else and serves especially for communication; and the second it is directed to oneself, and provides particularly psychological processes. It is an extraordinary fact that speech can be directed to others and to oneself. A distinction is thus 'speaking for others' from 'speaking for me'. According to Vygotsky the development of higher psychological processes are possible through the mediating function of language (signs). Therefore he called these processes higher psychological processes (in opposition to lower psychological processes, which are not culturally mediated).

According to Wertsch (1985), Vygotsky distinguishes higher psychological processes by four characteristics: (1) internal instead of external regulation (arbitrary), (2) consciousness, (3) social origin and social nature, (4) semiotic mediation. The relatively autonomous cognitive system of an adult in a civilized society is created by the collective regulation of acting. One fundamental tool for higher psychological processes is inner speech. It is obvious that investigations concerning consciousness and abstract thinking are closely related to language research. Vygotsky (1934/ 1987) gave, as follows, a metaphorical impression about the relationship between speaking and consciousness:

> *"Consciousness is reflected in the word like the sun is reflected in a droplet of water. The word is a microcosm of consciousness, related to conscious-ness like a living cell is related to an organism, like an atom is related to the cosmos. The meaningful word is a microcosm of human consciousness" (Vygotsky 1934/ 1987, p. 285).*

To sum up the essentials for cultural-historical psycholinguistics the focus on language and speech in the development of higher psychological processes links the cultural-historical approach to psycholinguistics. The starting point is the socio-cultural context, which includes naturally a 'speaking context'. Speech is addressed to somebody else or to oneself, so it is supposed to be dialogical. The specifically human way of acting, thinking and communicating with others can only be shaped

by interactions; starting with interactions with children, who learn to think and act and communicate (Jones 2008). Individuals do not exist outside of speech; they act and evaluate (which is associated with emotions). Speech is thus not conceived as a psychological phenomenon, but rather as a social process. Furthermore, it is stated that language and speech are necessary for mediating higher psychological processes. In conclusion, explanations of consciousness and abstract thinking must be analyzed in close connection to linguistic abilities.

2. A concept of inner speech

Inner speech is a central issue of cultural-historical psycholinguistics. It is an essential process that interrelates speaking and thinking, and therefore speech with higher mental functions; it is fundamental for both communicative and cognitive functions. There is an intensive examination of inner speech in Soviet psychology, introduced by Vygotsky. Vygotsky was concerned with the genesis of inner speech as well as its structure and function. His concept constitutes the background for all research, and therefore is basic and groundbreaking for all psycholinguistic investigations. A detailed description of the phenomenon of inner speech in the Vygotsky tradition can be found in Werani (2011; in press).

A basic assumption especially for *genesis* is that all higher psychological functions are originally shared between two people. The starting point is the mutual interpsychological process that is social at the beginning. Interiorization is a kind of generic term for all processes, which get "inside" the individual. It is to be pointed out that interiorization is not an internal copy of the external world; it is a dynamic process, which leads to a "quasi-social" inner level of consciousness (cf. Wertsch 1985). How the interiorization process works and what actually is interiorized still remains to be established (Valsiner & van der Veer 2000). In regard to inner speech the general consensus is that inner speech is interiorized speech; central is the transition of interpsychological and intrapsychological functions.

Concerning the *structure* of inner speech, Vygotsky (1934/ 1987, p. 266) assumes that "[inner speech] has its own syntax", hence, inner speech is understood by Vygotsky as an independent form of language. Vygotsky ascribes syntactic, phonological and semantic features to inner speech. The most important characteristic of

the special syntax is "fragmentation and abbreviation" (Vygotsky 1934/ 1987, p. 266). He was convinced that inner speech is mostly predicative, and used in a syntactically predicative manner. Apart from this characteristic Vygotsky describes the reduction of phonetic features of speech. Inner speech is shortened – compared to external speech – to such an extent that it could reach wordlessness. Vygotsky summarizes: "In inner speech, the syntactic and phonetic aspects of speech are reduced to a minimum. They are maximally simplified and condensed" (1934/ 1987, p. 275). Beside these characteristics Vygotsky also considers semantic features in detail; accordingly, he is interested in word meaning both as a linguistic as well as an intellectual phenomenon; following Vygotsky word meaning establishes the unity of speaking and thinking.

The *functions* of inner speech are attached different weights by several Soviet scholars, depending on the authors' main research interests. In general, the functions of inner speech relate to two areas, speaking for others and speaking for oneself. In the first area speech is directed outwards, the communicative aspect is focused, and thus speech regulates social interaction as one main function. Inner speech is ascribed a decisive role in the production and reception of language (Ananev 1963; Sokolov 1972). The functions of inner speech in language processing are treated more deeply by A. A. Leont'ev (1975; 1984) and Achutina (1978; 2004). In the second area speech is directed to oneself in a recursive way; thus these functions of inner speech are connected with higher mental functions (cf. Vygotsky 1934/ 1987). Basic functions ascribed to inner speech are regulative and control functions (for an overview see Werani in press). Depending on the research interest of different authors the different functions are named differently. Vygotsky for example stresses mental orientation (orientation is connected with perception and the direction of attention), the attainment of an awareness of facts to surmount difficulties and to get mental relief. Then, inner speech is de-scribed as being necessary for thinking, in that sense, as a means (instrument) of thought (Vygotsky 1934/ 1987; Galperin 1957/ 1972; Sokolov 1972). Consequently it can be understood as a means of reflection. Luria (1982) assumes that inner speech is the highest stage of self-regulation. Self-regulation by inner speech does not only serve to control external actions, but also internal actions (Galperin). Furthermore, Ananev extends the assumptions of inner speech claiming that inner speech is a

form of verbal-logical memory, which is determined by special convictions, conceptions of the world and by moral awareness (Ananev 1963). Therefore, inner speech is seen close to our consciousness, which is connected with the development of volitional acts and of personality (Luria 1982; Ananev 1963). In general, Ananev sees inner speech as an essential means of the development and construction of the personality.

To sum up, inner speech with its genesis and structure described in Soviet Psychology points to an independent form of language. Main functions of inner speech are regulation and control, related to the areas speaking and thinking, formation of personality, self-communication as well as language processing.

Inner speech is seen here from a new point of view. Inner speech is, in contrast to Vygotsky's (1934/ 1987) assumption, not understood as an independent form of speech with a multitude of functions. Rather, inner speech is a *possible manifestation of speech*, as is external speech and written speech. It is assumed that this internal manifestation is the richest, most common and most intimate one, since it also contains everything which is left unsaid.

Any research into inner speech is hence confronted with speech in general. Interiorization is therefore a key topic, because it stands for the transitional stage which is an interaction of interpsychological and intrapsychological processes. Of particular interest is the transitional process between inside and outside processes. The main issue is the process, and the fact that neither the interpsychological nor the intrapsychological processes are static. Furthermore, *awareness* is involved in inner speech, for example the imagination of an object always is a matter of becoming aware of the way of imagining the object. The consequence of highlighting this transitional process implies that not at all interiorization but also exteriorization are necessary for the development of inner speech. Hence, not only the (exteriorized) utterance of the actual other is important for the child to interiorize them. It is also important that the child learns to utter interiorized processes orally or in writing. In the following, three central functions of speech are mentioned, which can be regarded as most relevant to all manifestations of speech (external speech, inner speech, and writing). These three aspects are now outlined briefly, for a detailed version see (Werani 2011; Werani in press).

First, the thought is stabilized in the word by speech. According to Vygotsky the thought is not the word and the word not the thought. Though, the process to perform thought within words is highlighted. Vygotsky supposes „that thought is not expressed but completed in the word" (Vygotsky 1934/ 1987, p. 282). We assume that speech orders thoughts, and thoughts become conscious through speech. These thoughts can be reflected on. As one might expect, the process of interiorization of speech is central to this topic. In order to fulfill the completion of the thought the word must be well developed as inner speech. The more differentiated speaking and writing are, the more the quality of inner speech develops. A high quality of inner speech exerts a favourable influence on the interaction of higher mental functions and speech abilities (Rojas-Drummond, Gòmez & Vélez 2008; Mercer & Littleton 2007). In fact, speaking is not only used in the conventional communicative sense; above all it is an instrument linking speech to higher psychological functions. Hence, (inner) speech acquires a mediating function. Inner speech is seen as a rich and personal (intimate) manifestation of speech: it admits differentiation in thinking, it is important to the display of personality (Ananev 1963), and to the construction of the self (Bertau 2011; 2008).

Second, as the thought is stabilized in the word, it can be reflected on. The thought has to be clarified; this basis of objectivation then enables reflection, precisely the possibility to reflect on. Therefore, speaking turns out to be an important instrument of thinking. The processes which provide thinking are processes of orientation, ordering, control and reflection. However, this is not a deterministic view such that inner speech determines thought. But it is obvious that inner speech exerts a considerable influence on thought.

Third, because the word relates a human being to his or her socio-cultural environment, neither thought nor word appear in isolation. Speaking is embedded in specific socio-cultural contexts, and therefore thoughts are, too. It is not only speech which is interiorized, but equally the experiences with the environment, and the different valuations and attributions. In this dimension, personality and consciousness are expressed and reflected in speech. The role of inner speech increases, because it is obvious that inner speech becomes a mediator of thinking, speaking and acting. In summary, the whole society shapes an individual's speech,

thoughts and actions. It is precisely the societal use of language that informs inner speech.

## 3. Empirical evidence: An analysis of Speaking-Thinking-Types

Werani (2011) addresses the problem of approaching research on inner speech empirically and introduces a study of inner speech which uses the method of thinking aloud. The results of this study highlight the fact that speech processes and higher psychological functions are interwoven, and that the quality of speech influences the solution process in different ways. In the following the method is described, general results are presented, and afterwards one analysis (out of seven), which deals with the aspect of speaking-thinking-types, is illustrated.

Method

The method of thinking aloud (MTA) was used to collect the speech data. Subjects were instructed to do the Matrices of Raven (Kratzmeier & Horn 1988), and they were briefed to speak out aloud what they are thinking while solving the problems. The instruction was open for all utterances, meaning that there were no constraints to only speak about relevant aspects for the problem solving process. Because the main interest was on the process of problem solving there was no time limit given to the subjects. Raven's Matrices is a language-free intelligence test. In Werani (2011) they are used as problem solving tasks, precisely because in the literature they are generally assumed to be independent of world knowledge; moreover, they are seen as *language free* tasks. Hence, it was interesting to test if the tasks could actually be solved without any language/speech. The tasks consist of rectangular figures (called matrices) with one part missing; the subjects have to identify the correct supplement in a set of several complementary choices (see Figure 1).

Raven's Matrices consist of five sets (set A to set E) that are increasingly difficult; Set A is the easiest, and set E includes the most difficult tasks. For this exploration it is necessary to use an established research instrument, whose increasing difficulty is confirmed, for the interpretation of the results.
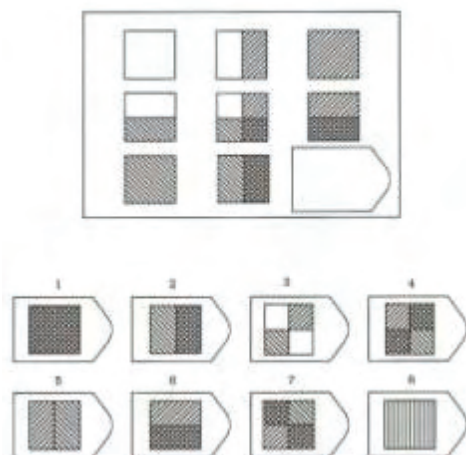
Figure 1: C8, an example out of Raven's Matrices

The investigation includes three samples: (1) The first sample (n = 22) was investigated with the method of thinking aloud. For the evaluation 22 verbal thinking-aloud protocols are available as data; also time duration and quality of the solution were measured. The sample consisted of 11 men and 11 women, the median age was about 31 years. The utterances of these problem solving subjects were taped and then transcribed. The recording times ranged from 20 to 70 minutes. (2) The control sample (n=22) was not investigated with the method of thinking aloud. These subjects were only instructed to solve the tasks. For the measurement of time duration and quality of the solution they were instructed to utter the number of the task and their solution. This sample was matched to the first sample, hence 11 men and 11 women were investigated (median age 27 years). For the further analysis time duration and quality of solution were available. (3) For exploration a third sample (n=10) was added involving aphasic patients (4 slight, and 6 medium severe aphasics). Because of the language impairment these patients were not investigated with the method of thinking aloud. The aim was to examine the assumption that the test is language free and that the patient should therefore be able to solve the problems with a visual strategy.

For the quantitative analysis as well as for the qualitative analysis the speaking-thinking-protocols were operationalized by being categorized. The chosen categories cover all examined features so that all phrases of the speaking-thinking-protocols can be assigned. Each category is defined precisely such that unambiguous assignment can be made, and double assignments are almost impossible (reliability of study r=0,99). A basic distinction of the categorization is between a material level and a modality level: (A) The material level contains statements related to the formal aspect of the task and the problem solving process itself; (B) The modality level subsumes all those expressions that are more about the situation and how to cope with the situation, or other associations.

On the material level (A) two broad categories can be distinguished: (1) Formal expressions are related to the formal procedure, including expressions which emerge from the instruction. All subjects had to name the task at the beginning and the chosen figure at the end of each task. Therefore, categories for formal procedures (e.g. "I am going to C10"), naming the solution (e.g. "solution is number one"), or to cancel the solution process (e.g. "I will go the next one") are distinguished. (2) Problem solving speech includes all statements which are directly related to the problem solving process. Here, four subcategories are differentiated: (a) problem representation (the subject names or describes the considered figures of the matrices), (b) questions (the subject interviews itself in the context of the solution process), (c) conjunctions (the subject identifies the goal of the action or the intention (final conjunction), the subject refers to conditions or draws conclusions (conditional conjunctions), or the subject highlights inconsistencies or contradictions (adversative conjunctions), (d) solution control (the subject confirms or constitutes the decision, or the subject only considers a solution, which is followed by a new problem solving sequence).

On modality level (B) three categories are distinguished: (1) situational relations, (2) creative relations, and (3) hesitations. The situational relations do not relate directly to the material, but to the current situation of the subject; the subject evaluates the action and reflects the situation; typical examples are common exclamations like "Uh, now it gets difficult" or expressions of uncertainty. The creative relations mirror personal preferences in vocabulary and expression (the man-

ner can be just phonemic as well as semantic). Finally, the hesitations contain delays and breaks.

Seven analyses and their general results

The results of the analyses of the protocols show clearly the interweaving of speech processes and higher mental functions (problem solving processes). In a *first analysis* quantitative factors like time and correct results were investigated. In all three samples the time duration rises from Set A (easy) to Set E (difficult), while the number of correct results falls. Sample one (with MTA) needs significantly more time than sample two (without MTA); most time is used by the aphasic sample. The most mistakes were made by the aphasics, sample one obtained the best results. In more detail, the use of word and phrases in sample one increases with the difficulty of the tasks. The more difficult the tasks are, the more the subjects speak; analyzing the categories it is obvious that problem solving speech is most frequent.

The *second analysis* focuses on correlations between time, correct solutions, and problem solving speech. Partial correlations were done, because for example the factor time could be responsible for better results. The results were two significant correlations between problem solving speech and correct solutions (p=0,043) as well as between problem solving speech and time (p=0,000). The correlation between time duration and correct solutions was not significant (p=0,920). To conclude, problem solving speech and good results in problem solving are connected. Time is thus not a factor contributing to improved problem solving results.

The *third analysis* focused on differences between good and bad problem solvers. The categories "good" and "bad" depend on the results (extreme groups). These two groups were investigated with respect to the language categories. The general result is that the good problem solvers use significantly more problem solving speech than the bad problem solvers. The bad problem solvers in contrast use significantly more formal utterances.

Investigating the speech style in *analysis four* shows no differences between good and bad problem solvers. Interestingly, the analysis of speech style in relation to the problem solving process of each subject shows differences (*analysis five*).

Hence, speech style states something about the individual and the problem solving process; speech style is an indicator for individual difficulties in problem solving processes but it does not differentiate between individuals.

The *sixth analysis* revealed four different speaking-thinking types; this analysis is explained below, because it is important for speech profiles. The *seventh analysis* concerned mistakes in tasks and raised the question as to what happens with speech when the problem is solved incorrectly. The results of this analysis showed that speaking is also able to disturb the problem solving process.

To sum up, all these analyses show that the quality of speech influences the solution process in different ways. Above all it becomes obvious that speech can have a favourable or unfavourable effect on the problem solving processes – depending on the quality of speech. Good problem solvers differ markedly from bad ones in their use of language (see also e.g. Bartl & Dörner 1998).

An analysis of four Speaking-Thinking-Types

The following analysis (analysis six) presents four speaking-thinking types based on a visual data exploration of the individual speech profiles (cf. VisMaster 2011). Each individual profile includes frequent linguistic categories of the utterances for each set. Therefore, the speech profiles charted as line plots include the formal expressions (A1), problem solving speech (A2), and situational relations (B1) (creative relations (B2) and hesitations (B3) were not frequent and therefore not included in the analysis). All 22 profiles based on characteristic features of the line plots can be classified into four groups. Strikingly, these four groups can be represented in a 2 by 2 table: on the one hand, there is the quality of the solution (there are good or bad problem solvers), and, on the other hand, there is the speech extent (there are sparsely speaking speakers or verbose speakers). The four types are named in a characterizing way: (1) pragmatic type, (2) talkative type, (3) doubting type, (4) taciturn type.

Figure 2 shows the group's distribution in a 2 by 2 table. The group number reflects the results of the test, thus, type 1 is the best one, and type 4 is the worst one.

	Sparsely speaking Speakers	Verbose Speakers
Good problem solvers	(1) pragmatic type	(2) talkative type
Bad problem solvers	(4) taciturn type	(3) doubting type

Figure 2: The distribution of the speaking-thinking-types

From the point of view of these results, it is obvious that the quantity of speech is only one factor in good problem solving results; however, other qualitative factors of speech must be involved. Figure 3 shows the typical profile of each type. The different length of each profile illustrates the proportion of the average of utterances of each type. Most utterances are produced by type 2; fewest utterances by type 4, type 1 and 2 are in between.

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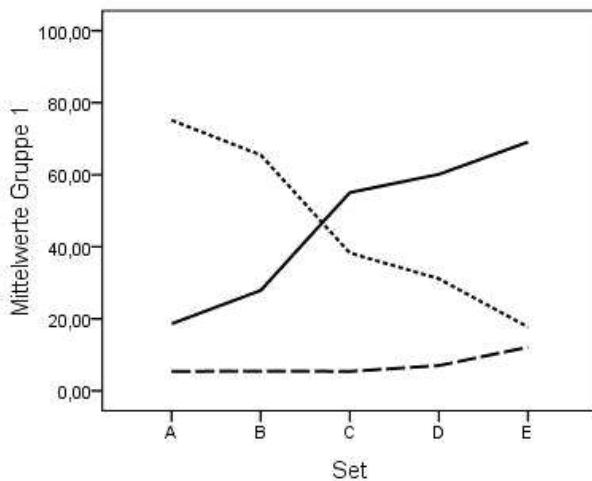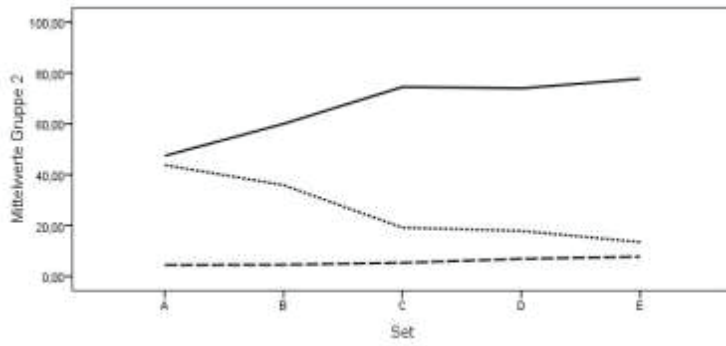
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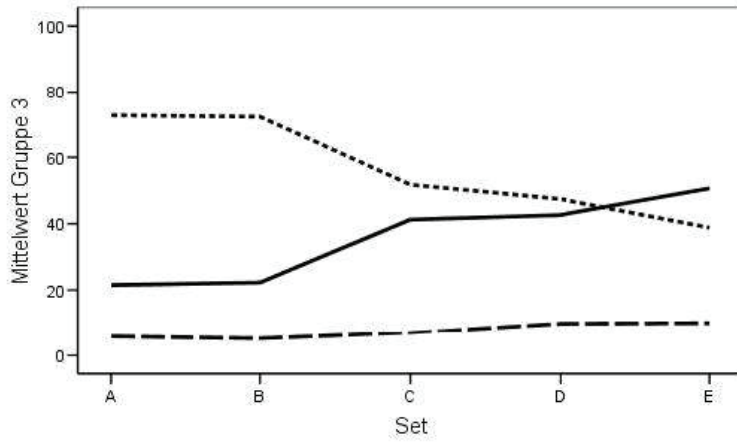
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Figure 3: Profiles of the four types (blue = formal expressions, red = problem sol-ving speech, green = situational relations): (1) pragmatic type, (2) talkative type, (3) doubting type, (4) taciturn type.

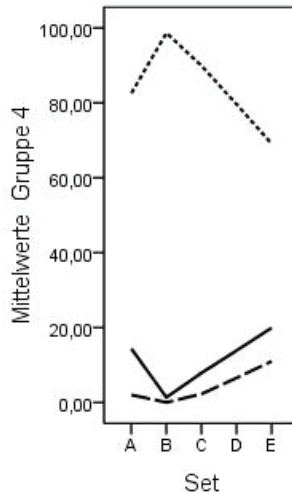The analysis of variance showed significant main effects for quantity of speech and for quality of problem solving. The significant effects for the quantity of speech were between type1-type4 (p = 0.023), type 2-type 4 (p = 0.029), type 3-type4 (p = 0.024). With regard to the quality of problem solving it is interesting that only two main groups can be distinguished: good and bad problem solvers (type1 and 2 – type 3 and 4: p=0.000). There were no significant effects between the good prob-lem solvers type 1 and 2 (p=0.846), and between the bad problem solvers type 3 and type 4 (p = 0.065).

In the following we will describe each of the four types using the speaking-thinking-protocols. To compare the subjects of each group and to draw up the characteristic features for each type task C8 (figure 1) was chosen out of the Ma-trices. Of particular interest are the different problem solving strategies.

(1) Pragmatic type

Figure 3(1) shows the typical speech profile of the pragmatic types. An obvious feature is the opposite direction of the profile: Formal expressions reduce from set A to set E, while the problem solving speech rises continuously; especially in set C there is an abrupt rise. Thus, set E shows the most problem solving speech. There are two interpretations possible: first, it is an indication of subjective increasing difficulty, and second, it is an adaptation of speech to the increasing complexity of the problems. In example 1, the pragmatic type subject 02 produces in C8 only little speech; starting with the obligatory formal expression and orientating oneself subject 02 gets into the problem solving process (see the square bracket in the example), aspects of reasoning, asking questions, and self-controlling lead to the solution of the problem and the final formal utterance. Regarding the percentages of the different categories it is clear that problem solving speech is predominate. In other words, subject 02 adapts his speech to the difficulty of the problem.[2] Typical for an orientation towards the problem solving process is reasoning or asking.

In summary, the pragmatic type produces problem solving speech. When he perceives a problem then he handles it; this is typical for these profiles. Speech is particularly used for problem solving, it is short, analytical, and a lot of questions are asked; to be more precise, speech is used in its mediating function. The mediating function occurs in two functions as mentioned above: first, a thought must be stabilized in a word, and then it is possible to reflect on the word. Questions, for example, can be understood as a means of reflection, the problem solver supports the solution process by urging himself to think about diverse aspects of the solution aspect. Furthermore, the use of conjunctions points to the possibility of analysis. Conjunctions embody the reflection process. This use of reflection distinguishes good from bad problem solvers.

Example 1: Pragmatic type, subject 02
(37'', correctly solved, number of phrases: 10)

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[2] In this investigation were no gender differences. Nevertheless the subjects are seen in their gender; gender is labelled by using correct language forms.

English translation
C8 / [formal expression]
aha / .. / .. / [orientation, self-initiation] /
it must be hatched diagonally/ [problem solving process, reasoning] /
aha / [affirmation, self-initiation] /
left hatched or hatched to the right? / [problem solving process, request by questions
to specify the reasoning] /
so, all hatched / [problem solving process, again reasoning] /
where's that? /[problem solving process, request by questions] /
.. / this is- this is not- not logical / [orientation, self-control] /
after all / now I see the figure / [problem solving process: affirmation of the problem
solution] /
that's number one in C8 [formal expression: naming the solution]

(2) Talkative type

The talkative type is characterized by the use of problem solving speech all the
time, so that problem solving speech takes up the largest part of verbal utterances
(see figure 3(2)). That seems like a strategy to counter possible problems by using
problem solving speech so to say to avoid problems. In contrast to the pragmatic
type this kind of use seems not to be economical, because problem solving speech
is not only used when it is needed. Nevertheless, the talkative type shows problem
solving results as good as those of the pragmatic type.

It would be interesting in a further investigation to distinguish these two types; for
example by adding a time limit. Although it was shown that time did not influence
the results both groups could react in different ways when they have to solve the
problems as quickly as possible. We would expect no change in the first three sets
of the Raven Matrices for the pragmatic type, because here they produce little
speech. For the talkative type two assumptions can be made: (1) the subjects get
along well talking little and to a certain extent when it is needed, (2) subjects be-
come worse, because due to the time constraint they are not able to solve the
problems successfully through (enough) speech.

The following example 2 is for the talkative type. The first and obvious difference
in contrast to the pragmatic type is the higher number of phrases in the same task.
After the first obligatory formal expression subject 22 also gets into the problem
solving process immediately while doing a first analysis with reasoning. She comes
relatively quickly to the solution, but then she performs a fairly extensive solution

control. She also expresses herself situationally, when she regards the possible solutions under the aspect of whether they are nice or not; that reflection does not bear problem solving power in a classical cognitive meaning.

The characteristic feature of the talkative type profile is that these subjects use plenty of problem solving speech all the time. For this reason it can be supposed that the talkative type is aware of the power of (inner) speech, and, therefore, they use speech in an extensive and rich way as a basic strategy for problem solving. The use of situational relations also tends to be positive so that speech is additionally used in a positive, motivating manner. In view of these facts the influence of speech on the problem solving process is obvious. The point at issue is that not only problem solving speech is relevant (according to cognitive problem solving theory) but also the whole attitude to the problem, especially in a motivating and positive manner. It would appear that for the talkative type it is necessary to speak more generally to perceive the problem as an entire figure (as proposed in Gestaltpsychology). We need further insight to differentiate what is necessary for the talkative type for the problem solving process. Thus far we can conclude that not everything we speak does have an intended purpose, but it is still needed for the solution process with respect to its *attitude and attribution*. It should be stressed again that it is characteristic of the talkative type to maintain a positive attitude and attribution to him/ herself and to the problem.

Example 2: Talkative Type, Subject 22
(1'19'', correctly solved, number of phrases: 23)

English translation
C8 / .. / C8 / .. / [formal expression] /
again such a rhythm / which is above . these things across / mhm / thus empty / filled in then / and then . down / there is once more / .. / .. / Mh / .. / right . joined with somewhat else / and it then gives this netting wire / [problem solving process: first analysis] /
.. / and that's also completely filled / puts it over the other / and below it is completely filled / and then it lies down over the whole thing / so I need a completed netting wire / [problem solving process: reasoning] /
that is number one / [formal expression: naming the solution]
.. / mhm / the others are also quite nice / .. / but you could also use the number five / because this is like a window, which you can open / that would be anywise nice / but it

does not fit naturally / so well / that was the number one / [situational relations]

that was the number one / [formal expression: naming the solution]

(3) Doubting type

At first sight, the doubting type shows a profile similar to that of the pragmatic type (see figure 3(3)): formal expressions reduce over the sets, while the problem solving speech increases. But two main differences can be observed: first, the intersection of the frequency of formal expressions and problem solving speech in the doubting type profile is considerably later than in the pragmatic type, and the percentage of problem solving speech is lower with the doubting type. Second, the bulk of the situational relations has a demotivating content, which could have an extensive impact on problem solving processes. The profile shows that situational relations increase with the complexity of the problems: there is a maximum in set E. Also in few talkers in this group the situational relations accumulate.

The typical characteristics for a doubting type are illustrated in example 3. The problem solving process starts in a manner similar to examples 1 and 2: first the formal expression is uttered then subject 21 enters into the problem solving process. The main difference is that the first problem solving expression involves a negative evaluation (see squared brackets). It follows an alternation between problem solving sequences and negative evaluations. At the end she finds the correct solution which is still commented negatively. An actual problem is that these situational relations have real negative self-influence, such as the expressions in subject 21 like: "oh, I notice that somehow my concentration is getting worse / .. / ../ . mh shit / I do not manage that ." The quality of subject 21's results is worse than other subjects, and in my opinion it is the qualitative aspect of her inner speech which is responsible for the solution process. In short, negative self-influence through negative self-evaluations in inner speech leads to bad problem solving processes. Therefore, as a consequence of these results an intense discussion about interiorization must follow. The question to be stressed is how speech can be interiorized to lead to an efficient quality. Speech patterns and especially negative evaluations in the context of the interaction processes appear within the interiorization at a later stage as a negative impact on the problem solving process.

Example 3: Doubting type, subject 21
(3'42'', correctly solved, number of phrases: 33)

English translation
at C8 / [formal expression] /
.. / .. / I do not somehow tap the systematic immediately / [problem solving process: negative evaluation] /
and I only see some strips in front of me / [problem solving process: presentation] /
notice that somehow my concentration is getting worse / .. / .. / mh shit / I do not manage that / [situational relation, negative evaluation] /
.. / mh / what's the systematics? / [problem solving process: initiating question] /
I must now proceed somehow concentrated / [situational relation: motivational request] /
le. half there is somewhat over it / then this there that then this / [problem solving process: problem representation] /
.. / mh / .. / my eyes are running somehow confused over the paper / .. / and I feel I did not manage what to put in / that cannot be true / [situational relation: negative evaluation] /
.. / all so so / .. / mh / .. / this is complete / [problem solving process: again representation] /
.. / mh / .. / it is somehow ambigous what to put in now / and I do not manage / and I'll get somehow visibly nervous / because I think that's beyond the time frame here, themselves / .. / and I cannot see anything anymore between these grids and strips and I I do not perceive the systematics / and I think to myself it cannot be so difficult, really not / .. / I do not cotton on that just do not know what it is / [situational terms: negative evaluation] /
the square above is not filled somehow / on the right with lines left / there so there so / [problem solving process: presentation] /
there must be a connection between the figures / [problem solving process: initiating request] /
.. / .. / mh / .. / .. / hm / .. / .. / this this this / [problem solving process: presentation] /
and then it may be, oh well, maybe it is empty now / there is still something about it and pulls it up / [problem solving process: reasoning] /
.. / .. / I simply take the . one / [formal expression: naming solution] /
good / wonderful / [Situational relation: positive evaluation with an ironic intonation]

The general profile of the doubting type is similar to the pragmatic type. One might think that a doubting type could change easily into a pragmatic type. But the use of speech and especially the influence of inner speech seem to prevent this change. A typical feature for the doubting type is that he realizes the problems to late. When he notices the problem he reacts with situational relations instead of intense use of problem solving speech. Therefore, inner speech as a mediating activity for problem solving is obviously not used for the problem solving process but for evaluating the situation; the reason is that especially negative evaluating speech disturbs the problem solving process. It can be assumed that the doubting

type shows poorer results than the pragmatic type because doubting subjects do not focus on the problem at the decisive point, but lose themselves in situational and personal mental states. Therefore, it is clear now that speech may have a negative influence on the problem solving process. This result can be seen in contrast to cognitive problem solving theory, because the doubting type is able to use relevant problem solving strategies. Thus, the modality level interferes with the problem solving process. We have to go a step further by highlighting the interiorization process, because not only the interiorization of language skills has to be under consideration but rather attitudes, evaluations, norms, and values.

(4) Taciturn type

Finally, the main characteristic of the taciturn type (figure 3(4)) is the extensive production of formal expressions; this kind of expression is dominant over all five sets. In other words, problem solving speech is never given the opportunity to influence the problem solving process in a positive manner. The contention that problem solving speech is needed to solve these non-verbal problems is clearly supported by the findings of this study. Subjects of this type show the worst results, which confirms the fact that inner speech supports the problem solving process and promotes positive results.

Example 4a: Taciturn type, subject 14
(59'', correctly solved, number of phrases: 4)

English translation
C8 / [formal expression]
.. / .. / .. / .. / .. / .. / hm? / [problem solving process: unspecific question] /
.. / I have to look at that exactly / [problem solving process: initiating]
.. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / [break] /
Is it symbol one? / [formal expression: naming solution in form of a question]

Example 4b: taciturn type, subject 17
(10'', correctly solved, number of phrases: 2)

English translation
C . 8 / [formal expression]
.. / .. / eins / [formal expression]

The examples 4a and 4b of taciturn types are self-explanatory: subject 14 enters the task with the formal expression and then produces an interjection which can be interpreted as a question and therefore as a minimal form of problem solving speech. Finally she states the solution in the form of a question. Subject 17 does not produce any problem solving speech; he utters only the two necessary formal expressions. It is not the case that using speech assures good problem solving solution; it is not an all-or-none law. Rather, the manner and quality of speech are responsible for good problem solving results. The taciturn type is able to solve some problems, but nevertheless these subjects are the worst of all. This result should provide an indicator of a correlation between wordlessness and bad results. Correct solutions in the taciturn type appear by chance, and it seems that these subjects are not able to use speech in its mediating function to come to a thinking strategy. Hence, although this task (C8) was solved correctly, the not-speaking-strategy in a problem solving task is a disadvantage for them in the long run.

In short, the taciturn type is characterized by sparing use of words. This raises the question of whether these subjects did not want to apply problem solving speech in its mediating function, or whether they cannot. Like the conclusion above this question leads to an intense debate about the quality of interiorization. The consequences become clear of not using speech in its mediating function. Once again, if thought are not stabilized in the word, there will not be a basis for reflection process. The taciturn type is not able to solve problems because he does not construct a basis for reflection through speech.

This analysis shows that there are different speaking-thinking types with various speech patterns and corresponding problem solving strategies. These strategies become evident through speech. The pragmatic and talkative types show a positive speech strategy, whereas the doubting type shows that speech with negative evaluation leads to weak solutions. Not to use speech is the worst strategy as shown by the taciturn type. Empirically it is a challenge to investigate the connection between speech profiles and higher psychological functions.

We observed a huge variation of speech profiles from silent to verbose speakers. To waste speech or to use negative speech impulses leads to weak problem solving

results. In contrast, good problem solving results are connected with pragmatic speech or a lot of speech with positive evaluations and stimulations.

4. Conclusion: Perspectives of Speaking-Thinking-Types

Theoretically, the role of speech and inner speech in relation to higher psychological functions is of utmost importance. In Soviet Psychology the genesis, structure, and function of inner speech are well established. Inner speech is speech for myself; it is a manifestation of speech in the same way as external and written speech are. This internal manifestation is in my opinion the richest, most common and most intimate one, and it is possible with inner speech to leave much unsaid. Inner speech is relevant to stabilization (of thoughts in words), self-regulation, and cooperation.

It is still challenging to find further empirical evidence for the relationship between speech processes and problem solving. Speech and problem solving processes are clearly interwoven, i.e. speech is a means in mediating thinking processes. Furthermore, the quality of speech plays an important role in relation to good or bad problem solving strategies. The analysis of speaking-thinking protocols in Werani (2011) leads to different speaking-thinking types. These four types show different speech profiles and use different strategies for problem solving. Interestingly, the quantity of speech is not a prediction for good problem solving. The main factor for good problem solving is the quality of speech. Therefore, one of the results is that speech could be both advantage and disadvantage for problem solving. Especially the situational relations influence the solution process in a positive or negative way. Hence, the problem solving process depends on the quality of speech in terms of problem-related speech and positive stimulation and evaluation. Both attitude and attribution are key aspects of problem solving processes; their importance can hardly be exaggerated.

It has been claimed that speech profiles allow investigation of higher psychological functions. A fundamental question for a further analysis of speech profiles is what exactly can be inferred from them. Can speech profiles be used as a window into specific higher psychological processes? What kind of statement is possible on the basis of speech profiles? Speaking is due to inter- and intrapsychological pro-

cesses, and it is a dynamic and variable process. Therefore, to enter into a discussion about speech profiles brings up the question of whether speech profiles are meaningful and how they can be investigated.

First of all the *concept of higher psychological functions* must be further clarified. The presented analysis refers to a relation between speech profiles and problem solving strategies. Problem solving is only one example of the thinking processes and hence it is only a part of the connection between speech profiles and higher psychological functions. Therefore, it only can be interpreted as a detail and all other considerations about speech influence in thinking remain speculative.

In Soviet psychology the study of personality in relation to speech is also a focus of higher psychological functions (Ananev 1963). The investigation of the self can be seen as an extension of this tradition; it is for example part of dialogical self theory (e.g. Bertau 2004; Hermans 2001) as well as social psychology (Kraus 2000). Whether (inner) speech is attributed to the development of personality also raises the question to what extent personality profiles are mediated by speech.

The following three factors have to be clarified in further investigations about the relation between speech and higher psychological functions: (1) positioning of the speaker, (2) genre of speech/of language activity, and (3) investigation method.

(1) The first factor considers the *positioning of the speaker*, which is manifested and performed in sociocultural conditions for example, speech community, linguistic repertoire and style, and various registers (Harré & van Langenhove 1999). Furthermore, the speaker's class and role must be considered just as attitude, motives and attributions. In applied linguistics, especially in forensic linguistics for example, voice, language and manner of speaking are used for speaker identification (Schall 2011). But speech is ambiguous, it is a highly dynamic process newly constructed in each situation and itself constructing the situation; hence the search for a linguistic fingerprint is without effect. For example, the register of style is very diverse between subjects and it is also diverse between specific positionings of one subject. Speech profiles in relation to positioning hence only can be understood as dynamic processes. In short, speech profiles are specific depending on positioning. It is assumed that these aspects influence speech profiles significantly. Discursive action is therefore a main topic of the analysis, and there is spe-

cial interest in how individuals build and represent their speech profiles through speaking interactions (Lucius-Hoene & Deppermann 2004). In the broader sense, speech profiles are involved in production and representation of identity.

(2) The second factor concerns the choice of the higher psychological functions to be investigated. Which speech/linguistic *genre* (Bakhtin 1986) is suitable for an investigation of a specific higher psychological function? Vygotsky gives only a few examples for higher psychological functions such as verbal thinking, logical memory, attention, volition (Vygotsky 1931/ 1997). This list must be expanded, because it is assumed that speech processes are involved in further functions like autobiographical memory, problem solving, perception and visual-spatial functions. To draw nearer to each function a specific genre needs to be selected. The speech/ linguistic genre represents the condition for each speech profile. Especially for research into the relationship between speaking and thinking self-reflexive genres are preferred, e.g. thinking about a special theme about oneself, seeing oneself solving a specific problem, talking about a problematic theme in general or specific to oneself.

(3) The third factor deals how speech profiles are influenced by the choice of method. Essentially, process-oriented and result-oriented methods must be distinguished. Whereas result-orientated methods focus on a result, process-oriented methods are interested in dynamic processes, as for example the actual process of speech and its linking to higher psychological functions. Therefore, process-oriented methods are preferred. This could be done by combining methods like thinking aloud with auto-confrontation techniques and interviewing (e.g. Clot 2005; Flick 2010).

Finally, the investigation of the relation between speech and higher psychological functions is challenging. It must be pointed out that this analysis is quite difficult, but very fruitful and important for understanding higher psychological functions. The positioning of the speaker is as important as the specific genre is, and the investigation method which the analysis involves. It is shown in Werani (2011) that the relation between speech and higher psychological processes is dynamic. The expected results in further investigations will be extensive and concern to language acquisition as well as to speech pathological aspects. Ultimately, the results

should clarify the relation between speech and higher psychological function over a wide range of speakers.

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Appendix

Example 1 – 4 in English and German

Example 1: Pragmatic type, subject 02

(37'', correctly solved, number of phrases: 10)

English translation	Original
C8 / [formal expression]	C8 / [Formale Äußerung] /
aha / .. / .. / [orientation, self-initiation] /	aha / .. / .. / [Orientierung, Selbstini- tiierung] /
it must be hatched diagonally/ [problem solving process, reasoning] /	das muss schräg schraffiert sein / [Prob- lemlöseprozess, Schlussfolgerung] /
aha / [affirmation, self-initiation] /	aha / [Bestätigung, Selbstinitiierung] /
left hatched or hatched to the right? / [problem solving process, request by questions to specify the reasoning] /	nach links schraffiert oder nach rechts schraffiert? / [Problemlöseprozess, Aufforderung durch Fragen zur Spezifi- zierung der Schlussfolgerung] /
so, all hatched / [problem solving process, again reasoning] /	also: ganz durchschraffiert / [Problemlö- seprozess, erneute Schlussfolgerung] /
where's that? /[problem solving process, re- quest by questions] /	wo gibt's das? / [Problemlöseprozess, Aufforderung durch Fragen] /
.. / this is- this is not- not logical / [orientation, self-control] /	. / das ist ja- das ist nicht- nicht so lo- gisch / [Orientierung, Selbstkontrolle] /
after all / now I see the figure / [problem solving process: affirmation of the problem solution] /	doch / jetzt seh' ich die Figur / [Problem- löseprozess: Bestätigung der Problemlö- sung] /
that's number one in C8 [formal expression: naming the solution]	das ist Nummer eins C8/ [Formale Äuße- rung: Nennung der Lösung] /

Example 2: Talkative Type, Subject 22

(1'19'', correctly solved, number of phrases: 23)

English translation	Original
C8 / .. / C8 / .. / [formal expression] /	C8 / .. / C8 / .. / [Formale Äußerung] /

again such a rhythm / which is above . these things across / mhm / thus empty / filled in then / and then . down / there is once more / .. / .. / Mh / .. / right . joined with somewhat else / and it then gives this netting wire / [problem solving process: first analysis] /

.. / and that's also completely filled / puts it over the other / and below it is completely filled / and then it lies down over the whole thing / so I need a completed netting wire / [problem solving process: reasoning] /

that is number one / [formal expression: naming the solution]

.. / mhm / the others are also quite nice / .. / but you could also use the number five / because this is like a window, which you can open / that would be anywise nice / but it does not fit naturally / so well / that was the number one / [situational relations]

that was the number one / [formal expression: naming the solution]

wieder so ein Rhythmus / der sich über . diese Querdinger da / mhm / also leer / dann ausgefüllt / und dann von . unten / da kommt dann noch so ein / .. / .. / mh / .. / rechts . gesellt sich noch was dazu / und es ergibt dann diesen Maschendraht / [*Problemlöseprozess*: erste Analyse] /

.. / und das ist dann auch ganz ausgefüllt / es legt sich über das andere / und unten ist es ganz ausgefüllt / und dann legt sich es allmählich über das Ganze / also brauche ich ein ausgefülltes Maschendraht / [*Problemlöseprozess*: Schlussfolgerung] /

das ist die Nummer eins / [Formale Äußerung: Lösungsnennung] /

.. / mhm / die andern sind auch ganz nett / .. / aber man könnte auch die Nummer fünf nehmen / weil das ist wie ein Fenster das man aufmachen kann / das wär' irgendwie ganz nett / aber es passt natürlich nicht rein / also gut / [Situative Bezüge]

die Nummer eins war das / [Formale Äußerung: Lösungsnennung]

Example 3: Doubting type, subject 21

(3'42'', correctly solved, number of phrases: 33)

English translation
at C8 / [formal expression] /

.. / .. / I do not somehow tap the systematic immediately / [problem solving process: negative evaluation] /

and I only see some strips in front of me / [problem solving process: presentation] /

notice that somehow my concentration is getting worse / .. / .. / mh shit / I do not manage that / [situational relation, negative evaluation] /

.. / mh / what's the systematics? / [problem

Original
bei C8 / [Formale Äußerung] /

.. / .. / hier erschließt sich mir irgendwie die Systematik nicht sofort / [Problemlöseprozess: negative Bewertung] /

und ich sehe nur irgendwelche Streifen vor mir / [Problemlöseprozess: Darstellung] /

merke wie die Konzentration irgendwie nachlässt / .. / .. / mh shit echt / kriege ich jetzt nicht gebacken / [Situativer Bezug, negative Bewertung] /

.. / mh / was ist das denn für eine Systematik? / [Problemlöseprozess:

solving process: initiating question] /
I must now proceed somehow concentrated /
[situational relation: motivational request] /

le. half there is somewhat over it / then this
there that then this / [problem solving process:
problem representation] /
.. / mh / .. / my eyes are running somehow con-
fused over the paper / .. / and I feel I did not
manage what to put in / that cannot be true /
[situational relation: negative evaluation] /

.. / all so so / .. / mh / .. / this is complete / [prob-
lem solving process: again representation] /

.. / mh / .. / it is somehow ambigous what to put
in now / and I do not manage / and I'll get some-
how visibly nervous / because I think that's
beyond the time frame here, themselves / .. /
and I cannot see anything anymore between
these grids and strips and I I do not perceive the
systematics / and I think to myself it can not be
so difficult, really not / .. / I do not cotton on that
just do not know what it is / [situational terms:
negative evaluation] /

the square above is not filled somehow / on the
right with lines left / there so there so / [problem
solving process: presentation] /

there must be a connection between the figures
/ [problem solving process: initiating request] /

.. / .. / mh / .. / .. / hm / .. / .. / this this this /
[problem solving process: presentation] /

and then it may be, oh well, maybe it is empty
now / there is still something about it and pulls it

initiierende Frage] /

ich muss jetzt irgendwie konzentrierter
vorgehen / [Situativer Bezug:
motivationale Aufforderung] /

li . so halb setzt sich was drüber / dann
das da dann das / [Problemlösepro-
zess: Problemdarstellung] /

.. / mh / .. / meine Augen rennen hier
irgendwie wirr übers Papier / .. / und
ich hab das Gefühl ich kriege es ir-
gendwie nicht raus was da rein soll /
das kann ja wohl nicht wahr sein /
[Situativer Bezug: negative Bewertung]
/

.. / ganz so so / .. / mh / .. / das ist ganz
/ [Problemlöseprozess: erneute Dar-
stellung] /

.. / mh / .. / irgendwie ist mir über-
haupt nicht klar was da jetzt rein soll /
und ich krieg es auch nicht raus / und
ich werde irgendwie zusehends nervös
/ weil ich mir denk das sprengt kom-
plett hier den Zeitrahmen / .. / und ich
sehe aber vor lauter Gitter und Stri-
chen bald überhaupt nichts mehr und
erkenne auch die Systematik einfach
nicht / und denke mir so schwer kann
es wirklich nicht sein / .. / ich kapier es
einfach nicht was das ist / [situativer
Bezug: negative Bewertung] /
da oben ist das Quadrat irgendwie gar
nicht ausgefüllt / rechts mit Strichen
links / da so da so/ [Problemlösepro-
zess: Darstellung] /
muss doch irgendeinen Zusammen-
hang geben zwischen den Abbildungen
/ [Problemlöseprozess: initiierende
Aufforderung] /

.. / .. / mh / .. / .. / hm / .. / .. / das das
das / [Problemlöseprozess: Darstel-
lung] /

und dann ist es möglicherweise- na ja
vielleicht kommt es jetzt leer / da setzt
sich noch was drüber da zieht es ganz

up / [problem solving process: reasoning] /	hoch / [Problemlöseprozess: Schluss-folgerung] /
.. / .. / I simply take the . one / [formal expression: naming solution] /	.. / .. / ich setzt jetzt einfach die . eins ein / [Formale Äußerung: Lösungsnen-nung] /
good / wonderful / [Situational relation: positive evaluation with an ironic intonation]	gut / na wunderbar / [Situativer Bezug: positive Bewertung mit ironischer Intonation]

Example 4a: Taciturn type, subject 14

(59'', correctly solved, number of phrases: 4)

English translation	Original
C8 / [formal expression]	C8 / [Formale Äußerung] /
.. / .. / .. / .. / .. / .. / hm? / [problem solving process: unspecific question] /	.. / .. / .. / .. / .. / .. / hm? / [*Problemlöse-prozess*: unspezifische Frage] /
.. / I have to look at that exactly / [problem solving process: initiating]	.. / das muss ich mir erst noch mal genau anschauen / [*Problemlöseprozess*: Ini-tiierung] /
.. / [break] /	.. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / .. / [Pause] /
Is it symbol one? / [formal expression: naming solution in form of a question]	ist das Symbol eins? / [Formale Äuße-rung: Lösungsnennung in Frageform]

Example 4b: taciturn type, subject 17

(10'', correctly solved, number of phrases: 2)

English translation	Original
C . 8 / [formal expression]	C . 8 / [Formale Äußerung] /
.. / .. / eins / [formal expression]	.. / .. / eins / [Formale Äußerung]

Keywords	Name index

Keywords

Cultural-historical theory
Inner speech
Problem solving
Psycholinguistics
Speaking-thinking-types
Speech profile
Thinking aloud

Name index

Achutina, T.V.
Ananev, B.G.
Bakhtin; M.M.
Bertau, M.-C.
Bühler, K.
Deppermann, A.
Galperin, P.J.
Humboldt, W. von
Keiler, P.
Leont'ev, A.A.
Leont'ev, A.N.
Lucius-Hoene, G.
Luria, A.R.
Sokolov, A.N.
Steinthal, H.
Van der Veer, R.
Vygotskij, L.S.
Werani, A.
Wertsch, J.V.