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Pragmatic ability in children with early onset brain damage and children with pragmatic language impairnent

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List of papers

This thesis is based on the studies reported in the following papers, referred to in the text by their respective Roman numerals:

I   Holck, P., Nettelbladt, U. and Dahlgren Sandberg, A. (2009). Children with cerebral palsy, spina bifida and pragmatic language impairment: differences and similarities in pragmatic ability. *Research in Developmental Disabilities*, **30**, 942–951.

II   Holck, P., Dahlgren Sandberg, A. and Nettelbladt, U. (2009). Interaction during intervention: Conversations between professionals and children with cerebral palsy. *Communication & Medicine*, **6**, 49-60.

III   Holck, P., Dahlgren Sandberg, A. and Nettelbladt, U. (2009). Inferential ability in children with cerebral palsy, spina bifida and pragmatic language impairment. Accepted for publication in *Research in Developmental Disabilities*. E-publication ahead of print.

IV   Holck, P., Dahlgren Sandberg, A. and Nettelbladt, U. (submitted) Narrative ability in children with cerebral palsy.

Abstract

The general purpose was to study pragmatically related abilities in children with early-onset brain damage, i.e. children with cerebral palsy (CP) and children with spina bifida and hydrocephalus (SBH), and in a group of children with pragmatic language impairment (PLI).

In study I and III children with CP, SBH and PLI were compared. In study I pragmatically related abilities were assessed. No significant differences between the CP group and the SBH group occurred, both groups having pragmatically related problems. The three groups all had problems with story comprehension and narrative ability.

In study III literal and inferential understanding were analyzed. No significant differences occurred between the CP group and the SBH group. The PLI group made fewer inferences and had significantly less typical answers compared to the CP group.

In study II, conversations during intervention between children with CP and their physiotherapists (PTs) and speech language therapists (SLTs) were studied. The PTs talked significantly more about topics not directly related to the intervention compared to the SLTs.

In study IV narrative ability in children with CP was explored. The difficulties with story recall, compared to the norms of the test and the results of a group of TD children, could be related to problems with explicitness and causal conjunctions.

In conclusion, the children with CP and the children with SBH represented in this thesis both have pragmatically related problems. The problems occur mainly in relation to higher-level language skills as narrative ability, and are mainly manifested at a textual level.

Acknowledgements

Abbreviations

AAC	Alternative and Augmentative Communication
BST	Bus Story Test
CA	Conversation Analysis
CCC	Children's Communication Checklist
ERRNI	Expression, Reception and Recall of Narrative Instrument
FB	False belief
IR	Initiative-Response Analysis
MLU	Mean length of utterance
NAP	Narrative Assessment Profile
SLT	Speech language therapist
STM	Short-term memory
PT	Physiotherapist
PLI	Pragmatic language impairment
SBH	Spina bifida with hydrocephalus
SBM	Spina bifida myelomeningocele
SLI	Specific language impairment
TD	Typically developing
ToM	Theory of mind
WM	Working memory

Background

Introduction

The pragmatic ability of children with cerebral palsy (CP) is the focus of this thesis. Traditionally research related to CP focuses on speech production and dysarthria (e.g. Pennington & McConachie, 2001a) and the implications of the use of augmentative and alternative communication (AAC; e.g. Granlund, Björck-Åkesson, Wilder & Ylvén, 2008). On the abilities related to the use of spoken language research is limited, although some exceptions regarding pragmatic ability in conversation can be found (e.g. Pennington & McConachie, 2001b). However, in the clinical setting professional activity with children with physical impairments indicates that pragmatic problems not only can be found in clinical groups normally associated with pragmatic problems, like children with spina bifida and hydrocephalus (SBH; Fletcher, Barnes & Dennis, 2002; Rapin & Allen, 1983), but also in other clinical groups such as children with CP. The focus is the effects of the underlying brain damage, i.e. the existence of a concomitant physical and language impairment, rather than the etiology of the brain damage, which is very different in the case of CP compared to the case of SBH. The physical impairment *per se* implies that the child's freedom to move about independently in order to pursue interesting objects or events is restricted. As a consequence, the child might experience a limited knowledge of the world and decreased exposure to conversational partners compared to typically developing peers.

Verbal interaction is the most important means for children to practise and develop their linguistic and communicative skills. To this end, they need to be involved in conversations with both adults and peers; with adults primarily to develop language structure and with peers primarily to develop pragmatic and interactional skills (Hansson, Nettelbladt & Nilholm, 2000; Rogoff, 1990). A further important aspect of is the notion that not only the child's language needs to be considered, but also the entire communicative interaction. That is, the conversational partners and their communicative behaviour have a significant impact on the development of a young child's pragmatic ability. If a child is not exposed to appropriate communicative challenges by having to take a sufficient share of responsibility for the development of a conversation, the child might risk not developing into a competent and attractive

communication partner (Sadler & Mogford-Bevan, 1997). The adults whom the child meets in its everyday context may unconsciously reinforce potential interactional problems, e.g. by facilitating the interaction too much, and thus not preparing the child for future demands. Thus, it is a challenging task for the conversational partner to give sufficient support as well as providing adequate challenges. This process may be more complicated when the child has an impairment causing the conversational partner to perceive the child to be in a less able position. Children with physical impairments meet many professionals, implying that the conversational style of these professionals' has a substantial influence on the development of the conversational ability of the child.

Clinical experience has shown that pragmatically related problems such regarding conversation, inferential ability and narrative ability, are not uncommon in the CP group, thus suggesting that the CP group may share some traits with children in the SBH group. Other groups with known pragmatic problems are children with pragmatic language impairment (PLI) without physical impairment (Bishop, 1997; 2000; Botting & Conti-Ramsden, 1999). In a first explorative study the potential pragmatic problems in children with CP and children with SBH were observed and compared with the problems manifested in the PLI group. As a consequence of these results further studies of some pragmatically related abilities of vital importance for comprehension and academic success were undertaken, namely inferential understanding and narrative ability.

Theories of pragmatic abilities and disabilities

During the 1970s and the 1980s clinical emphasis in speech and language pathology began to shift from defining language in terms of form and content to defining language in terms of its use (e.g. Bates, 1976; Prutting & Kirchner, 1983), labelled "language use" by Bloom and Lahey (1978). According to Duchan (1984), the incorporation of areas of pragmatics such as conversation, discourse genres, social interaction and activity participation changed clinical practices so significantly that their combined additions into assessment and intervention began to be called a "pragmatics revolution" in the United States. This new way of looking at communication also led to a shift from an individual fault seeking perspective to a perspective where the contributions of both interlocutors in a dyad were emphasized (Duchan, 1984).

However, in other disciplines such as philosophy and sociology the study of pragmatics was already well established. The pioneers of pragmatics were philosophers, and the modern usage of the term pragmatics could be attributed to Charles Morris (Levinson, 1983). Morris' original semiotic definition of pragmatics was "the relations of signs to their interpreters" (cited in Perkins, 2007:9), i.e. the interpretation of symbols by the interlocutors in a conversation. Morris clearly distinguished pragmatics from syntax and semantics, since pragmatics was closely tied to the use of language (Mey, 2001).

Grice´s maxims, relevance theory and inference

Paul Grice formulated the "Gricean maxims", i.e. a theory about people's use of language (Levinson, 1983). According to Levinson (1983), Grice's work opened the way to a consideration of pragmatics as an interface between cognitive, social and linguistic development. Grice suggests that there is a set of over-arching assumptions guiding the conduct of conversation. These may be formulated as guidelines for the efficient and effective use of language in conversation and express a general co-operative principle. The four maxims are the maxim of quality (try to make your contribution one that is true), the maxim of quantity (make your contribution as informative as is required, but not more informative than is required), the maxim of relevance (make your contributions relevant) and the maxim of manner (avoid obscurity and ambiguity and be brief and orderly). To summarize, interlocutors should speak sincerely, relevantly and clearly, while providing sufficient information (Levinson, 1983). Grice suggests that the maxims are not arbitrary conventions but rather describe rational means for conducting co-operative exchanges, and could thus govern aspects of non-linguistic behaviour too. Apart from being interpreted as a set of prescriptive rules for how conversation "ought" to be, Grice's maxims can be used to explain a crucial phenomenon in pragmatics, i.e. how utterances can be taken to mean something over and above what they mean on a literal level, i.e. implicature (McTear & Conti-Ramsden, 1992). Knowing the maxims enables an addressee to draw inferences as to the implied meanings of utterances. Every utterance has both "natural" meaning, i.e. what is actually said, and "non-literal" meaning, i.e. what is implied or the implicature. Breaching a maxim is a particularly salient way of getting an addressee to draw an inference and hence recover an implicature (Grundy, 2000).

Although the relation between the Gricean maxims and communicative impairment is intriguing and constitutes a creative approach, descriptions of

this relationship is unusual in the literature. However, McTear and Conti-Ramsden (1992) provide an example in children with autism, who were found to be likely to violate the maxims of quantity and relevance. Being unable to accurately infer their listeners' knowledge, these children had problems with the maxims of quantity and relevance. Perhaps the case of autism is the most salient example, but possibly also children using alternative and augmentative communication (AAC) might involuntarily breach some of the maxims mainly due to a restricted vocabulary, leading to problems with relevance.

Sperber and Wilson (1995) questioned the number of maxims, and suggested that the maxim of relevance would suffice to explain the process of utterance understanding. The maxim of relevance became the cornerstone of the Relevance Theory developed by these authors. According to Sperber and Wilson (1995), the principle underlying relevance theory is that in any given context, what people say is relevant (Mey, 2001). Moreover, the principle of relevance implies that the greater the effect of an utterance, the more relevant it is, and the more effort emplyed to understand something, the less relevant it is (Grundy, 2000). Relevance theory takes a different approach from Gricean theory in that it characterizes pragmatics in terms of cognitive processes rather than contextual action or usage principles (Perkins, 2007; Verschueren, 1999). This theory has been criticized for failing to take sufficient account of the reciprocal nature of communication (Perkins, 2007).

Two different types of inferencing processes are usually identified: deductive and inductive inference. With deductive inference, fixed rules are applied to information in order to arrive at an outcome. In consequence deductive inferences are inflexible and not uncertain. The outcome of a deductive inference follows the premises according to the rules of logic (Leinonen et al., 2000). An example:

1. Water starts to boil at 100 ° Celsius.
2. The water is 100 ° Celsius.
Outcome: The water is starting to boil.

Given the premises, the only possible outcome is the one stated. Inductive inferences, on the other hand, are plausible outcomes to a given premise, based on a number of earlier experiences and observations. An example:

1. All dogs bite.
2. A dog is approaching!
A possible outcome: The dog will bite me.

An inductive inference does not follow automatically by application of the rules of logic, it is a plausible conclusion on the basis of available evidence and general world knowledge (Leinonen, Letts & Smith, 2000). However, a third inferencing type, abduction, has been suggested by Peirce (cited in Bråten, 2007). Abduction probably is the dominating type of inference and can be described as an intermediary between deductive and inductive inferences.

Another three commonly identified types of inferences are put forward by Harley (2001): logical inference, that follows from the meanings of words and is similar to deductive inference, bridging inference (sometimes called backward inference), which enables us to relate new to previous information in order to maintain coherence as in the use of reference, and finally elaborative inference, i.e. when we extend what is in the text with our world knowledge.

In order to make an inference, we need to bring together information from the linguistic expression, the context and previous knowledge and experience so as to work out the intended meaning (Leinonen & Letts, 1997; Letts & Leinonen, 2001). Inference is widely seen as the key cognitive process involved in pragmatics (Perkins, 2007), and draws on cognitive processes such as memory and theory of mind, linguistic processes such as lexical and syntactical knowledge, and perceptual processes such as visual and auditory perception. This implies that the origins of problems with inferential ability are not easily tracked down (Perkins, 2007). Thus children who show adequate sentence comprehension may still fail to draw inferences (Letts & Leinonen, 2001, Leinonen & Letts, 1997).

Politeness

Some situations seem to require the breaching of the Gricean maxims, thus leading to the subject of politeness. Politeness phenomena are one manifestation of the wider concept of etiquette or appropriate behaviour (Grundy, 2000), and have become a cover term in pragmatics for whatever choices are made in relation to the need to preserve people's public self-image or face (e.g. Goffman, 1959; Verschueren, 1999). Broadly defined, politeness includes both polite friendliness and polite formality (Brown & Levinson, 1987). Three major politeness strategies are defined by Brown and Levinson

(1987): positive politeness, negative politeness and off record. In positive politeness the expression of solidarity and familiar, attentive behaviour is referred to. Negative politeness refers to the expression of restraint and respect in behaviour, and, finally, off the record concerns the avoidance of ambiguity, i.e. to express oneself in clear.

When someone is obliged to perform a potentially face-threatening act, like posing a demand, he/she will employ certain strategies to minimise the threat. A first choice would be to do the act off or on record. If the speaker goes off record, the utterance is said in an ambiguous way, so that the speaker cannot be said to have committed himself to a particular intention. Linguistic expressions of off record utterances are metaphors, irony, rhetorical questions and understatements. If the speaker chooses to go on record, in other words when the communicative intention is transparent to the interlocutors, a second choice must be made. The utterance can be made completely open and direct, i.e. bald on record, or with compensatory action, i.e. somewhat mitigated and/or indirect. When an utterance is done baldly, it is performed in the most direct, clear and unambiguous way possible, e.g. "Shut up!" When, on the other hand, it is made with compensation, the speaker tries to soften the face-threatening act by making it clear that no face-threat was intended. This can be done in either of two ways: using a form of positive politeness, i.e. the expression of solidarity and familiar behaviour, or using a negative politeness forms, i.e. the expression of restraint and respect behaviour. Bald on record communication is typical for child directed adult talk (Aronsson, 1991).

The notion of face is also associated with politeness and consists of two specific kinds of wants attributed by the interlocutors to one another. Negative face is meant our wish not to be imposed on by others and to be allowed to go about our business unimpeded. Positive face is a positive, consistent self-image claimed by interlocutors, a wish to be approved of by others. Negative face is most similar to what we generally mean when we talk about politeness, namely formal politeness. Positive face is more elusive, but can be described as the wish of a person that his/her own wants are desirable to at least some others. According to Brown and Levinson (1987), face must be constantly attended to in interaction. Any act that puts face wants at risk is a face threatening act. Examples of acts that potentially are a threat to the listener's negative face wants, since they may be seen as imposing, are requests, advice, reminders, promises and compliments. Acts potentially threatening the positive face wants of the listener could be disapproval, criticism and non-cooperation in an activity. These acts can be seen as a sign of disapproval. When it comes to speaker contributions, examples of potentially positive face threatening acts are excuses and acceptance of offers, and examples of negative face threatening acts are apologies and breakdown of physical control over body as in the case of a physical impairment. According to Grundy (2000), there are five strategies to

choose from when a face threatening act is to be performed: doing the act bald on record, using positive politeness, using negative politeness, doing the act off record, and refraining from doing the act, going from greater to lesser threat to face.

The openness of a conversation can be predicted on the basis of three factors: the degree of asymmetry in the power relation, how well the interlocutors are acquainted and the magnitude of the demand (Brown & Levinson, 1987). The openness tends to be more pronounced the lesser the differences are, i.e. openness is more likely to occur with a low degree of asymmetry, the interlocutors are well acquainted and the magnitude of the demand is small. However, Aronsson and Rundström (1988) oppose the notion that the manner of the conversation is more or less predetermined, and claim that the degree of openness is more a matter of teamwork, thus taking a more dialogic perspective.

In asymmetrical relations the dominating party tends to use more indirect, negative politeness, because of the greater face threat and social distance (Brown & Levinson, 1987). Indirectness is when the speaker means something else than is literally expressed. However, in a study of interactions between doctors and children Aronsson and Rundström (1988) found that the doctors tended to be more direct when talking to the child than when talking to the parent. They also found frequent use of positive politeness (familiar and attentive behaviour) when the doctors communicated with the children. This could be manifested in using the inclusive pronoun "we" instead of "I" and "you", thus indicating a mutual understanding. Jokes and compliments were other manifestations of positive politeness. Presumably an interventional situation could be what Brown and Levinson (1987) relate to as activities that can be seen as face threatening, namely those acts that by their nature run contrary to somebody's face wants, as shown in studies of speech and language intervention (Hulterstam & Nettelbladt, 2002).

Discourse analysis, text linguistics and narrative ability

During the 1970s and the 1980s discourse analysis emanated as a reaction to the predominating linguistic analyses focusing phonemic and sentence level, taking a monological and decontextualized position (Linell, 2005). In previous research phenomena such as linguistic variation, speech errors and hesitation phenomena were not accounted for (Coulthard, 1985). New types of analyses, encompassing the entire textual level, were needed. In discourse analysis and text linguistics entities above sentence level are studied, and perhaps most importantly language use and language variation (Brown & Yule, 1983). According to Halliday and Hasan (1976) it is of importance to examine utterances in discourse within a contextual frame both when it comes to the

structure and the content. Cohesion and coherence, two types of textual connectives, are central concepts in text linguistics (Brown & Yule, 1983; Halliday & Hasan, 1976). Cohesion describes the ways in which words structurally link together in sentences. Coherence captures the context-based connections between words that make them produce sense. In other words, cohesion establishes local relations between syntactic constituents (e.g. reference), whereas coherence has to do with the global meaning regarding what is expressed (Mey, 2001). However, coherence in itself may operate on a global or a local level. Local coherence is connected to the immediately preceding conversational turn, whereas global coherence is connected to the overriding topic. Most often cohesion and coherence co-exist and cooperate.

Halliday and Hasan (1976) take the view that the primary determinant of whether a set of sentences does or does not constitute a text depends on cohesive relationships within and between the sentences. One type of cohesive relationship are syntactic markers like and, but, so and then, which relate what is about to be said to what has been said before. In fact, Halliday and Hasan (1976) point out that it is the underlying semantic relation rather than the syntactic marker that has the cohesive power. Yet another type of cohesion brought up by Halliday and Hasan (1976) is reference. Reference directs the listeners to look elsewhere for their interpretation. Anaphoric relations and cataphoric relations are two examples of reference. Anaphoric relations require the listener to go back in the text for interpretation, and cataphoric relations require the listeners to look forward in the text for interpretation.

We expect the ideas expressed in a text to relate to a topic and to be developed towards a goal specified by the topic. Some key skills in discourse production and comprehension is the ability to work out what the topic is and how the topic sets up expectations about the narrative (Leinonen et al., 2000). A topic is a semantic structure bridging discourse and contexts, and emerges with the unfolding verbal interaction. Topics are notoriously difficult to define, since different topics seldom can be adequately separated from each other. In order to capture topical structures, it is advisable to focus on boundaries as topic shifts, as contrasted to more coherent or seamless stretches (Linell, 1998). Just like in the case of coherence, a topic can be referred to as either local or global. When the speaker contributes a topic for the immediately following turn, and the subsequent speaker takes up this topic in his/her turn, the topic is local. A global topic is when several turns can be related to the topic of the whole conversation. However, a given utterance may be on a local or global topic or both at the same time, or on neither (Bublitz, 1988). According to Bublitz (1988), a number of topical actions are used to initiate, maintain and complete a topic. As a rule, the interlocutors acknowledge the ongoing topic and do not change it without good reason, but when the interlocutors' interests are focused on different topics a topic shift or a digression may take place. A

digression can be defined as a shorter, temporary 'outing' from the ongoing topic (Bublitz, 1988). In the case of a digression, the speaker does not close the previous topic before s/he digresses from it, but rather suspends it. In this way a breaching of the rules of conversation is avoided. After closure of the digression the speaker returns to the suspended topic. A digression can be classified as either local or non-local (Bergmann, 1990). By a local digression is meant the tendency of the interlocutors to turn to local matters, e.g. in the immediate surroundings, in their conversations, whereas a non-local digression is more abstract and not related to the concrete situation (Bergmann, 1990).

Topicality and coherence are closely connected concepts, since they partly constitute each other (Brown & Yule, 1983). Topics are a vital resource speakers use to create coherence in discourse, and some topics are poly- rather than monotopical (Linell, 1998). There are cases of topic change, e.g. digressions, where the respective utterances may be judged as being coherent but not topically coherent. Thus, two consecutive contributions may be about two totally different discourse topics but nevertheless regarded as an acceptable and coherent sequence by the interlocutors because of some kind of situationally given connection (Bublitz, 1988).

It is commonly held that inference generation is a prerequisite for understanding and producing narratives, given that inference generation facilitates coherence (Perkins, 2007) and thus supports comprehension (Norbury & Bishop, 2003). In addition to inferential ability, the ability to understand and produce narratives is another example of higher-level language and cognitive skills, such as understanding cause-effect relationships and being able to sequence and structure events in a way that satisfies the listener's needs (Paul, Hernandez, Taylor & Johnson, 1996). Narration is also considered to be a crucial ability for carrying out everyday activities such as relating one's own personal experiences (Humphries, Oram Cardy, Worling & Peets, 2004), and is a part of a child's daily life at home and in school. Narrative ability is a vital skill, since it has been shown to play an important role in academic achievement and social success (Boudreau, 2008; Paris & Paris, 2003; Bishop & Edmundson 1987), to be a valid predictor of longer-term language skill, and finally to be associated with literacy ability in children with language impairment (Paris & Paris, 2003; Botting, 2002). Furthermore, Adams (2002) recommends that an exhaustive assessment should include a comprehensive investigation of narrative ability.

To understand and be able to retell a story a child needs a number of skills including world knowledge, theory of mind and inferencing, as well as sufficient vocabulary and grammatical competence. Intertwined, these abilities allow the child to create a mental representation of a story (Paul, 2000). As a consequence, a narration task puts considerable demands on memory,

requiring the child to retain information over time (Feagans & Farran, 1981). The child has to simultaneously achieve adequate content, structure, and cohesion as well as the listener's needs in order to succeed in a narrative task (Johnston, 2008).

Conversational context and interaction

One of the starting points for this thesis was the significance of conversational contexts and conversational partners in talk-in-interaction. In discourse analysis, a dialogic perspective is a given prerequisite. The dominating paradigm in language sciences, however, is monologism. Monologism regards communication as actions exchanged between individuals, and portrays individuals as thinking and acting in ways which are primarily subject to individual intentions and secondarily to behaviour defined by social factors. Dialogism, on the other hand, takes actions and interactions in their contexts as basic units (Linell, 1998). Dialogism can be defined as any interaction through language (or other symbolic means) between two or several individuals who are mutually co-present (Luckmann, 1990). Fundamental principles for dialogism are sequential organization, joint construction and interdependence between acts and activities (Linell, 1998).

Notions of cooperation and mutual other-orientation are central to dialogue and communication. On the other hand, a dialogue may also involve strong interactional asymmetries and competitive positionings (Linell, 1998). According to Linell and Luckmann (1991) communication presupposes asymmetries of knowledge and participation of various kinds. Without these asymmetries, there would be less of a need to communicate at all. In addition, dialogue is often built upon complementary rather than symmetrical roles of participation (Linell, 1998).

According to Linell (1998), a theory of dialogism needs a theory of contexts, since what we say is not said only in words but largely between, behind and beyond words. Context sensitivity is a universal property of communicative and cognitive events (Linell, 2009). Linell (2009; 1998) discusses two major basic meaningful phenomena which are accessible and could potentially be made relevant, and defines them contextual resources. These are divided into immediate context resources and mediate (or abstract) context resources. Immediate context resources are made of prior discourse and its surrounding concrete situation, which includes physical spaces, persons and objects. The mediate context resources are more extensive and roughly include (a) what actors already assume, believe, know or understand about the things talked about, (b) the actors model of their current and upcoming communicative project, (c) specific knowledge or assumptions about the persons involved, (d) the activity type, (e) knowledge of language, communication routines and

action types, and (f) general background knowledge (including "common sense").

Two examples of analyses of interaction are Conversation Analysis (CA; Sacks, Schegloff & Jefferson, 1977) and Initiative-Response Analysis (IR-analysis; Linell, Gustavsson & Juvonen, 1988). CA was developed by a group of sociologists, often known as ethnomethodologists (Levinson, 1983). CA lies at the interface between sociology, linguistics and social psychology (Hutchby & Wooffitt, 1998), and can broadly be defined as the study of talk. To be more precise, CA is the systematic analysis of recorded, naturally occurring talk in everyday situations of human interaction, i.e. talk-in-interaction or conversation. Some of the basic assumptions of CA are that ordinary talk is a highly organized, ordered phenomenon, and that the issue is how the participants, not the analysist, make sense of any given utterance. In addition, the analysis should not be constrained by prior theoretical assumptions. The objective of CA is to uncover the tacit reasoning procedures and sociolinguistic competencies underlying the production and interpretation of talk (Hutchby & Wooffitt, 1998). Conversation is viewed as being co-constructed between participants, with an ongoing shaping and renewing of the context. Some of the basic concepts of CA are turntaking, adjacency pairs (paired utterances as e.g. question - answer), repairs (e.g. when the listener in the case of a communicative breakdown request the speaker to make a reformulation or repetition of an utterance) and pre-sequencing (e.g. initiating an utterance with the name of the addressee; Levinson, 1983). According to Perkins (2007), CA has had a powerful influence at the interpersonal level, highlighting the fact that a communication disorder is not only the problem of an individual but also one of several factors impacting on interpersonal communication.

IR-analysis is derived from CA, and the two analyses naturally share many traits. In the IR-analysis turns are coded with respect to their response (i.e., how they link backwards) and their initiation (i.e., how they carry the dialogue forward) properties. The response properties are categorized along the dimensions of scope (local vs. non local, i.e. linking up with the immediately preceding turn or not), focality (focal vs. non-focal, i.e., linking up with central or peripheral aspects of the present topic) adequacy (whether the partner treats them as adequate or inadequate) and whether they are alter- or self-linked (linking up with the partner's or with the speaker's own preceding turn). The initiation features are either soliciting (requesting a response, like in questions and directives) or non-soliciting (a response is possible, but not explicitly requested). Most turns have both response and initiation properties, but sometimes they have only response ("minimal response") or only initiation (change of topic) properties.

The emergentist model of pragmatic ability and disability

A recent theoretical approach to pragmatic ability and in particular in relation to pragmatic impairment has been put forward by Perkins (2007). Compared to many other theories Perkins' model has a more clinical approach, where the point of departure is taken from pragmatic impairment rather than pragmatic ability, suggesting that the study of pragmatic impairment is a useful approach to the understanding of pragmatics. Perkins (2007) proposes that pragmatic ability is not a distinct phenomenon in its own right but rather an emergent phenomenon, where an interaction of a range of cognitive, semiotic and sensorimotor abilities which underlie communicative behaviours takes place. To be more exact, pragmatics is defined as "…the emergent outcome of interactions between cognition, language and sensorimotor systems within and between individuals as motivated by the requirements of interpersonal communication" (Perkins, 2007:3). Examples of underlying abilities are linguistic abilities, and cognitive abilities like memory and theory of mind. Particularly interesting from a clinical point of view is Perkins' observation that although theories of pragmatic impairment originate in language, they habitually incorporate features such as gesture, posture and social rapport. On the other hand, speech language therapists (SLTs) have been found to adopt a more holistic approach closer to Morris' (1938) original semiotic definition of pragmatics as "the study of the relation of signs to interpreters" (cited in Perkins, 2007:9). In addition, Perkins suggests that SLTs, through their knowledge of different sorts of pragmatic impairment, are more aware of the cognitive and neurological origins of pragmatics than what is usually accounted for in different models. However, although clinicians often have an awareness of and a capacity to describe and diagnose various kinds of pragmatic impairment, an understanding of the underlying causes which could assist in the choice of an adequate intervention is often not at hand.

In the emergentist theory pragmatic impairment is defined as a state of disequilibrium within the interpersonal domain, caused by a dysfunction restricting the range of interactions within the domain as a whole. Thus, "All communication impairments have a pragmatic dimension in that they produce an interactional imbalance which results in a redistribution of resources and a concomitant reconfiguration of choices" (Perkins, 2007:61). By this declaration the scope of pragmatic impairment is enlarged, encompassing a much wider range of communication disorders possibly associated with pragmatic impairment such as SLI, autism spectrum disorders and SBH. Examples of choices are what, how, why, when, where something is said, to whom it is said and who says it. Impairment of an element in a domain can create a state of disequilibrium both within the domain itself and across domains. Some further important theoretical concepts put forward by Perkins

are compensatory adaptation, the intrapersonal versus interpersonal domain, and the reduction of choices. Compensatory adaptation occurs both within and between individuals, and is a means to achieve equilibrium, although this adaptation may result in further pragmatic impairments. Finally, a reduction of available choices at all levels of communication could be at hand in the presence of cognitive, sensorimotor or semiotic problems, thus causing a pragmatic impairment. Interestingly, Kirchner and Prutting (1989) expressed a similar view of pragmatic difficulties, stating that these can arise as a secondary feature of any developmental language impairment due to limited communication ability.

Assessment of pragmatic ability

Pragmatic ability is dependent on a number of capacities. In the following text the capacities of most relevance for this thesis are accounted for, beginning with linguistically related abilities followed by some cognitively related abilities.

Assessment of linguistically related abilities

The assessment of pragmatic ability is complicated because of its complex nature, dependence on contextual factors and the dearth of developmental norms. In a review article regarding assessment of pragmatic ability, Adams (2002) summarizes what should characterize an assessment: "A comprehensive assessment of language pragmatics should be able to identify the strengths and weaknesses of this child's pragmatic abilities. It might also be required to pinpoint the interlocutor behaviours that facilitate communication and should provide information about comprehension of pragmatic information" (p 973). In the article a valuable survey of approximate age of emergence of a number of pragmatic behaviours such as turn taking, topic maintenance, repairs, narratives and polite forms is presented. When assessing pragmatic ability it is not possible to rely on a single test which covers all the aspects, rather a range of separate assessments has to be made. Already in 1989 Bishop declared that there is a shortage of instruments suitable to assess pragmatic ability, and 13 years later Leinonen et al. (2000) stated that adequate psychometric measures for testing pragmatic functioning were still to be developed. Conti-Ramsden, Crutchley and Botting (1997) argued that a strong factor for deciding whether a child has a pragmatic impairment is clinical opinion. However, often there is a need for a less subjective measure. Three main methods of assessing pragmatic ability can be outlined; assessment of different pragmatic components, analyses of interaction, and finally checklists and interviews.

Two central pragmatic components often used in the assessment of pragmatic ability are inferential ability and narrative ability. This fact constitutes one of the reasons for choosing in depth analyses of these components in this thesis.

Further reasons are that clinical experience has shown the inferential ability and narrative ability are often problematic for children with early onset brain damage and children with PLI, and that these abilities are possible to assess due to the existence of clinically adaptable assessment material.

Inferential ability
Inference generation requires adaptation to the linguistic and physical context and to various other contextual demands, and thus provides a useful means to examine pragmatic ability. Inferential ability in children has been the subject of numerous studies, and breakdown in the ability to draw inferences has been shown to be evident in a range of communication impairments including hydrocephalus (Barnes & Dennis, 1998), SLI and PLI (Norbury & Bishop, 2002). Inferential ability can be assessed after reading a story to the child, by asking questions requiring an inference to be made on the contents of the story. A subsequent qualitative analysis of answers considered not to be adequate usually constitutes a rich source of data. In the literature several examples of different analytic methods of atypical answers are present. For example Loukusa, Leinonen, Jussila, Mattila, Ryder, Ebeling & Moilanen (2007) categorized atypical answers into incorrect focus, world knowledge, given information, don´t know, totally irrelevant, tautology, no reponse and other, and finally Norbury and Bishop (2002) made a division into wrong, odd and scope of the question misunderstood.

Narrative ability
According to Botting (2002), narrative ability is one of the most interesting and contextually valid ways in which to measure communicative competence, and provides an excellent quasi-naturalistic measure of children's spontaneous language. Two means to assess narrative ability are story generation and story retelling. Personal narratives are an example of story generation. This is the most common type of narrative but is rarely used for assessment purposes (Johnston, 2008). Story generation is considered to be more taxing than story retelling, since it emerges from the child itself without external input with an adult as model (Leinonen et al., 2000). Story generation also reflects a natural form of discourse and represents children's functional discourse abilities (Hudson & Shapiro, 1991). An obvious advantage with story generation is that it is more representative of spontaneous communication, and Johnston (2008) suggests that it perhaps would be better to focus on personal narratives for clinical purposes, especially as they are vital for facilitating peer interaction. However, it could be argued that story retelling is less demanding and thus particularly appropriate for preschool-aged children (Boudreau, 2008). An advantage with retold stories is that the evaluator is familiar with the content of the story, thus making the scoring easier and more reliable. However, in an

experimental elicitation context there is no intrinsic motivation to produce a complete story with a wide range of story elements, since the child only has to relate what happened (Hudson & Shapiro, 1991).

In a clinical setting, story retelling would probably be the preferred assessment instrument since analysis is less time consuming. Two examples of tests assessing narrative ability as retelling of a story are the Bus Story Test (Renfrew, 1997) and the Expression, Reception and Recall of Narrative Instrument (ERRNI; Bishop, 2004). The Bus Story Test is standardized for three to eight-year-old Swedish children (Svensson & Tuominen-Eriksson, 2002), and consists of a storybook with pictures and no written words. The narrative is recorded and transcribed orthographically. The age level of consecutive speech used in retelling a story can be assessed from the information content, sentence length and number of subordinate clauses in this test, according to the manual guidelines. The ERRNI test a person's ability to relate a story, comprehend it, and remember it after a delay. A standard pictorial context is used to elicit the narrative, which is recorded and transcribed. After 10-30 minutes the child is asked, without warning, to recall the story, and the narration is again recorded. Subsequently a series of comprehension questions, literal as well as inferential, are completed. In the English version norms are provided for an information index, a measure of comprehension, mean length of utterance in words, and a forgetting index.

Further, narrative ability can be assessed with an analytic assessment procedure such as the Narrative Ability Profile (Bliss, McCabe & Miranda, 1998). The NAP was developed to evaluate the multidimensional nature of discourse with people with communicative impairments on a macrolevel, and enables clinicians to assess diverse patterns of discourse with the same procedure. The result is a profile of the strengths and weaknesses that the child exhibits regarding a range of dimensions considered to be fundamental to the production of structurally appropriate narrative discourse, such as topic maintenance, event sequencing, explicitness, referencing, conjunctive cohesion, and fluency. The NAP can be used in connection to varying materials and narrative genres. A disadvantage is that norms are not applicable with the use of the NAP.

As is the case with atypical answers to inferential questions, problems manifested in connection to narratives potentially constitute a rich source of information. For example analyses could yield further information concerning the occurrence of different conjunction types, quantitative measures such as total amount of words and amount of different words, mazes (i.e. hesitation phenomena such as pauses, repetitions and revisions; Nettelbladt & Hansson, 1999) and story elements (i.e. minimally acceptable story characteristics such as

formal beginning and orientation, initiating event, problem, resolution, and formal ending device; Hudson & Shapiro 1991; Stein & Glenn, 1979).

Analyses of interaction

For the purposes of diagnosis and intervention, a detailed analysis applied at the level of conversation is necessary (Adams, 2002). As previously presented, two examples of analyses of interaction are Conversation Analysis (CA; Sacks, Schegloff & Jefferson, 1977) and Initiative-Response Analysis (IR-analysis; Linell et al., 1988). The CA analysis view communication impairments as manifestations of interactive solutions to underlying problems, rather than as primary deficits per se (Perkins, 2007).

CA has evoked a lot of interest in recent years in its application to communication disorders (Perkins, 2007). However, this analysis is extremely time consuming and detailed and requires long training, and it could be criticized as being dependent on the inductive analysis of naturally occurring conversation (Perkins, 2007). On the other hand, its strength would be its ability to reveal interesting results at a micro level.

Compared to CA, IR-analysis is quantifiable and somewhat more easily adaptable to clinical use, due to a less detailed transcription and a predetermined number of analytic categories. Thus, IR-analysis allows larger chunks of interaction to be analysed. The different combinations of initiative- and response-properties yield a system of 18 different turn categories. The turn categories are scored so that the strongest category (a soliciting initiation with no response property) is given six points and the weakest category (a minimal response not accepted by the partner) is given one point. The other categories are placed in between, according to their interactive strength. From these measures degree of asymmetry, dominance and balance can be computed, either for the dialogue as a whole or for each participant. In Sweden, the IR-analysis has frequently been used in research related to adult-child interaction (e.g. Hulterstam & Nettelbladt, 2002; Hansson, Nettelbladt & Nilholm, 2000) and child-child interaction (e.g. Bruce, Hansson & Nettelbladt, in press; Hansson, Nettelbladt & Nilholm, 2000) in clinical contexts. The IR-analysis enables comparisons across groups and individuals, and also allows a developmental perspective to be taken into consideration.

Other pragmatically related linguistic abilities

Other pragmatically related linguistic abilities such as reference, cohesion and coherence should briefly be mentioned. Referring expressions are interesting in the context of pragmatic impairment, since the ability to produce and

comprehend such contextually determined meanings requires complex cognitive, social and linguistic skills (Leinonen et al., 2000). Problems with referring expressions have been suggested to be caused by difficulties in integrating linguistic and contextual information (McTear, 1985). Cohesion refers to a number of linguistic devices such as pronouns which set up links between different utterances in an interchange (Halliday & Hasan, 1976). Finally, coherence is the interrelatedness of ideas or propositions so that a listener can make sense of them (Leinonen et al., 2000). These abilities are assessed in the Narrative Analysis Profile (Bliss et al., 1998) in connection to the Bus Story Test (Renfrew, 1997). Yet another ability is the ability to use and understand figurative language (Sahlén & Reuterskiöld Wagner, 1999; Kerbel & Grunwell, 1998). However, figurative language is not dealt with in the current thesis.

Checklists and interviews

Checklists and interviews, finally, have the advantage of avoiding the problem of lack of normative data. The most recent and a widely used checklist is the Children's Communication Checklist (CCC; Bishop, 1998). The Swedish version of CCC (Nettelbladt, Radeborg & Sahlén, 2003) is a 79-item checklist assessing children's communication behaviours across eleven subscales, five of them constituting the pragmatic composite, i.e. the part of the CCC where pragmatic ability is estimated. The completion of the checklist results in a score that is weighed against a cut-off score, thus evaluating whether the child can be considered to have a pragmatic impairment or not. The CCC aims to differentiate children with PLI from other types of language impairment. It is not intended to be used as a diagnostic instrument, but to generate hypotheses for diagnosis and provide aspects for further assessment (Adams, 2002). The checklist can be completed by both parents and professionals, and possibly the major advantage with the CCC is that it can be used as a basis for a discussion between parents and professionals regarding the child's pragmatic ability (Bishop, 1998).

The Pragmatics Profile of Communication Skills in Children (Dewart & Summers, 1997) is in the format of an interview. The aim of the Pragmatics Profile is similar to one of the aims of the CCC, namely to help practitioners gain an insight into how an individual typically communicates in day to day interaction in familiar settings with people he or she knows well. It consists of a structured interview procedure, to be used with parents, teachers or other carers. The Pragmatics Profile contains two separate interview forms, the pre-school profile (from the age of nine months to five years of age) and the school version (from the age of six years up to the age of ten years), taking in account the increasing variety and complexity of the different communicative and social settings that children encounter as they grow older. The Pragmatics Profile for

each of the two age ranges falls into four sections, covering communicative functions, responses to communication, contextual variation, and, finally, interaction and conversation. The result of the Pragmatics Profile is descriptive, and thus the answers require interpretation. The Pragmatics Profile has yet to be officially translated and tested in Sweden.

Definition and assessment of cognitively related abilities

Memory
Poor working memory has been found to contribute to pragmatically related problems such as poor narrative ability (Dodwell & Bavin, 2008) and problems with inference making (Leinonen, Ryder, Ellis & Hammond, 2003), and is one of the cognitive disabilities often mentioned in connection with pragmatic ability (Perkins, 2007). Memory is a complex area, and can broadly be defined as the capacity to retain information about oneself and one's environment. In an everyday setting memory is understood to be the ability to remember the mental traces of experience, of past events and learned facts (Fuster, 2003). In this thesis memory was employed as one of several measures of linguistic and cognitive abilities. Memory was assessed by using the Digit Span subtest of a test frequently used in the cognitive assessment of children, the Wechsler Intelligence Scale for Children (Wechsler, 1999). In this test verbal short-term memory (STM) and working memory (WM) are measured by repeating digits forwards and backwards, respectively. The background to this test is the "magical number seven plus or minus two" introduced by Miller (1956). Miller noticed that the memory span for persons with typical development was around seven elements, called chunks, regardless whether the elements were digits, words or other categories. Repeating digits forwards is a measure of the ability to remember information over a brief period of time, i.e. STM, whereas repeating digits backwards requires manipulation of the information. Thus, STM as measured in the present work primarily deals with attention, whereas WM is a measure of the capacity to maintain and manipulate information for a few seconds. However, this method of measuring memory and dividing memory into STM and WM is not uncontroversial, and it can of note are that the concepts STM and WM often are used synonymously (e.g. Gathercole, 1999).

The term WM was introduced by Baddeley and Hitch (1974), who argued that WM so far had been described as a too passive process. According to Baddeley and Hitch, WM is a far more active process, including a deliberate and active attitude towards the information as well as the initiating and completion of a series of actions. In this original work Baddeley and Hitch developed a model consisting of a central executive, aided by two short-term storage mechanisms: the phonological loop and the visuo-spatial sketchpad. The central executive encompasses the ability to focus on the central

information, to plan, initiate and complete an activity. The phonological loop deals with verbal information, and the visuo-spatial sketchpad deals with nonverbal material in visual or spatial form. Later Baddeley (2000) added a third subcomponent, the episodic buffer, where visual, spatial, and verbal information is integrated. Baddeley's phonological loop model has dominated much of the research with children, including children with SLI (Montgomery, 2003). Gathercole and Baddeley (1990) were the first to study the phonological WM abilities of children with SLI and to propose the notion of a causal link between phonological WM and language impairment. Using a non-word repetition task, they showed that children with SLI had significantly greater difficulty repeating three and four syllable non-words than two groups of typically developing children, suggesting that the children with SLI had reduced phonological WM capacity. In a Swedish study it was also shown that non-word repetition skills were significantly correlated to phonological and grammatical development (Sahlén, Reuterskiöld Wagner, Nettelbladt & Radeborg, 1999).

Theory of mind

In Theory of Mind (ToM) ability language and cognition are considered to interact with each other (Miller, 2004), thus being a potentially important ability of relevance for pragmatic ability. ToM is a complex ability and goes under different labels such as mentalizing, social cognition and mind reading (Falkman, 2005). Theory of mind can be defined as "the ability to predict and explain people's behaviour with reference to mental states" (Slaughter & Repacholi, 2003:1) and implies that the child can perceive other persons' thoughts, feelings and intentions even if they are not easily discerned. Several theories have been put forward in an attempt to explain the development of children's understanding of the mind. The three most dominant theories are the theory theory, the modularity theory and the theory of mental simulation (Lewis & Carpendale, 2002). Theory theorists (e.g. Wellman, 1990) argue that the development in ToM is essentially one of hypothesis testing, and that older children's knowledge of the mind consists of a theory about other's mind. In the modularity theory (e.g. Leslie, 1987), the understanding of mind is regarded to be innately specified in a discrete mental module. According to the third theory, the theory of mental simulation, children are introspectively aware of their own mental states and can use this awareness to infer the mental states of other people through a kind of role-taking or simulation process (Hala & Carpendale, 1997). Of these theories, the theory theory is regarded as the most dominant.

ToM is commonly seen as a critical cognitive capacity involved in pragmatic understanding (Perkins, 2007). Difficulties with ToM ability have been reported for children with various impairments like autism (e.g. Baron-Cohen,

Leslie & Frith, 1985), deafness (Woolfe, Want & Siegal, 2002), severe speech and physical impairment (Falkman, Dahlgren Sandberg & Hjelmquist, 2005), specific language impairment (SLI; Gillott, Furniss & Walter, 2004) and pragmatic language impairment (PLI; Botting & Conti-Ramsden, 1999). The relationship between pragmatic ability and ToM seems to be complex. It has been suggested that an understanding of people's mental states is a prerequisite for pragmatic ability in conversation, and, simultaneously, that ToM emerges from pragmatic ability (Peterson & Siegal, 1999). According to Lewis and Carpendale (2002) ToM develops within a relationship between the child and others.

In the extensive research concerning ToM during the past decades, underlying factors such as problems with executive functioning (Hughes, 1998), linguistic ability (Miller, 2004), weak central coherence and lack of conversational experience (Woolfe et al., 2002; Frith, 2003; Falkman et al., 2005) have all been proposed as contributing factors for an insufficient ToM ability. The possible implication of language impairment in the development of ToM deficits has been discussed by e.g. Miller (2004). Miller found evidence that children with SLI, performed at an age appropriate level when the task was less linguistically demanding. Although there has been a tendency to attribute difficulties with ToM to the intrapersonal domain, it has been suggested that children's understanding of their partners' inner states is crucially related to contextual factors such as the emotional context of the interaction. ToM may be important for the ability to draw inferences regarding social situations and the pragmatics of interaction (Lewis & Carpendale, 2002).

For the assessment of ToM a range of materials exists. In order to demonstrate that someone can ascribe mental states like thoughts and beliefs to oneself and others it is useful to construct a situation where a belief is incorrect, i.e. a "false belief". This was originally developed by Wimmer and Perner (1983). False belief, i.e. the ability to understand that people will act according to their own beliefs even when those beliefs are false, is a commonly used measure to assess ToM ability. A classic example of a false belief task is the "Sally and Ann" task, where a marble is dislocated from its original position in a basket and instead put into a box when one of the persons depicted (Sally) has left the room. The child is asked where Sally will look for the marble when she returns. Wimmer and Perner (1983) found that children below the age of about three and a half years failed the task. A similar test used to assess false belief is the "Smarties" test, following the procedure of Perner, Leekam and Wimmer (1987), where a tube contains buttons instead of Smarties. A third example, used in the present thesis, is the "Thought picture" test (Woolfe et al., 2002). This test is constituted of pictures with flaps covering vital details, and the child is asked to point at the correct picture showing what the person involved will think is under the flap (the test is described more in detail under "Method"). The

"Thought picture" test is considered to minimize verbal task-performance requirements, which is an advantage since there is evidence for an association between language impairment and ToM (Gillott et al., 2004).

Children with early onset brain damage

Two of the most common early-onset physical impairments in children are CP and SBH. A significant proportion of children with CP or SB have complex profiles that may include relative strengths in some aspects of verbal functioning and impairments in others, such as nonverbal functions, attentional deficits, and executive dysfunction. For both groups it has been found that verbal abilities tend to be more developed compared with nonverbal abilities as measured by intelligence tests (Fletcher et al., 2002; Sabbadini, Bonanni, Carlesimo & Caltagirone, 2001; Brookshire, Fletcher, Bohan & Landry, 1995; Carlsson, Uvebrant, Hugdahl, Arvidson, Wiklund & von Wendt, 1994).

Cerebral palsy

Cerebral palsy (CP), a non-progressive impairment that is one of the most common motor impairments in childhood, is the result of an insult to the developing brain. The diagnosis encompasses a group of disorders of the development of movement and posture, and is based on a description of functional disabilities of the motor system (Bax, 1964). The classification of CP is based on clinical signs clustered into three syndromes; (1) Spastic syndromes including hemiplegia (a paresis on the left or right side of the body), diplegia (a paresis where the lower limbs are more affected that the upper) and tetraplegia (a paresis where all four limbs are severely involved, the upper limbs at least as much as the lower), (2) Atactic syndromes including atactic diplegia and simple ataxia and (3) Dyskinetic syndromes including dystonia and choreathetosis (Hagberg, 1989). However, the definition of CP as a pure motor impairment is under debate. Shapiro (2004) argues that cerebral palsy as a syndrome does not address the broader issues of neurodevelopmental dysfunction, since it ignores the interaction of cognitive, communicative, executive, behavioural and motor dimensions. Moreover it is interesting to note that Shapiro (2004) suggests that the motor deficit may not be the most functionally hampering aspect. There are three major causes of CP; prenatally acquired brain damage in 14%, perinatal brain damage in 34% and unknown origin in 52% of the cases. Regarding the prevalence of CP, most studies in western countries show figures of around 2-2.5 per 1000 live births (Nordmark, Hägglund & Lagergren, 2001). Children with CP are considered to be a heterogeneous group, since the causes and nature of the brain damage may vary considerably, differing in severity as well as in manifestation of symptoms (Straub & Obrzut, 2009).

CP is characterized by accompanying symptoms such as problems with sensation, vision, cognition, communication, perception, behaviour and seizures (Bax et al., 2005). Feeding problems, gastroenterological problems and incontinence are also associated symptoms in some children with CP (Straub & Obrzut, 2009). Gross motor impairments have been found to correlate strongly with associated impairments such as visual impairments, learning disabilities and epilepsy, suggesting that gross motor impairments provide an indication of the child's overall disabling condition (Himmelmann, Beckung, Hagberg & Uvebrant, 2006).

CP is associated with a high risk for cognitive impairment, in the range of 30-70%, where children with hemiplegic or diplegic CP tend to have better cognitive outcomes (Warschausky, 2006). In a review article Straub and Obrzut (2009) claim that learning problems occur in about 50% of the children with CP, and in a Swedish population-based study it was found that 40% of the children had learning disabilities (Himmelmann et al., 2006). However, there is a general lack of empirical research addressing cognitive ability (Fennell & Dikel, 2001), although it is apparent that there are numerous neuropsychological manifestations associated with CP, the children experiencing functional difficulties in several domains (Straub & Obrzut, 2009). For example it has been shown that children with CP experience problems with short-term memory, but that long-term memory is not as clearly affected (Straub & Obrzut, 2009). Children with bilateral spastic CP have been found to demonstrate deficits on prefrontally or frontally mediated measures of attention and inhibition (Straub & Obrzut, 2009; Christ, White, Brunstrom & Abrams, 2003). In addition, some children with CP have been found to experience problems with theory of mind (ToM). In a study by Falkman, Dahlgren Sandberg and Hjelmquist (2005), it was found that children with severe speech and physical impairment had delayed false belief skills.

Regarding linguistic ability, there is some confusion regarding the concepts "speech", i.e. articulation, versus "language", i.e. aspects of phonology, syntax and lexicon, thus making it difficult to distinguish which aspects of communication are being discussed and evaluated. According to the results of a study by Sabbadini et al. (2001), linguistic abilities among eight persons with CP and dysarthria or anarthria (age span nine to 30 years) were comparable to the abilities of the persons in the control group, although it was found that the persons with CP experienced problems with comprehending syntactically complex sentences. However, several studies have reported that children with CP often experience problems with phonology and grammar as well as with motor speech abilities (Pirila et al., 2007; Pennington, Goldbart & Marshall, 2005; Pennington, Goldbart & Marshall, 2004). In the study by Pirila et al.

(2007) the CP group consisted of 36 premature children with white matter damage, age range 1;10 – 9;0 years. 22 of the children were diagnosed with diplegia, five children with hemiplegia and nine children with tetraplegia. The children with an IQ >70 primarily demonstrated problems with articulation, whereas children with an IQ <70 also had problems with comprehension and language production. None of the 22 children with an IQ >70 met the criteria for SLI. Furthermore, Pirila et al. (2007) found a relationship between the severity of the motor impairment and the incidence of speech and language impairments. Finally, in an investigation of 31 children with CP and hemiplegia ranging from nine to 16 years, Carlsson et al. (1994) found that children with right hemisphere lesions showed unaffected language abilities, in contrast to previous research where it has been found that early right-hemisphere lesions may also have negative effects on verbal function.

The literature is scarce concerning pragmatic ability in children with cerebral palsy, especially children without anarthria or severe dysarthria. However, Parkes et al. (2008) reported a significant prevalence of psychological symptoms or social impairments in 26% of the children with cerebral palsy, aged eight to twelve years old. The most occurring problem was in the domain "peer problems". Research has been carried out regarding conversation between children with CP and their mothers (Pennington & McConachie, 1999; 2001b) and between children with CP and their siblings (Dallas, Stevenson & McGurk, 1993a; 1993b), respectively. These studies show that children with CP rarely initiate conversations with familiar adults, take a passive and respondent role, produce many yes/no answers and rarely ask questions. The interlocutors, on the other hand, are more dominating; they start conversations, introduce topics and pose many questions. Interestingly, Pirila et al. (2007) suggested that cognitive abilities in the normal range may camouflage problems a child may have in the social functioning domain. In conclusion, capacity for language use typically depends on the level of motor, intellectual, and sensory impairments.

Spina bifida and hydrocephalus

Spina bifida is a disorder of the central nervous system that encompasses profound dysmorphologies of brain development, especially apparent in the cerebellum, midbrain, corpus callosum and posterior cortex. Spina bifida myelomeningocele (SBM) is the most common and severe type of spina bifida, where the neural tube fails to close completely in the very early development of the foetus. About 95% of the children with SBM have the Arnold-Chiari II brain malformation, which includes the brainstem and the cerebellum and introduces a barrier to cerebral spinal fluid outflow from the ventricular system to the subarachnoid space. Virtually all children with the Arnold-Chiari II malformation will develop hydrocephalus (Warschausky, 2006; Fletcher,

Barnes & Dennis, 2002). The intraventricular pressure produced by hydrocephalus causes the expansion of the ventricles and the displacement of adjacent brain structures. In about 80% the hydrocephalus will require placement of a diversionary shunt in order to relieve intracranial pressure. Hydrocephalus is a fairly common disorder of childhood, with a prevalence of 0.8 per 1000 live births in Sweden (Persson, Hagberg & Uvebrant, 2005). However, the number of children with hydrocephalus is increasing as a result of the survival of infants born at early gestational ages who have a higher risk of developing hydrocephalus, as well as due to improved treatment techniques for hydrocephalus (Fernell, Hagberg & Hagberg, 1990).

Children with SBH have a range of potential disabilities. Depending on location, the spinal cord lesion is associated with problems involving walking as well as difficulties with bladder and bowel control (Fletcher et al., 2002). Hydrocephalus is frequently associated with deficiencies in intellectual and/or behavioural development (Warschausky, 2006; Dennis et al., 1981). In a population-based study Persson, Hagberg and Uvebrant (2006) found that the majority of the children with SBH had some associated neuroimpairment such as learning disability, epilepsy or cerebral palsy. The multiple brain anomalies associated with SBH entail risks for cognitive impairments (Warschausky, 2006) and learning problems (Lindquist, Persson, Uvebrant & Carlsson, 2008; Fletcher et al., 2002). SBH is also associated with memory and language deficits (Warschausky, 2006; Fletcher et al., 2002) and an increased risk of developing behavioural problems (Brookshire et al., 1995). In a Swedish survey of 107 children Lindquist, Carlsson, Persson and Uvebrant (2006) found that the majority of the children with hydrocephalus had behavioural problems. The occurrence of behavioural problems was related to cognitive function; as many as 90% of the children with an IQ <70 had behavioural problems, compared to about 50% of the children with an IQ > 69 according to the parents' ratings (Conners' Rating Scales; Conners, 1989). In addition many of the children had autism. Both autism and behavioural problems were significantly more frequent in children with SBH with additional learning disabilities, and in children with CP and/or epilepsy. A large quantity of AD/HD in the SBH group has also been found. In a group of 164 children parent rating scales revealed that 31% of the children could be identified with AD/HD, predominantly the inattentive type (Burmeister, Hannay, Copeland, Fletcher, Boudousquie & Dennis, 2005). To summarize, similarly to children with CP children with SBH vary considerably in their individual neurobehavioural strengths and weaknesses concerning motor and language abilities, cognition and academic achievements (Fletcher et al., 2002). In the case of SBH, this variation can be explained by the development of cognitive and motor processes in a brain where components have been damaged and reorganized, which leads to different outcomes in different children (Fletcher et al., 2002).

In these children the intellectual performance is often affected, and the overall IQ is in the low-average range or below (Lindquist, Carlsson, Persson & Uvebrant, 2005). However, children with hydrocephalus generally have been shown to have a characteristic test profile in which language based measures exceed performance-based measures (Fletcher et al., 2002; Brookshire, Fletcher, Bohan & Landry, 1995; Dennis et al., 1981).The origin of the cognitive impairment is not the hydrocephalic condition in itself, but rather in the anomalies and related disabilities of the developmental brain (Dennis et al., 1981). Previous a larger proportion of children with SBH were at risk for severe cognitive impairments. With the medical treatment of today, mainly the use of shunts, these children suffer from less severe and more specific cognitive impairments. For example short term memory, long term memory and executive functions have been reported to be significantly affected compared to a control group, despite normal or near-normal IQ (Lindquist, Persson, Uvebrant & Carlsson, 2008). The executive functions found to be significantly affected were visual planning and strategic thinking. In a study of 26 children with SBH, aged 7-17 years, Vachha and Adams' (2005) results are in agreement, also reporting a poor memory span. More importantly, the children did not have an efficient strategy for remembering the most salient information, thus just tried to remember as much information as possible regardless of value. The implications of this finding according to the authors was that due to limited memory capacity, children with SBH are even more dependent than typically developing children on the ability to selectively learn and recall the important facts in comparison to less important information. Not being able to do this leads to less successful classroom learning.

In contrast to the case of CP, a large body of research regarding language and communication related to SBH is available. Speech and language abilities have been considered to be an area of strength in children with SBH, since these children often appear to have fluent speech with phonological, syntactic and lexical abilities on a par with their chronological age (Vachha & Adams, 2003; Fletcher et al., 2002; Barnes & Dennis, 1998; Dennis & Barnes, 1993). However, Vachha and Adams (2002) show that of 70 children with SBH, as many as 83% of the children had language impairments, as measured by a spoken language assessment. When interviewed, only 18% of the parents perceived their child to have language difficulties. Dennis, Jacennik and Barnes (1994) suggested that children with SBH are comparable to nonimpaired children at the microscopic level, i.e. factors like quantity, fluency and syntactic complexity, but are impaired on a macroscopic level, i.e. discourse production, especially in regard to a semantic-pragmatic level. These differences occurred even in the case of average to above average verbal cognitive ability.

Possibly seemingly unaffected verbal output sometimes misleads the conversational partners, masking problems related to cognition and language (Schwartz, 1974). However, language content has often been found to be impoverished. As early as 1962 Hadenius, Hagberg, Hyttnes-Bensch and Sjögren called content-poor language in children with hydrocephalus the "cocktail party syndrome". Tew (1979) found that the "cocktail party syndrome" seemed to be associated with cognitive impairment, and later on it has been found that the occurrence of the "cocktail party syndrome" has decreased, possibly as a consequence of enhanced medical treatment. Interestingly, in 1983 Rapin and Allen compared descriptions of spina bifida with hydrocephalus to the descriptions of a so far not noticed group, which they described as children with "semantic pragmatic syndrome". Today, the problem with content impoverished language use better fits the description of pragmatic language impairment (PLI), and in fact difficulties in using context to understand meaning is suggested to be a cause of many of the discourse deficits associated with SBH (Barnes & Dennis, 1998). Further communication problems in children with SBH are difficulties in the comprehension of ongoing discourse and problems with reading comprehension (Fletcher et al., 2002; Dennis & Barnes, 1993), problems with narrative ability and difficulties in making inferences as well as retrieving literal information from a text (Fletcher et al., 2002; Barnes & Dennis, 1998; Dennis & Barnes, 1993). Fletcher et al. (2002) stated that children with impairments primarily at the semantic-pragmatic domains often are not identified, and Vachha and Adams (2003; 2002) suggest that the fluent language production frequently showed may mask subtle language deficits central to social acceptance. In addition, discourse comprehension, especially inferential ability, has been found to be impaired (Barnes & Dennis, 1998). Fletcher et al. (2002) conclude that speech and language development in children with SBH shows strengths in syntax and lexicon, and weaknesses in speech production, meaning construction and pragmatic ability. Finally Vachha and Adams (2002) found that a majority of the children have poor inferential and pragmatic abilities despite adequate lexical and syntactic skills. In conclusion, traditionally structural language related abilities such as phonology, syntax and lexicon have been considered to be a strength in children with SBH. On the other hand, there is overwhelming evidence for pragmatically related problems in the children.

Children with pragmatic language impairment

Before an account of pragmatic language impairment (PLI) is presented, specific language impairment (SLI) must briefly be dwelt upon. SLI is commonly described as a condition where a child with otherwise typical development, without accompanying hearing impairment, low non-verbal intelligence or neurological damage, does not learn language as expected (Leonard, 1998; Bishop, 1997). According to Leonard (1998) the only thing clearly abnormal about these children is that they do not learn language rapidly and effortlessly as compared to typically developing children. As a consequence, SLI is a diagnosis based both on exclusion and inclusion criteria. Identification of language problems in children can usually be made quite straightforwardly, whereas it is more challenging to distinguish SLI from other conditions of which language problems are a part of (Leonard, 1998). To label a condition as a specific language impairment a discrepancy criterion is often used, i.e. the existence of an obvious gap between the expected age level of the child's language ability and the child's actual language ability (Leonard, 1998). Why some children experience problems in learning language can be answered at several different levels; in terms of neurobiology, etiology, and limitations in underlying cognitive processes. At the neurobiological level, evidence suggests some abnormality in early neurological development (Ors, Ryding, Lindgren, Gustafsson, Blennow & Rosén, 2005; Bishop, 1997). Genetic factors have also been strongly implicated in the etiology (Bishop 2001; 1997). A factor often mentioned in relation to limitations in underlying cognitive factors is working memory (e.g. Gathercole & Baddeley, 1990). Finally, the SLI group is considered to be rather heterogeneous, with PLI as a subgroup (Leonard, 1998; Bishop, 1997).

Pragmatic language impairment is not possible to define as clearly as CP and SBH. No clear criteria exist, and PLI consists of a wide range of symptoms rather than constituting a diagnosis. However, in 1983, Rapin and Allen drew attention to pragmatic impairment for the first time when they presented a clinically based classification system of developmental language disorders. The "semantic pragmatic syndrome" constituted a subgroup of a category labelled "higher order processing disorders", also containing the subgroup "lexical deficit disorder" (Rapin, 1996). In the original article the semantic pragmatic syndrome was characterized as fluent expressive language with syntactically well-formed and phonologically intact utterances, but often not really communicative language. This syndrome also showed impaired comprehension of connected discourse, although short phrases and individual words are comprehended. Moreover, questions are frequently answered with seemingly irrelevant responses, and often young children echo what is said to them. In

this paper Rapin and Allen (1983) stated that the communicative problems of the children in question were more apparent in conversation than in understanding or producing language on a sentence level, and that not only the language produced by the child needed to be considered, but rather the entire communicative interaction. In addition, Rapin and Allen (1983) argued that the semantic pragmatic syndrome is not static and definitive but often changes over time (see also Sahlén & Nettelbladt, 1993). Rapin and Allen (1983) suggest that although the semantic pragmatic syndrome could be seen in a number of children who did not show evidence of brain dysfunction, the semantic pragmatic syndrome was most frequently observed in children with hydrocephalus. These children have a tendency towards using sentences without real semantic content in interpersonal interaction. As earlier mentioned, this phenomenon was labelled the "cocktail party syndrome" by Hadenius et al. and children who show these symptoms have also been called "chatter-box" children (Rapin, 1996). In a later study, Rapin (1996) declared that symptoms occurring in association with the semantic pragmatic syndrome, in this later study called the semantic pragmatic deficit disorder, was most prevalent in verbal children with autism and less frequent in children with language impairment.

Another descriptive classification of pragmatic problems appeared in 1987, when Bishop and Rosenbloom (1987) established the concept "semantic-pragmatic disorder". Here they followed the terminology of Rapin and Allen (1983), but avoided the use of the word "syndrome" with its suggestion of a diagnostic entity with clear-cut boundaries. In an article written 1989, Bishop suggested using the term "specific semantic-pragmatic disorder" for children who are not autistic but who initially present with a picture of language delay and problems with language comprehension. Later on these children learn to speak with an adequate syntax, although the pragmatic problems become increasingly obvious as they develop their verbal proficiency. Bishop (1989) argued that children with this language profile tended to have mild autistic features, although not pronounced enough to result in a diagnosis of autism. In contrast to the standpoint taken by Rapin and Allen (1983), where the term "semantic-pragmatic syndrome" may be applied to children with known etiologies such as hydrocephalus or autism spectrum disorders, Bishop notes that in the UK "semantic-pragmatic disorder" has been regarded as a subtype to SLI. This typically incorporates the implicit notion that nonverbal IQ is age appropriate, that there is no known organic etiology, and that the child does not meet the criteria for autism. Other researchers though, as Leinonen et al. (2000) argue that it is more probable that SLI and pragmatic impairment coexist as a "multiple language handicap". Furthermore Leinonen et al. (2000) argue that pragmatic impairment could not possibly be a subgroup of SLI since pragmatic impairment is intrinsically linked to cognitive functioning, thus excluding age appropriate IQ. Subsequently Bishop (1997; 2000) and Botting

and Conti-Ramsden (1999) coined the term pragmatic language impairment (PLI). It was argued that pragmatic problems do not necessarily co-occur with semantic difficulties, and as a consequence the "semantic" part of the term was omitted. In fact, Bishop (1989) noted relatively high scores on a test of word naming in children with pragmatic impairment. It was also suggested that pragmatic difficulties could be found both in children who use fluent and complex language and in children who have problems with phonology and grammar. Contrary to the opinion of Leinonen et al. (2000), Bishop (1997) also suggested that PLI implies a pragmatic impairment without an additional learning disability.

In 1997 Bishop suggested that although the categories suggested by Rapin and Allen (1983) had been useful for focusing attention on pragmatic problems in children with SLI, there was a need to take another approach focusing on social functions and language impairment as two independent problems, albeit sometimes co-occurring. Bishop (2000) argued that in some children pragmatic impairment was not just secondary to structural language problems, even though the children did not meet the criteria for autism either. Thus, in a central overview regarding PLI and its relationship to SLI and autism spectrum disorders, Bishop (2000) hypothesized whether PLI could be considered to be secondary to structural language difficulties or if it could be regarded as an autistic spectrum disorder. The overview led Bishop to conclude that pragmatic difficulties may be found in children who lacked additional autistic symptoms, but that there were no sharp dividing lines between PLI and SLI or between PLI and autistic spectrum disorder, respectively. Bishop (2000) concluded that many of the children could not be attributed to have either of the two conditions, thus opening up for a third condition, namely PLI. Bishop suggested that PLI is an intermediate condition between autistic disorder and SLI, rather than being attached to one or the other. Partly investigating the same topic, Botting and Conti-Ramsden (1999) reported that a thorough examination of ten children with pragmatic impairment showed that one child met the criteria for Asperger syndrome and three children could be described as having high-functioning autism. In addition it was found that half of the children in the sample showed some extent of structural language impairments.

As suggested already by Rapin and Allen (1983), pragmatic problems are not static and definitive but often change over time, as is the case with autism (Bishop, 1989). For example, Reuterskiöld Wagner and Nettelbladt (2005) reported that a child with an initial diagnosis of SLI later received a diagnosis of autism. This illustrates that sometimes the underlying problems can manifest themselves in different ways, thus further emphasizing the significance of PLI as a separate condition (Bishop, 2000). However, it is important to note that although PLI and autism tend to co-occur, problems with social relationships and limited interests (characteristic traits of autism spectrum

disorders) is not applicable for most children who meet the criteria for PLI (Conti-Ramsden et al., 1997).

Numerous attempts to classify pragmatic impairment in children have been made. Often the classifications contain both neutral descriptions as well as descriptions of difficulties, making it hard to obtain a homogenous picture. Within the same classification system categories can stem from different theoretical frameworks such as Grice´s maxims, relevance theory, discourse analysis, conversation analysis and the theory of mind paradigm. The confusion is further aggravated by the fact that categories are often not mutually exclusive (McTear, 1985). Thus we are left lacking a uniform and global theory for the description of pragmatic impairment (Perkins, 2007).

The original classification by Rapin and Allen (1983) was designed to encompass different clinical populations as for instance children with hydrocephalus and children with autism. The classifications outlined by Bishop and Rosenbloom (1987) and Bishop (1997), however, concentrated solely on children with pragmatic impairment in combination with language impairment. The earlier classifications by Rapin and Allen (1983) and Bishop and Rosenbloom (1987) were more at a macro level, with common traits stating that the children had fluent language with age appropriate syntax and phonology, difficulties in understanding language in general, especially in less structured situations, and reduced language comprehension. In the classification by Bishop (1997), however, the descriptions were more focused on different subskills, with a tendency towards more interactional descriptions such as topic shifts and topic drifts, not noticing and/or not being able to solve misunderstandings and being too explicit or presupposing too much in relation to the conversational partner. Yet another classification, taking a somewhat different stance than the classifications previously mentioned, is the classification by McTear (1985). This classification is based on interactional analysis, that is the ability to identify and make repairs, the ability to give expanded responses and, finally, coherence in connection to narration.

In an attempt to summarize difficulties occurring in the presence of pragmatic impairment described in the literature, Leinonen, Letts and Smith (2000) offered a comprehensive account. The summary contains 19 traits, some of them describing abilities and others describing impairments. In an effort to further summarize these traits, it can be concluded that several of them deal with traits related to contextual and interactional factors. Other major traits are largely intact syntax and phonology, problems with handling cause and effect relations and problems with appropriacy, theory of mind, and topic introduction and topic maintenance.

In conclusion, a development from broader, clinically based categorizations to a more narrow scope can be observed, beginning with the seminal paper by Rapin and Allen (1983), which included categories such as autism spectrum disorders and hydrocephalus, to a narrowing down in scope in the research performed by Bishop (2000) and Leinonen et al. (2000), where the focus more or less exclusively is on children with language impairment.

Aims

The general purpose of the present thesis was to study pragmatically related abilities in children with early-onset brain damage and children with pragmatic language impairment. The children with early-onset brain damage consist of two groups, children with spina bifida and hydrocephalus and children with cerebral palsy, with special focus on children with cerebral palsy.

More specifically, the aims were:

- To compare children with cerebral palsy, children with spina bifida and hydrocephalus and children with pragmatic language impairment in order to explore the pragmatic abilities within the groups, and to explore the patterns of different relationships among variables of importance for pragmatic ability

- To investigate how two types of professionals, physiotherapists (PTs) and speech-language therapists (SLTs), communicate with children with cerebral palsy during intervention

- To explore how children with cerebral palsy, children with spina bifida and hydrocephalus and children with pragmatic language impairment understand inferential and literal content

- To investigate in depth the narrative ability in a group of children with cerebral palsy, to search for possible contributing factors to the problems they encounter and to compare the results with the results of a group of typically developing children

Methods

Participants

The participants belong to two different samples. The first is a group of eight children with cerebral palsy (CP), accounted for in study II. The children were recruited from the Child- and Youth habilitation units in the Southern region of Sweden on the basis of the following inclusion criteria: (1) diagnosis of cerebral palsy (spastic diplegia, spastic hemiplegia and/or ataxia or athetosis); (2) age-span between 5 and 11 years; (3) speech used as the primary communication mode with no need for alternative and augmentative communication (AAC); (4) contact with a PT and a SLT on a regular basis (approximately once a week to once a month). All children had mild to moderate language impairment according to the medical records ; two of the children had moderate dysarthria as well. The children's level of motor impairment according to the Gross Motor Function Classification Scale (GMFCS; Palisano, Rosenbaum, Walter, Russel, Wood & Galuppi, 1997) varied from level I to level IV, median level II (i.e. the child is able to walk indoors and outdoors but experiences limitations on walking on uneven surfaces and inclines). A higher level implies a more severe motor impairment. For an overview of the children, see table 1.

Table 1. Overview of the participating children in study II.

Children	Boys	Girls	Chronological age range	Mean chrono-logical age	Mental age range	Mean mental age
8	7	1	6;2-10;4	8;6	4;0-9:6	6;8

Seven PTs and eight SLTs participated. One PT participated with two children. For an overview of the professionals, see table 2.

Table 2. Overview of the participating professionals in study II.

	Female	Male	Professional experience range	Mean professional experience
PTs	4	3	6-33 years	15
SLTs	8	0	< 1-21 years	10

The second sample of totally 40 children consist of ten children with CP, ten children with SBH, ten children with PLI and ten children with typical development (TD), accounted for in study I and III. The children with CP and SBH were recruited from a wide geographical area, and the children with PLI were recruited from preschools and schools with special language units for children with language impairment in two regions in Southern Sweden. The criterion for inclusion for the children with CP was a diagnosis of spastic diplegia. Seven of the children performed on Level II, one on Level III and two on Level IV on the GMFCS (Palisano et al., 1997). Two of the children had language impairment, mainly affecting phonological ability but also grammar to a less degree. The criterion for inclusion for the children with SB was hydrocephalus. Two of the children in this group had additional language impairment, also mainly affecting phonological ability and grammar to a less degree. Criteria for the children with PLI were language impairment, pragmatic problems as defined by the CCC (Bishop, 1998) and according to an informal assessment by a teacher and/or a speech language therapist. Criteria for inclusion for all children were intelligible speech (one child in the CP-group had moderate dysarthria) and IQ >70. The TD children had IQs within the normal range and no history of developmental delay. See table 3 for an overview. In study IV, only the results from the children with CP were included.

Table 3. Overview of the participants in study I and III.

	Boys	Girls	Chronological		Mental	
			range	Mean	range	Mean
CP	7	3	6;0-10;6	7;11	4;6-9;6	7;4
SBH	6	4	5;2-10;9	7;2	4;0-9;6	6;9
PLI	6	4	5;3-10;2	8;2	6:0-11;6	9;4
TD	7	3	5;4-9;1	7;2	4;6-10;0	8;0

Procedure

Study I

The assessment of the children in study I took part in the children's preschools, schools or homes. Due to the large number of assessment instruments that were administered and to the fact that some of the children had problems to concentrate for a longer stretch of time, the assessment procedure was extended to two or sometimes three occasions. In addition to the assessment procedure, video recordings of the children in conversations with a parent, a sibling and a professional were produced for future studies.

The following tests, most of them often used in clinical settings, were included in the assessment procedure:

- *Language production.* A Swedish phonology test (Hellquist, 1991) was used for production of phonology. For the production of grammar a Swedish standardized test, the Gramba (Hansson & Nettelbladt, 2004) was used.
- *Language comprehension.* A Swedish version of The Test for Reception of Grammar (TROG; Bishop, 1982; translated to Swedish by Holmberg & Lundälv, 1998) was used to assess comprehension of grammar. A Swedish version of the Peabody Picture Vocabulary Test - revised (PPVT; Dunn & Dunn, 1997) was used to assess word comprehension.
- *Inferential and literal comprehension* was assessed using a material from Bishop and Adams (1992; translated to Swedish by Holck & Nettelbladt for this occasion). The children were asked to listen to two short stories, and were subsequently asked 14 questions after each story (in total 28 questions). 14 questions concerned the literal content of the two stories, where the answers were stated explicitly in the story. 14 questions required inferential comprehension and could be answered only by drawing an inference about something that had not been explicitly stated, i.e. implicit information in the story.
- *Story recall.* For this purpose the Bus Story Test was used (Renfrew, 1997; Swedish translation and adaptation Svensson & Tuominen-Eriksson, 2002). This is a standardized test (up to the age of 8;5), which consists of a storybook with pictures and no written words. The child was told the story whilst looking at each picture, and was subsequently asked to retell the story using the pictures as prompts. The narrative was recorded, transcribed orthographically and analysed for amount of original information included, number of subordinate clauses and mean sentence length of the longest five sentences according to the test manual.

- *Children's Communication Checklist* (CCC; Bishop, 1998). The CCC is a 79-item checklist assessing children's communication behaviour across 11 subscales, five of them constituting the pragmatic composite, i.e. the part of the CCC where the pragmatic ability is estimated. Parents and teachers were asked to complete CCCs separately. The Swedish CCC (Nettelbladt, Radeborg & Sahlén, 2003) has Swedish norms, resulting in a Swedish cut-off at 140 (compared to the original which has a cut-off at 132).
- *Intellectual ability.* To establish the children's mental age Raven's progressive matrices, coloured version, was used (Raven, Court & Raven, 1986). This is a non-verbal test, frequently used in studies of children with speech- and language impairment.
- *Memory.* The Digit Span subtest of the WISC was used as a measure of verbal short-term memory and working memory (Wechsler, 1999). The children were asked to repeat single digit numbers read out loud, forwards and backwards.

Reading and writing abilities were not specifically tested. The reason for this is twofold. First, in the thesis the focus is on spoken language. Secondly, approximately one third of the children were within the pre-school age range.

Study II

The pretesting of the children in study II took part in the children's preschools or schools. The children were tested with Raven's progressive matrices, coloured version (Raven et al., 1986) to establish the mental age of the children. Language comprehension was assessed with the Swedish Test of Language Comprehension (SIT; Hellquist, 1989), a test with a limited amount of norms from typically developing children. Finally, the Swedish version of Children's Communication Checklist (CCC; Bishop, 1998; Swedish version Nettelbladt et al., 2003) was used to assess the pragmatic ability of the children.

Each child was video recorded during intervention with a PT and a SLT. The recordings took place at the children's habilitation unit or preschool/school. In order to cause a minimum of intrusion, the intervention consisted of what the PTs and the SLTs normally would do together with the child. The length of the recordings varied between 20 and 45 minutes.

Study III

The data in study III emanated from the same data collection as in study I. In study III the focus was on how children with CP, SBH and PLI managed with inferential and literal comprehension as assessed by the material from Bishop and Adams (1992).

Study IV

The data in study IV emanated from the same data collection as in study I. However, only the data from the CP group (ten children) was studied. Study IV is based on the results of the Bus Story Test (Renfrew, 1997). The children were told the story whilst looking at each picture, in all 12 pictures. Subsequently the children were asked to retell the story as close to the original as possible using the pictures as prompts.

Analyses and scoring

Study I

The analyses and the scoring of the CCC, TROG, PPVT, Gramba, Raven's progressive matrices and the digit span subtest followed the usual procedures and scoring. The results of the phonology test were merged into three categories; 0 = normal phonology, 1 = minor phonological problems, and 2 = major phonological problems.

For the analysis of the inferential and the literal responses a 3-point scoring system was adopted, according to the scoring procedure used by Bishop and Adams (1992). The scores were assigned as follows: 2 points – fully correct and adequate, 1 point – partially correct, and 0 point - no response or incorrect. The Bus Story Test manual provides a norm-referenced information score that indicates the number of relevant pieces of information the child includes in the story, out of a possible total of 54. Two points were given for each item that was designated as "essential" and one point for each item that was designated "subsidiary". The total number of points each participant received on this analysis constitutes the information score. In addition, the number of subordinate clauses and the mean sentence length of the longest five sentences were calculated. However, in study I only the information score was included.

Study II

The initial 20 minutes of each dialogue were transcribed orthographically according to the principles of CHAT (Codes for the Human Analysis of Transcripts; MacWhinney, 2000). CHAT is a transcription and coding format, that together with the Computerized Language Analysis System (CLAN) constitute the Child Language Data Exchange System (CHILDES). The quantitative measures of the conversations were derived from the CLAN analysis program. The variables derived from CLAN were number of words, number of turns, ratio of words per turn and words per minute (derived from total number of words). In relation to dominance, different analyses were conducted. (1) To analyse the spoken interaction the Initiative-Response

analysis (IR-analysis, Linell et al., 1988) was used. This analysis has previously been accounted for in the sections "Conversational context and interaction" and "Analysis of interaction". (2) A topical analysis, assigning the topics to the categories *dominating activity, other topic* and *local* or *non-local digressions*. The turns were counted and assigned to one of the categories. (3) Mitigating strategies and feedback. The dialogues were analysed for mitigating strategies used by the two groups of professionals. The values for the mitigating strategies were obtained by adding the occurrences of indirect speech (e.g. "I can show you another way to do it" when the child has given an incorrect response), inclusive pronouns (e.g. "Where are we going to try to balance"), mitigated word forms (e.g. "Now I think you are cheating again"), reducing of the professional's importance (e.g. "I thought I was the one who decided"), taking the blame for the child's failure (e.g. "Maybe I didn't look properly" when the child has made a mistake he won't acknowledge) and excuses for the child's lack of ability (e.g. "What has happened to the stick? Doesn't it want to?" when the child wasn't able to put a ring on a stick). (4) Positive feedback. The occurrences of positive feedback (e.g. "very good", "how clever you are", "perfect") were calculated for each professional group.

Study III

For the analysis of the inferential and the literal responses a 3-point scoring system was adopted. Like in study I the scores were assigned as follows: 2 points – fully correct and adequate, 1 point – partially correct, and 0 point - no response or incorrect. In an additional descriptive analysis of the atypical responses it was found that similar responses tended to occur frequently, and these formed the basis for groupings into five categories of atypical responses.

Study IV

The recorded narrative samples were transcribed into CHAT format (MacWhinney 2000), a transcription and coding format. A presentation of the Bus Story Test and its scoring procedures were provided in relation to study I. In addition to the measures provided by the Bus Story Test, further analyses were carried out in order to achieve a more thorough analysis. (1) An analysis according to the principles of the Narrative Assessment Profile (NAP; Bliss et al., 1998) was made. The NAP results in a profile of the strengths and weaknesses that the child exhibits regarding a range of dimensions considered to be fundamental to the production of structurally appropriate narrative discourse, namely topic maintenance, event sequencing, explicitness, referencing, conjunctive cohesion, and fluency. The child's achievement on each dimension was assessed with one to three points: 3 points – appropriate, 2 points – variable, 1 point – inappropriate, according to the procedures used in the NAP. (2) A sample of quantitative measures was calculated through the use of CLAN (MacWhinney, 2000). These included total number of words and

mazes, i.e. hesitation phenomena (Nettelbladt & Hansson, 1999). (3) To quantify story length the number of propositions was tallied (a complete phrase structure with at least a noun and a verb present; Botting, 2002). (4) A descriptive analysis of story elements, i.e. the occurrence of a *formal beginning* and *orientation* to introduce setting and characters (e.g. "Once upon a time there was a very naughty bus"), an *initiating event* (e.g. "While his driver was trying to mend him…"), a *problem* to achieve the intended goal (e.g. "...the bus decided to run away"), a *resolution* of the problem (e.g. "...he telephoned for a crane to pull him out…"), and a *formal ending device* (e.g. "The end") was conducted (Hudson & Shapiro, 1991).

Reliability and statistical analyses

For all four studies the Statistical Packages of Social Sciences (SPSS; 2001, version 16.0) was used. Both parametric and non-parametric statistical methods were used for the analyses.

Study I

An ANCOVA with mental age as covariate was performed to assess group differences. Mental age was used as covariate, since the groups differed significantly on that variable. To explore specific group differences a Bonferroni test was performed. The association between variables was evaluated with a partial correlation, controlling for mental age. The level of significance was set at 0.05.

Study II

Transcriptions and IR-codings were performed. 30% of the transcriptions were checked by an independent coder, with transcription agreement approaching 98%. 30% of the IR-codings were re-coded by an independent coder. The intercoder agreement for the IR-analysis was 96%. The intercoder agreements were calculated using the formula agreements/agreements + disagreements multiplied by 100 to get percentages. Nonparametric statistical methods were used due to small sample sizes. Between-groups comparisons were made with the Mann Whitney U test. Wilcoxon signed rank test was used for within-groups comparisons. Associations between variables were evaluated with the Spearman rank correlation coefficient. The level of significance was set at 0.05.

Study III

Interrater reliability assessments of the responses to inferential and literal questions were conducted in two steps. Firstly, reliability was calculated on the assignment of points in the scoring procedure. Reliability between two raters on a sample of 560 responses to inferential questions was 86 %, and on a

sample of 560 responses to literal questions 90 %. Secondly, reliability was calculated on the assignment of atypical responses into the five subcategories. Here, reliability between the same two raters was 95 % on the atypical responses to the inferential questions, and 94 % on the atypical responses to the literal questions. Since the groups differed significantly on mental age, an ANCOVA with mental age as covariate was performed to assess group differences on the dependent variables. To explore specific group differences pair wise a Bonferroni test was performed. To assess within-group differences the Wilcoxon signed rank test was used. The association between variables was evaluated with a partial correlation, controlling for mental age. The level of significance was set at 0.05.

Study IV

Interrater reliability assessments were conducted for the BST and for the NAP analysis. As for the BST, an independent coder checked the scoring, and a correlation analysis was performed. The analysis showed that the correlation between the results was significant at the 0.01 level, r varying from .727 to .971. With the NAP analysis, 20% of the transcripts were coded in common by two coders to practice the coding scheme. Disagreements were resolved through discussion. Following this all transcripts were coded independently by the same two coders to determine interrater reliability, and the correlation analysis showed r varying from .578 to .999 (p = < .10). Nonparametric statistical methods were used due to small sample sizes. Between-groups comparisons were made with the Mann Whitney U test. The Wilcoxon signed rank test was used for within-groups comparisons. Association between variables was evaluated with the Spearman rank correlation coefficient. The level of significance was set at 0.05.

Results

Study I

Study I is a comparative study, where three groups of children, children with CP and children with SBH, both with early-onset brain damage, and children with PLI, with recognized problems with pragmatic ability but without an established brain damage, were compared regarding pragmatically related abilities, language abilities and cognitive abilities. In addition, the results were compared to a group of TD children.

The most salient results were the many similarities between the three groups, particularly between the children with CP and the children with SBH where no significant differences occurred. The significant differences almost exclusively involved the children in the PLI group, who performed significantly worse than the CP group on inferential and literal comprehension and the CCC, on grammatical production and on short-term memory. In addition, the PLI group performed significantly worse than the SBH group on the CCC. Regarding lexical comprehension there was a main effect of group without any specific group differences, but the mean result in the group of typically developing children was 131.3, compared to 94.9 in the CP-group, 100.3 in the SB-group and 111.2 in the PLI-group. On the test of comprehension of grammar and the measure of phonology there were no statistically significant differences.

Since mental age could be suspected to influence the results, a partial correlation analysis was performed where mental age was partialled out. The results revealed differing correlation patterns in the three groups. The analysis indicated that the ability to make inferences may rely on different contributing factors: in the CP group and the SBH group inferencing appears to be related to language comprehension, whereas in the PLI group it appears to be related to lexical comprehension. The results need to be interpreted with care since the number of children in each group is very small.

Study II

In this study the conversations of PTs and SLTs during intervention with eight children with CP were studied. PTs and SLTs have different foci in their intervention. For SLTs, verbal communication is both the goal and the medium through which intervention is carried out, whereas for PTs, the verbal channel is solely a means of communication. Based on these prerequisites it could be hypothesized that a difference between the two groups would be present.

However, hardly any significant differences occurred when a quantitative analysis, an interactional analysis (IR-analysis), a topical analysis and an analysis of mitigating strategies and feedback were carried out. The only difference between the two groups of professionals that reached significance was concerning the issue of topic. The SLTs talked significantly more about the dominating activity, i.e. about topics that were associated to the assessment or treatment situation. The PTs had significantly more non-local digressions, i.e. temporary "outings" from the topic at hand about subjects not related to the here-and-now situation. These results imply that the PTs had significantly more opportunities for casual small talk, not related to the dominating activity.

The quantitative analysis revealed a tendency for the PTs to dominate the interactions by talking more, compared with the SLTs. The SLTs, on the other hand, tended to dominate the dialogues interactionally by asking more questions. The use of mitigating strategies and feedback did not differ significantly, however large individual differences could be seen.

Study III

In study III inferential and literal story comprehension were further explored by an analysis of the atypical responses. To this end a categorisation system was developed, with the intention to be applicable for both inferential and literal atypical responses and to be possible to use in a clinical context. The categorisation resulted in five response categories. Four out of the five categories were applicable for both inferential and literal questions: (1) *External associations*, where the response was characterized by aspects not related to the text, as e.g. general or personal world knowledge or free associations; (2) *Text-related*, where the response was related to aspects that can be found in the text, however not correctly; (3) *Lexical associations*, where the response was semantically related to the target response and (4) *Don't know*. For the inferential questions a category was added, (5) *No obvious inference*, where the response indicated that an inference had not been made. "Why" questions and

"think/believe" questions were examined separately, since these questions often are considered to be especially problematic for children with comprehension difficulties. A group of TD children participated in the study as a comparison group.

The analysis of data showed that the PLI group performed significantly worse than the CP group on inferential comprehension. The PLI group had significantly fewer typical responses, significantly more *external associations* and *no obvious inferences* and, finally, performed significantly worse on the "why" questions and the "think/believe" questions compared to the CP group. No significant differences between the CP group and the SBH group occurred. The only statistically significant difference within groups concerned the CP group, performing significantly better on inferential questions than on literal questions. The correlation analysis did not reveal any clear cut different patterns of associations among variables between the groups. However, inferential comprehension tended to be related to language comprehension in the CP group and to the ability to predict future developments and cause/effect relations in the SBH and PLI groups. The latter is explained by the problems in the two groups to answer "why" questions and "think/believe" questions.

Examples of different categories and scoring are provided in Appendix A. The target story is provided in the original English version and in Swedish translation.

Study IV

The purpose of study IV was to investigate in depth the narrative ability in ten children with CP and to search for possible contributing factors for the occurring problems. The results of the children with CP were compared to the results of a group of TD children. Previous research had demonstrated that the CP group experienced problems with the retelling of a narration task, the Bus Story Test, sometimes performing several standard deviations below the norms.

Regarding the results of the Bus Story scores it was found that the CP group performed significantly worse than the TD group on the measure of subordinate clauses, but not on the information score or on the MLU score. On the Narrative Assessment Profile analysis (NAP) the two groups performed very similarly. However, when all the NAP dimensions were merged into one, the TD children performed significantly better than the CP group. A separate analysis of the use of conjunctions revealed that the TD group used causal conjunctions significantly more than the CP group. The two groups performed similarly on the quantitative measures: total number of words, mazes (hesitation phenomena) and propositions. A descriptive analysis of story

elements demonstrated that the TD children used a wider range of story elements than the children in the CP group.

The pattern of correlations differed somewhat between the groups. In the CP group, the information score of the Bus Story Test was found to be positively correlated with mazes, inferential comprehension, literal comprehension and the explicitness dimension of the NAP. In the TD group the information score correlated with the explicitness dimension, and in addition with the amount of propositions.

Two commented examples of narratives are provided in Appendix B, the most advanced narrative and the least advanced narrative according to the scores given. For comparison the target story is provided in the original English version and in Swedish translation.

Discussion

Research is limited when it comes to abilities related to pragmatic ability in the literature regarding CP, where previous research primarily has been focusing on dysarthria and AAC and to a lesser extent on pragmatic ability in conversation (e.g. Pennington & McConachie, 2001b). However, clinical experience has indicated that pragmatic problems not only can be found in clinical groups normally associated with pragmatic problems, like children with SBH (Fletcher, Barnes & Dennis, 2002; Rapin & Allen, 1983), but also in children with CP. In this thesis, where the intention has been to use a unified approach towards pragmatic ability in children with CP, SBH and PLI, several similarities between these groups regarding pragmatic ability were found, thus demonstrating that all three groups experience problems with pragmatic abilities.

Studies related to cerebral palsy

Two of the studies were exclusively concerned with children with CP, however in different respects and with different participants. In study II, where focus was on the professionals rather than the children, professional interaction during intervention was studied. The main finding was that the conversational patterns of the two professional groups did not differ to a large extent, somewhat surprising given the professionals' different vocational training and intervention focus. The PTs tended to talk more and the SLTs tended to ask more questions. Both these behaviours may provide the professional with a means to better comprehend a child who is difficult to understand, by restricting the possible scope of the child's contribution (Pennington & McConachie, 2001b), thus avoiding exposure to possible misunderstandings. However, it can be argued that the mentioned behaviours are not equivalent; posing questions could be considered to be a more active, deliberate and sophisticated form of behaviour compared to more general verbosity.

The significant differences were found in the topic analysis, where the SLTs talked significantly more about the dominating activity and the PTs had significantly more non-local digressions. One implication of the results is that there are significantly more opportunities for small talk, not related to the intervention situation, in the conversations with the PTs. The difference in intervention focus between the groups may explain this finding. For the SLTs, the communication is the means as well as the goal. The conversation *is* the intervention, leaving little time for topics not related to the intervention.

For the PTs, the communication is the means but not the goal for the intervention. This leaves them with opportunities for casual small talk as they carry on with their ordinary intervention. It has been suggested that the importance of small talk is underestimated. Walsh (2007) argues that in particular SLTs but also other health care professionals should more appreciate the significance of small talk and the therapeutic gains that can be made by the use of it. Small talk has the potential to foster and sustain interaction, and Walsh (2007) concludes that small talk is really "big talk".

A possible advantage the PTs in the study have over the SLTs is that the "inherent paradox of therapy" is not active in the PT intervention, thus removing the focus from the communication impairment. The "inherent paradox of therapy", described by Simmons Mackie and Damico (1999), is activated when the therapist constructs contexts where the clients are more likely to perform incompetently, so that their "errors" can be "repaired" in order to help them to improve their communicative abilities. Furthermore intervention can in some sense be confusing for the child, with the focus of the SLTs' conversational contributions altering between talk about the activity and talk about the quality of the child's language production (Hulterstam & Nettelbladt, 2002).

The use of mitigating strategies and feedback varied considerably between the individuals but not significantly between the two groups. However, the PTs tended to use positive feedback more than the SLTs. It can be speculated if this can be due to the physical activity and handling, sometimes inflicting a certain degree of discomfort upon the child, thus requiring more reinforcement than verbal activity does. Obviously feedback is warranted in intervention, but used when it is really not well-earned, it may confuse the child and contribute to an inadequate self-image.

Study IV was a detailed study of the narrative ability in children with CP. In a previous study (study I), the scoring procedure provided in the Bus Story Test revealed that the three clinical groups all experienced problems with recall of narratives, according to the norms of the test, to varying degrees. In study IV, the results of one of the groups, the CP group, were analysed in depth. A further aim of the study was to search for possible contributing factors to the problems with story recall. In order to do this, additional analytic procedures, preferably possible to use in a clinical setting, were searched for in the literature. The results of the additional analyses, in particular the NAP, revealed that the CP group mostly performed similarly to the TD children, only slightly more inferior. This was somewhat surprising, given that the results of the CP group were almost two standard deviations below the criteria for different tasks. However, a closer look revealed that the results of the TD

group also were below the criteria by almost one standard deviation. The analysis of relationships in study IV indicates that the problems of the CP group partly could be explained by comprehension difficulties on a textual level rather than on sentence level, since the children had significantly lower results on the literal comprehension questions but not on the comprehension of grammar. Similar results were found by Norbury and Bishop (2002) in a study of children with SLI. It was also found that the CP group used causal conjunctions significantly less than the TD group. In the absence of explanatory cohesion devices such as causal conjunctions in a narrative, the listener becomes more dependent on inferential understanding. As an effect, the transfer of comprehensible information to the listener might be less transparent. Another significant difference between groups was found regarding theory of mind ability, where the TD children outscored the CP group. Problems with theory of mind were also found in a study of children with CP by Dahlgren, Dahlgren Sandberg and Hjelmquist (2003). However, the children in their study had pronounced speech impairments. According to Tager-Flusberg and Sullivan (1995) and Norbury and Bishop (2003), narratives requires a theory of mind in that the narrator has to take the listener's needs in account.

Although associations among variables were based on a very small sample, it is interesting to note the positive relationship between the use of mazes (hesitation phenomena) and the information score of the Bus Story Test, only occurring within the CP group. This finding indicates that mazes, albeit unconsciously, might have been used as a means of facilitating the finding of words and recall of story contents. The use of mazes seems to allow the child to find some time to figure out what would come next, perhaps reflecting word finding problems or linguistic planning problems. Interestingly, the two children with the lowest Bus Story Test information score had the smallest amount of mazes (see example 2 in Appendix B), and were in addition the only children who achieved the maximum score on the fluency dimension of the NAP. Finally, the correlation analysis suggested that the problems of the CP group regarding the Bus Story Test information score were manifested as a lack of crucial information and coherence, two vital abilities in relation to the production and understanding of a narrative.

Comparative studies

In two of the studies in this thesis, children with CP, children with SBH and children with PLI were compared concerning different pragmatic abilities. Their results were compared to the results of a group of TD children.

In study I, pragmatically related abilities, linguistic abilities and cognitive abilities were investigated. The most salient results were the lack of differences, and particularly the similarity between two of the clinical groups, the children with CP and the children with SBH. These two groups shared a number of pragmatically related traits. Opposed to the PLI group, neither the CP group nor the SBH group had pragmatic problems according to the CCC. In spite of this, a common feature for all the three groups was an appearance of pragmatically related problems such as difficulties with story recall, inferencing, comprehension and short-term memory, although manifested in different ways and to different degrees. The significant differences in this sample involved the PLI-group, and were in the domains of inference and short-term memory, abilities associated with pragmatic ability. Out of the three groups, the CP group was presented with the least pragmatically related problems, as could be expected.

A study of the patterns of correlations suggested that the ability to make inferences relied on different contributing factors in the different groups. In the CP-group and the SBH group inferencing correlated with grammar comprehension and literal comprehension, thus constituting a language comprehension related contributing factor. In the PLI-group, on the other hand, inferential ability correlated with lexical comprehension, indicating that lexical ability might be essential for making inferences in this group. In earlier research, it has been suggested that children with PLI have word-finding problems (Botting & Conti Ramsden, 1999; Rapin & Allen 1983). However, these correlational results must be treated with caution, due to the small sample size.

Another outcome concerned the CCC, that was used as a first tool to assess whether a child could be considered to have pragmatic problems or not. The results in this study point to the possibility that the CCC is more sensitive to socially related pragmatic abilities than to linguistically related abilities, based on the fact that the CCC only correlated with a few of the other variables commonly associated with pragmatic ability. A suggestion is that it may be meaningful to make a division of pragmatically related problems into more socially versus more linguistically associated problems, where the CCC could be argued to mainly capture the former and where the latter includes e.g. narrative and inferential ability.

In study III inferential and literal comprehension were compared among the three clinical groups and with a group of TD children. More specifically, an analysis of the atypical responses was carried out, and for this purpose an analytic framework was developed. The main finding in this study was that the ability to answer inferential questions was not significantly worse than the ability to answer literal questions in any of the groups. Somewhat unexpected,

more than 50% of the children even found it easier to answer inferential questions. The CP group and the SBH group both even performed better on the inferential questions compared to literal questions, although the difference only reached significance in the CP group. An interesting possible explanation to this was put forward by Botting and Adams (2005). They suggested that the children do not experience a problem with inferencing *per se*, and that inferencing is not problematic in structured situations but emerge when the child has to make inferences in a less structured situation such as a conversation.

In the analysis of atypical responses, four categories applicable for both inferential and literal atypical responses were distinguished: *external associations, text-related responses, lexical associations* and *don't know* responses. A fifth category was added for the inferential questions, namely *no obvious inference*. The outcome of this analysis showed that the PLI group relied more on external factors such as general world knowledge and free associations when delivering an atypical response, compared to the CP group. Applying a global/local perspective, the results can be interpreted so that the CP group compensated for their story comprehension problems by using resources on a textual level, whereas the PLI group compensated by using resources emanating from their own world knowledge, sometimes expressed in an odd way. It can also be argued that there is a qualitative difference between text-related atypical responses and external associations, where the responses on a textual level can be considered to be closer to the typical response. The PLI group also had difficulties with predicting future developments and cause/effect relations, as evident from their problems with answering "why" questions and "think/believe" questions. Perhaps an easy way out when confronted with a question one does not know the answer to, could be to turn to familiar experiences in order to achieve some coherence. The CP group, on the other hand, tended to give text-related atypical responses, keeping themselves more strictly to the task at hand.

When the atypical responses were compared between inferential and literal comprehension, an interesting pattern occurred in the TD group. Their proportion of *don't know* responses was considerable larger than in the other groups on the atypical inference responses. This could be interpreted as the TD children rather giving a *don't know* answer than having a guess, thus demonstrating an awareness of their shortcomings. It is also noteworthy that the TD children had no occurrences of *no obvious inference,* and that the occurrences of this category were rare across groups.

In conclusion, the three clinical groups in the comparative studies all showed signs of pragmatically related problems, mainly concerning language comprehension and story recall, and for the PLI group in addition short-term

memory. The occurrence of pragmatically related problems is not unexpected in the light of clinical experience and according to Perkins' (2007) emergentist theory. In this perspective, pragmatic ability is defined as an emergent phenomenon where an interaction of cognitive, semiotic and sensorimotor abilities underlying communicative behaviors takes place. The majority of the children had some form of impairment related till communication such as somewhat lower mental age or a language impairment, suggesting the possibility of pragmatically related problems.

Concerning the relationship between autism, PLI and SLI, Bishop (2000) suggested that rather than constituting three distinct conditions, PLI could be depicted as literally intermediate between autism and SLI on a continuum. In a similar fashion it can be suggested that according to the results presented here the pragmatically related problems of the children with PLI, SBH and CP could be placed on a continuum, where SBH is intermediate between PLI and CP, the latter group presenting the least problems related to pragmatic ability. In addition some patterns of relationships could be discerned, where one of the more important was that the CP group was helped by well functioning language comprehension for story recall and for the ability to make inferences, whereas the SBH group and the PLI group were hampered by their poor ability to predict future developments and cause/effect relations in their ability to make inferences.

General discussion

Two concepts of interest to discuss in relation to the findings in the present thesis are the concepts "local" and "global". To begin with, in their description of the "semantic pragmatic syndrome" or PLI, Rapin and Allen (1983) noted that short phrases and individual words were comprehended without difficulty, whereas comprehension of connected discourse was impaired. Similar opinions have later been put forward by Leinonen et al. (2000). This has also been found to be valid for children with SBH (Vachha & Adams, 2003; Fletcher et al., 2002; Barnes & Dennis, 1998; Dennis & Barnes, 1993), where it has been demonstrated that these children are comparable to nonimpaired children at the microscopic level, i.e. on word and short phrases level , but are impaired on macroscopic level, i.e. discourse production. Thus, the difficulties for these groups are described as being on a global rather than a local level. However, it must be emphasised that "local" and "global" are relative concepts; what is considered to be local level in one context may be considered to be global in another context.

Two of the studies in the thesis were about inferential and literal comprehension and narrative ability. The clinical groups demonstrated

problems with these abilities to varying degrees. However, the relation of these abilities and language comprehension at sentence level was not as straightforward as could be expected. For example did the comprehension of grammar on a sentence level not correlate with literal comprehension or story recall in any of the groups, suggesting comprehension problems on a global level rather than a local level, i.e. on textual level rather than sentence level. However, these findings need to be confirmed with a larger sample of children.

The concepts global and local levels are connected to coherence and cohesion, two types of textual devices/functions (Brown & Yule, 1983; Halliday & Hasan, 1976). Coherence relates to the global meaning regarding what we want to express (Mey, 2001). The children with CP did not have problems with coherence compared to TD children in the narrative study. Cohesion, however, was more difficult for the children with CP. According to Halliday and Hasan (1976), the primary determinant of whether a set of sentences do or do not constitute a text depends on cohesive relationships within and between the sentences. The CP group had problems with conjunctive relations, i.e. relating what is about to be said to what has been said before. This was manifested in significantly fewer causal conjunctions compared to the TD group. Problems with referencing, where the listeners are directed to look elsewhere in the text or discourse for their interpretation, also occurred in the CP group as demonstrated in example 2 (Appendix B). In this narrative new persons or artefacts are introduced with a noun only as an exception. Johnston (2008) argues that a narrative may lack cohesion, not because the language forms are unknown, but because the child focuses too much attention on organizing the narrative. The child is simply not capable of managing both abilities simultaneously.

Coherence is closely connected to topic (Brown & Yule, 1983), as topics are vital for creating coherence in discourse (Linell, 1998). In the interactional study, where the professionals rather than the children with CP were the subjects of interest, the only significant differences between the professional groups were related to topic. The SLTs talked significantly more about topics related to the dominating activity or overriding topic, whereas the PTs had significantly more non-local digressions. This implies that the interactions involving the SLTs were more globally coherent, whereas the PT interactions were coherent at a more local level.

In connection to the interactional study the use of contextual resources is of interest. Linell (2009; 1998) distinguishes two types; the immediate context and the mediate (abstract) context. The immediate context manifested in the surrounding concrete situation differs between the professional groups, as do some of the mediate context resources. For example are the child and the SLT often sitting at a table looking at pictures, whereas a child and a PT often move

about more freely in a large room. An example of mediate context resource where the professionals experience different conditions, potentially affecting the intervention situation, is the activity type. The activity type probably has implications for the use of politeness, feedback and mitigating strategies (Allwood, 2007). The PTs tended to use more mitigating strategies and feedback compared to the SLTs. Possibly the inherent physical activity, at times somewhat laborious, in the PT interventions require more reinforcement and positive feedback. Brown and Levinson (1987) suggested that when a person is obliged to perform a face-threatening act, as e.g. posing a demand, certain strategies can be employed to minimize the threat. Rather than being bald on record, i.e. completely open and direct, the utterance is often made somewhat mitigated or indirect ("Could you please...").

Grice formulated four maxims as guidelines for efficient and effective use of language in conversation. The maxims constitute a theoretical concept, but it is all the same interesting to analyse if they are in some way applicable in this context. In the interaction study, some of the maxims could be seen to be in play. For example it was demonstrated that the PTs tended to talk much, i.e. that at least some of the individuals tended to breach the maxim of quantity. As a consequence, it is possible that the child in the dialogue talks less, with an interactional imbalance as a result. Another maxim, the maxim of relevance, is inherently related to contextual factors, due to the fact that one and the same utterance may be relevant in one context but not in another. Applied on SPL intervention, the communicative activity can be completely decontextualized, as is often the case in an assessment activity, and thus perhaps not being perceived as relevant by the child.

From a clinical point of view, the emergentist model of pragmatic ability and disability (Perkins, 2007) is appealing, and further provides a useful theoretical framework in this context. According to this theory, a deficit may be linguistic, cognitive, motor or perceptual, and compensation may be attempted by making adjustments to a similar or different system. A case of possible compensatory intrapersonal adaptation is the positive association between the information score of the narrative recall test and the use of mazes in the CP group. In this case mazes appeared to be used, albeit unconsciously, in order to gain time so that the child could find the appropriate pieces of information and/or the right words. However, a compensatory adaptation may give rise to symptoms which appear to be distinct impairments in their own right, although it was intended to solve an underlying problem. That is, a pragmatic problem may be the consequence of one or more compensations (Perkins, 2007). Another example of possible compensatory adaptation is another child in the same study, who seemed to compensate for his poor remembrance of the story contents with applying his own world knowledge onto the story, resulting in a rather bizarre narrative.

Some methodological issues must be considered. The sample size is small, which calls for caution in interpreting the results, especially so in the within-group analyses. The small sample size is primarily due to small clinical groups (in particular the SBH group), but also to the time consuming data collection and data analyses. The distribution of age would have benefited of being narrower, but again this is an effect of small clinical groups and availability of children. The mean chronological age for the children with CP and PLI was somewhat higher than for the other groups, as was the mean mental age of the children with PLI. However, the latter was compensated for in the statistical analyses of the differences among groups.

A more theoretically related problem is the inherent difficulties of assessing pragmatic problems, due primarily to the contextual dependence. A child experiencing problems in a particular conversational context may have less or no problems in another conversational context or in a formal and structured assessment situation. The basic material used for the assessment of pragmatic ability, the CCC (Bishop, 1998), avoids some of the problems by being designed as a checklist. The parents and/or professionals who answer the questions have the opportunity to support their answers on the child's behaviour over a longer period of time and over a range of different situations, and in addition have good knowledge of the child. However, according to Perkins (2007) the capacity of checklists to characterize a specific type of pragmatic impairment objectively must be viewed with caution, since the items are typically selected on the basis of observation and impression. Further, in one of the studies it was suggested that the CCC is more sensitive to socially related pragmatic abilities than to linguistically related abilities.

Since no far-reaching conclusions can be drawn, the results in the present thesis need to be further explored in future studies. Conversational data regarding conversations between the children and their parents, peers and teachers have not been used, and thus allows for further interactional studies to be made in the future. However, some of the data concerning children with CP and children with SBH in conversations with peers have been investigated and preliminary analyzed in a master thesis (Viberg, 2008), where the results suggested that mental age and language comprehension were more crucial than diagnosis for the interactional dominance relation between the children with physical impairment and their peers. Further, a follow-up study of the children, particularly the children with CP and SBH, would be interesting regarding the development of reading and writing abilities viewed in the light of the existing problems with narrative ability.

Conclusions and clinical implications

The main conclusion is that the children with CP and the children with SBH represented in this thesis both have pragmatically related problems, however not as extensive as in the PLI group. The problems occur mainly in relation to higher-level language skills as narrative ability and are mainly manifested at a textual level.

In the main comparative study, study I, the results indicate that children with CP and children with SBH share a number of pragmatically related traits. With this in mind, and taking the common diagnostic descriptions associated with the respective disorders into account, children with CP could risk to be under-diagnosed concerning problems related to pragmatics such as story recall and short term memory, whereas children with SBH could risk to be under-diagnosed concerning language abilities such as language comprehension. Further, pragmatically related problems in the CP-group may be masked if the children are taciturn and passive. The results indicate the importance for children with early-onset physical impairments to undergo an assessment procedure unprejudiced by diagnosis, especially concerning pragmatic ability.

A further analysis of story comprehension, one of the abilities causing problems for many of the children, revealed that it was only the PLI group who experienced more problems with inferential comprehension than with literal comprehension, and that the CP group even performed better on inferential than on literal comprehension. Further, the results of this study suggest that language comprehension both on sentence and text level must be taken into account when performing an assessment, since they appear to measure different aspects of language comprehension. In order to carry out an adequate intervention, it is also vital to analyze what kind of atypical responses a child gives. The analysis of atypical inferential responses revealed that the PLI group relied more on external associations than the CP group when making an atypical response, whereas the CP group tended to use more text-related responses. Possibly a text-related atypical response is closer to the typical response than an external association. The categories emerging from the analysis of atypical responses were found to have the potential to be of value for pinpointing a child's difficulties with story comprehension, with relevance for intervention. For example may a different form of intervention be needed for a

child who has many text-related atypical responses compared to a child who has a lot of external associations.

A more detailed analysis of the difficulties of a group of children with CP on a narration task suggest that the problems with the information score could be traced to a shortage of information and cohesion as assessed by the NAP, indicating a problem with cohesion at the textual level in the CP group. The CP group also had significantly less causal conjunctions than a TD group. The use of mazes in the CP group correlated positively with the BST information score, suggesting that mazes were used as a compensatory adaptation in order to find words and recall relevant pieces of information. Consequently, these findings identify the difficulties of story recall in this group to problems with explicitness and causal conjunctions, thus narrowing down and facilitating the design of an intervention.

From the results of the assessment studies I, it can be concluded that more than one instrument should be used in order to pin down in what area a child experiences most comprehension difficulties. It has been shown that children, at least on group level, can perform adequately on a test for the comprehension of grammar but nonetheless have problems with story comprehension, i.e. to have problems with comprehension on a textual or global level but not on a sentence- or more local level. This knowledge is vital for the planning of a relevant intervention. The local/global concepts can possibly be of use both in the assessment procedure and in the intervention planning.

When two professional groups, PTs and SLTs, were compared during intervention, surprisingly few significant differences occurred. However, it was observed that the PTs proved to have good chances for providing the children with opportunities for conversational training, e.g. manifested as small talk, at the same time as they were carrying out their regular physical intervention. This could probably further be taken advantage of by enhancing the PTs' awareness of the effect of different interactional styles and their importance for contributing to the child's conversational development, e.g. by actively monitoring their own interactions. Furthermore, during the PT intervention the focus is not the child's communication problems, leaving the child with the opportunity to engage in more relaxed small talk.

In this thesis it has been attempted to further pin down contributing factors to pragmatic impairment, which in a clinical context sometimes is used as a rather superficial label. What initially appears to be a pragmatic problem, may stem from problems with higher level linguistic problems. In spite of a somewhat higher mental age, the PLI group encounters more difficulties in relation to the SBH group, and even more so in relation to the CP group. This applies for difficulties with e.g. inferential and literal comprehension and short-term

memory. Regarding the CP and SBH groups, the diagnosis did not seem to be of crucial importance since no significant differences occurred between the groups. Rather, the occurring pragmatic impairments in these groups can be viewed as an emergent phenomenon, dependent on contextual resources on a local or global level. With the present results taken into account, the planning of a more individualised and specific intervention may be facilitated.

Swedish summary

Avhandlingen handlar om barn med tidigt förvärvad hjärnskada samt barn med pragmatisk språkstörning (pragmatic language impairment; PLI) och deras pragmatiska förmåga. Barnen med tidigt förvärvad hjärnskada består av två grupper, barn med cerebral pares (CP) och barn med ryggmärgsbråck och hydrocephalus (spina bifida med hydrocephalus; SBH). Samtliga barn använder verbal kommunikation som sitt huvudsakliga kommunikationssätt. Tidigare forskning och klinisk erfarenhet har visat att barn med SBH ofta har pragmatiska problem, men när det gäller barn med CP har tidigare forskning mest behandlat dysartri, anartri och användandet av formell alternativ och kompletterande kommunikation (AKK). Dock har klinisk erfarenhet visat att även barn med CP ofta uppvisar pragmatiska problem t.ex. i samtal, vid berättande och vid förståelse av sammanhängande text, om än i mindre omfattning än PLI- och SBH-grupperna.

Det övergripande syftet med avhandlingen har varit att studera pragmatiska delförmågor och därtill relaterade språkliga och kognitiva förmågor hos barn med tidig hjärnskada, speciellt barn med CP, samt i en grupp av barn utan konstaterad hjärnskada men med pragmatiska problem, dvs. barn med PLI.

Syftet i studie I var att jämföra tio barn med CP, tio barn med SBH och tio barn med PLI för att närmare utforska olika pragmatiska delförmågor inom grupperna. En bedömning av barnens pragmatiska, språkliga och kognitiva förmågor gjordes. Resultaten visade att det fanns fler likheter än skillnader, fr.a. mellan barnen med CP och barnen med SBH, där inga signifikanta skillnader framkom. De signifikanta skillnader som fanns berörde i stort sett endast PLI-gruppen, vilken presterade sämre än CP-gruppen avseende bokstavlig och inferentiell (icke-bokstavlig) förståelse, grammatisk produktion och korttidsminne. Likheterna mellan CP-gruppen och SBH-gruppen, i kombination med de typiskt förekommande beskrivningarna av problem vid CP och SBH, tyder på att barn med CP riskerar att underdiagnostiseras när det gäller pragmatikrelaterade problem som textförståelse och korttidsminne, medan barn med SBH kan riskera att underdiagnostiseras avseende språkliga förmågor som språkförståelse.

I studie II var syftet att undersöka hur två professionella grupper, sjukgymnaster och logopeder, kommunicerade med åtta barn med CP vid intervention. Sjukgymnaster och logopeder har olika fokus för sin intervention, och därmed kan det förmodas att kommunikationen skiljer sig åt mellan grupperna. För logopeder är verbal kommunikation både mål och medel för

interventionen, medan den verbala kommunikationen för sjukgymnaster bara är ett kommunikationsmedel. Trots dessa olikheter fanns få signifikanta skillnader mellan grupperna vid en analys av kvantitativa och interaktionella aspekter samt vid en topikanalys. De signifikanta skillnaderna förekom endast i topikanalysen, där logopederna pratade signifikant mer om den dominerande aktiviteten, dvs. om ämnen relaterade till interventionssituationen. Sjukgymnasterna hade signifikant fler icke-lokala ämnesdigressioner, dvs. tillfälliga "utflykter" från det pågående ämnet som handlade mer om abstrakta ämnen som inte var relaterade till här-och-nu situationen. När det gällde den kvantitativa och interaktionella analysen tenderade sjukgymnasterna att dominera interaktionen genom att prata mer, medan logopederna tenderade att dominera genom att ställa fler frågor. Resultaten tyder på att sjukgymnasterna hade fler tillfällen till vardagligt småprat som inte var direkt relaterat till interventionssituationen. Sjukgymnasterna får därmed möjlighet att förse barnen med goda tillfällen till samtalsträning i form av vardagligt småprat under tiden som de genomför sin vanliga intervention. Dessutom fokuseras inte barnets kommunikationssvårigheter i sjukgymnastinterventionen, vilket ytterligare kan bidra till en kravlös och vardaglig samtalssituation.

I studie III var syftet att närmare utforska bokstavlig och inferentiell förståelse hos tio barn med CP, tio barn med SBH och tio barn med PLI. Resultaten visade att det inte förekom några signifikanta skillnader mellan barnen med CP och barnen med SBH. Däremot presterade PLI-gruppen signifikant sämre än CP-gruppen på inferentiell förståelse. Analysen ledde till en kategorisering av de atypiska svaren, omfattande fem kategorier. Fyra av dessa är möjliga att använda för både bokstavliga atypiska svar och inferentiella atypiska svar, medan en kategori endast är användbar för atypiska inferenssvar. De övergripande kategorierna är *externa associationer*, *textrelaterade svar*, *lexikala associationer* och *vet inte*. För de inferentiella atypiska svaren finns även kategorin *ingen uppenbar inferens*. PLI-gruppen hade färre *typiska svar*, fler *externa associationer* och fler *ingen uppenbar inferens*. Ett ytterligare resultat var att barnen i CP-gruppen presterade signifikant bättre på inferentiell förståelse än på bokstavlig förståelse. Överhuvudtaget visade det sig att drygt hälften av samtliga barn till och med var bättre på att besvara inferensfrågor än bokstavliga frågor. Kategoriseringen har en potential att vara ett kliniskt användbart verktyg för att tydliggöra på vilket sätt ett barn har svårigheter när det gäller förståelse på textnivå, för att därmed kunna planera en adekvat intervention. T.ex. behöver troligtvis ett barn med textrelaterade svårigheter en delvis annan typ av intervention än ett barn med många externa associationer.

I studie IV var huvudsyftet att göra en detaljerad analys av den narrativa förmågan hos tio barn med CP. Ett ytterligare syfte var att söka efter möjliga bidragande orsaker till de förekommande svårigheterna. Trots att barnen med

CP presterade cirka två standardavvikelser under normen för det använda testet, visade det sig att de bara presterade signifikant sämre i jämförelse med en grupp barn med typisk utveckling (typical development; TD) när det gällde antalet bisatser enligt testets normer. Inga signifikanta skillnader förekom avseende informationspoäng och MLU. Ytterligare analyser visade att TD-gruppen hade signifikant fler kausala konjunktioner, samt fler typer av berättelsekomponenter (story elements) än CP-gruppen. Sammantaget tyder de samlade analyserna på att svårigheterna med återberättande i CP-gruppen huvudsakligen orsakades av svårigheter med tydlighet och kohesion. En korrelationsanalys visade att informationspoängen korrelerade positivt med användandet av tvekfenomen (mazes) i CP-gruppen. Detta tyder på att tvekfenomen kan ha använts som en omedveten kompensatorisk anpassning för att hitta ord och/eller komma på relevant information.

Sammanfattningsvis visar resultaten av studierna att både barnen med CP och barnen med SBH hade pragmatiskt relaterade problem, om än inte i samma omfattning som barnen med PLI. Svårigheterna uppträdde fr.a. beträffande högre språkliga funktioner som narrativ förmåga, och manifesterades huvudsakligen på textnivå. Vidare tyder resultaten på att språkförståelse behöver bedömas på både ord-, sats- och textnivå, då ett barn kan ha svårigheter på en högre nivå men inte på en lägre. En mer detaljerad bedömning kan leda till att utformningen av en adekvat intervention underlättas. Resultaten visar också på betydelsen av att en bedömning av barn med CP och SBH görs utan förutfattade meningar utifrån den givna diagnosen. Kunskap om de symtom diagnosen vanligen medför kan göra att andra symtom, inte minst avseende pragmatisk förmåga, inte uppmärksammas. Slutligen visade det sig i interventionsstudien att det förekom oväntat få skillnader mellan sjukgymnasters och logopeders samtal med barn med CP under intervention. Dock visade det sig att logopedsamtalen mer bestod av samtalsämnen relaterade till den pågående interventionen, medan sjukgymnasterna visade sig ha goda förutsättningar till att förse barnen med tillfällen till träning av vardagligt småprat samtidigt som de utförde sin ordinarie behandling.

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Appendix A

Assessment of inferential ability

Target story in English

Story A "Ice-skating"
Andrew was ice-skating on the ice, wrapped up in his woolly hat, gloves, and scarf. He skated to the middle of the pond, where the ice was thin. Andrew cried out when the ice gave way under his weight and he crushed through it. A man rushed quickly to rescue him, pulling him out by both arms. When he got home, Andrew got wrapped up in a blanket and sat down by the fire, holding a hot cup of tea* (Bishop & Adams, 1992)
*In the Swedish translation "tea" is substituted with "chocolate"

Story B "Rubbish pile"
Mike was cycling down the road and decided to turn in through a gateway. Just behind the wall there was a pile of rubbish, and right on top there was an old pram. Mike hurried to find his friends, who were playing in the wood. Come and see what I´ve found, he said. Mike and his friends scrambled to the top of the rubbish heap and got the pram down. They took the top part off and hammered an old plank into position above the base of the pram. Mike got into the go-cart and raced down the track on it while his friends cheered (Bishop & Adams, 1992)

Target story in Swedish

Berättelse A "Skridskoåkning"
Peter åkte skridskor på dammen. Han hade på sig mössa, vantar och halsduk. Han åkte iväg till mitten av dammen, där isen var tunn. Peter skrek till när isen gick sönder under honom och han trillade ner i vattnet. En man kom rusande för att rädda honom, och drog upp honom i båda armarna. När han kom hem blev Peter insvept i en filt och satte sig framför elementet med en kopp varm choklad (translated by Holck & Nettelbladt).

Berättelse B "Skräphögen"

Nils cyklade nerför gatan och bestämde sig för att svänga in på en grusgång. Där fick han syn på en hög med gammalt skräp som folk hade kastat, och högst upp låg det en barnvagn. Nils skyndade sig och hämtade sina kompisar, som var och lekte på lekplatsen bredvid. Kom och se vad jag har hittat! sa han. Nils och hans kompisar skyndade sig dit och fick ner barnvagnen. De lyckades få bort överdelen och spikade sedan fast en gammal bräda de hittade ovanpå underdelen. Sedan klev Nils upp på sin racerbil och åkte ner för gatan medan hans kompisar hejade på honom (translated by Holck & Nettelbladt).

Examples of responses related to assessment of inferential ability

1. Examples of responses on inferential questions receiving 2 points:

Question: How did the man know that something was wrong? (Hur visste mannen att något var fel?)
Response: He was in the water (Han var i vattnet)
Response: Because he screamed for help (Därför han ropade på hjälp)

Question: What was the pram doing on top of the rubbish? (Varför låg barnvagnen där?)
Response: It was broken (Den var sönder)
Response: Nobody wanted it (Ingen ville ha den)

2. Examples of responses on literal questions receiving 2 points:

Question: Who rescued Andrew? (Vem räddade Peter?)
Response: A man (En man)
Response: A boy (En pojke)

Question: What did Mike do when he´d finished making the go-cart? (Vad gjorde Nils när racerbilen var färdig?)
Response: He drove (Han körde)
Response: He tested the go-cart (Han testade racerbilen)

3. Examples of inferential atypical responses categorized as external associations:

Question: How did the man know that something was wrong? (Hur visste mannen att något var fel?)
Response: You shouldn´t fall, you should skate (Man ska inte falla, man ska åka; 1 p)
Response: He went to the hospital (Han åkte till sjukhuset; 0 p)

4. Example of inferential atypical responses categorized as text-related:

Question: How did the man know that something was wrong? (Hur visste mannen att något var fel?)
Response: The radiator* wasn´t warm (Elementet var inte varmt; 0 p)
**In the Swedish translation "fire" is substituted with "radiator"

5. Examples of inferential atypical responses categorized as no obvious inference:

Question: How do you think Andrew felt when he got back? (Hur tror du att Peter kände sig när han kom hem?)
Response: He lied in a blanket (Han låg i en filt; 0 p)

Question: How do you think the other children felt when they saw Mike racing on the go-cart? (Hur tror du att de andra barnen kände sig när de såg Nils åka iväg på racerbilen?)
Response: Then the children are supporting him (Då hejade barnen på honom; 0 p)

6. Examples of literal atypical responses categorized as external associations:

Question: Who rescued Andrew? (Vem räddade Peter?)
Response: Daddy (Pappa; 1 p)

Response: A police (En polis; 0 p)

7. Example of literal atypical responses categorized as text-related:

Question: Who rescued Andrew? (Vem räddade Peter?)
Response: He who fell into the water (Han som föll i vattnet; 0 p)

8. Lexical associations:

Chocolate   coffee, water
Hat   helmet
Warm   cold
Go   cycle

(Choklad   kaffe, vatten)
(Mössa   hjälm)
(Varm   kall)
(Åka   cykla)

Appendix B

Assessment of narrative ability

Target story in English

Once upon a time there was a very naughty bus. While his driver was trying to mend him, the bus decided to run away. He ran along the road beside a train. They made funny faces at each other and raced each other. But the bus had to go on alone, because the train went into a tunnel. He hurried into the city where he met a policeman who blew his whistle and shouted: "Stop, bus". But the naughty bus paid no attention and ran on into the country. He said: "I´m tired of going on the road". So he jumped over a fence. He met a cow who said: "Moo, I can´t believe my eyes". The bus raced down the hill. As soon as he saw there was water at the bottom, he tried to stop. But he didn´t know how to put on his brakes. So he fell in the pond with a splash and stuck in the mud. When the driver found where the bus was, he telephoned for a crane to pull him out and put him back on the road again (Renfrew, 1997).

Target story in Swedish

Det var en gång en mycket stygg buss. Medan chauffören försökte laga honom, bestämde sig bussen för att rymma. Han åkte på vägen bredvid ett tåg. De gjorde grimaser åt varandra och tävlade om att köra fortast. Men bussen måste fortsätta ensam, därför att tåget åkte in i en tunnel. Han skyndade in till staden där han mötte en polis som blåste i sin visselpipa och skrek: "Stanna buss!". Men den stygga bussen brydde sig inte om det utan fortsatte ut på landet. Han sade: "Jag är trött på att åka på vägen". Så han hoppade över ett staket. Han mötte en ko som sade: "Mu, jag kan inte tro mina ögon". Bussen rusade ner för backen. Så fort han såg att det var vatten där nere försökte han stanna. Men han visste inte hur han skulle göra för att bromsa. Så han föll i dammen med ett plask och fastnade i leran. När chauffören hittade platsen där bussen var ringde han efter en lyftkran för att dra upp honom och sätta tillbaka honom på vägen igen (Svensson & Tuominen-Eriksson, 2002).

Example 1 (the most advanced narrative, boy aged 7;9).

*CHI: det var en gång en buss .
*CHI: det var en gång en buss som var förståndig eller nånting .
*CHI: o så gick han typ sönder .
*CHI: o när busschauffören tänkte o laga honom så smet han .
*CHI: det var [/] det var ett tåg .
*CHI: eller bussen körde bredvid ett tåg .
*CHI: dom tävlade o tåget gjorde äckliga grimaser .
*CHI: eh@fp sen fortsatte bussen ensam för tåget skulle genom en tunnel .
*CHI: han fortsatte genom en stad .
*CHI: han mötte en polis som viss(lade) [/] visslade i en visselpipa och skrek stanna buss .
*CHI: fast bussen brydde sej inte om honom .
*CHI: bussen fortsatte ut på landet .
*CHI: han blev trött o köra på vägen .
*CHI: så han hoppade över ett staket istället .
*CHI: det var en ko vad det var nu en hona eller hane eller någonting .
*CHI: eh@fp han sa eh@fp jag tror inte mina ögon .
*CHI: det var en backe # som [/] som eh@fp +...
*CHI: bussen # körde så snabbt han kunde nerför en backe
*CHI: o när han såg att det var vatten försökte han bromsa
*CHI: <och eh@fp> [//] fast han visste inte hur han skulle bromsa .
*CHI: så han föll ner i leran .
*CHI: o sen när busschauffören hittade honom då [x 3] ringde han .
*CHI: eller sen när busschauffören hittade honom på den plats han var då ringde han till en lyftkran som kunde lyfta upp bussen på vägen igen .

Explanations of CHAT codes: [/] retracing without correction, @fp filled pause, # pause, +... trailing off, [//] retracing, [x 3] times 3.

English (literal) translation
Once upon a time there was a bus that was sensible. And then he sort of went to pieces. And when the chauffeur was going to mend him he ran away. It was a train. Or the bus drove beside a train. They competed and the train made disgusting faces. Then the bus went on alone since the train should go through a tunnel. He went on through a city. He met a police who whistled in a whistle and shouted stop bus! But the bus paid no attention to him. The bus ran on into the country. He became tired of going on the road. So he jumped over a fence instead. It was a cow, what was it now a female or a male or something.

He said I can´t believe my eyes. The bus drove as fast as he could down a hill. And when he saw that there was water he tried to brake. But he didn't know how he should brake. So he fell down into the mud. And then when the chauffeur found him then he telephoned. Or then when the chauffeur found him on the place he was then he telephoned a crane that could lift back the bus on the road again.

Scores and comments: The Bus story scores: Information score 46p, Number of subordinate clauses 7, MLU 15. The NAP scores: Topic maintenance 3p, Even sequencing 3p, Explicitness 3p, Referencing 3p, Conjunctive cohesion 2p, Fluency 2p (the fluency dimension cannot be assessed from this excerpt since pauses and mazes have been omitted for the sake of readability). Number of propositions: 25. Story elements: No formal ending device (e.g. "the end") can be discerned.

Example 2 (the least advanced narrative, boy aged 6;0)

```
*CHI:        den hoppade .
*CHI:        o sen kom han .
*CHI:        sen körde han .
*CHI:        han satt där inne i bussen .
*CHI:        han klarade sej .
*CHI:        glasögon .
*CHI:        hund o katt .
*CHI:        elefant o katt .
*CHI:        o en elefant o katt .
*CHI:        dom körde in där till garaget .
*CHI:        sen alla bussar .
*CHI:        snipp snapp snut så var sagan slut .
*CHI:        sen åkte dom hem .
*CHI:        upp o ner .
*CHI:        vad hände .
*CHI:        vissla .
*CHI:        han hoppa sånt .
*CHI:        mu det kan inte vara sant .
*CHI:        sen sprang han .
*CHI:        för han den där leran .
*CHI:        för han åkte ner i leran .
*CHI:        han klarade sej .
```

English (literal) translation
It jumped. Then he came. Then he drove. He sat there in the bus. He got along. Glasses. Dog and cat. Elephant and cat. And an elephant and cat. They drove in there to the garage. Then all buses. Then they went home. Up and down. What happened. Whistled. He jumped such. Moo! It can´t be true. Then he ran. Because he there mud. He went down into the mud. He got along.

Scores and comments: The Bus story scores: Information score 2p, Number of subordinate clauses 0, MLU 5. The NAP scores: Topic maintenance 1p, Even sequencing 1p, Explicitness 1p, Referencing 1p, Conjunctive cohesion 1p, Fluency 3p (the fluency dimension cannot be assessed from this excerpt since pauses and mazes have been omitted for the sake of readability). Number of propositions: 12. Story elements: No formal beginning and orientation, no initiating event, no problem and no formal ending device (e.g. "the end") can be discerned.