# Knowing you, Knowing me

# Mentalization Abilities of Children who use Augmentative and Alternative Communication

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## Abstract

The present thesis investigated several components important to the understanding of mentalization for children who use augmentative and alternative communication (AAC). The result of the thesis demonstrated that non-verbal mental age correlated significantly with mentalization tasks, and that the participants did not significantly differ compared to a nonverbal age-matched group of children without disabilities. Different expressions of active participation, which is necessary to be able to display mentalization in dialogue, was observed in analysed interaction. The children's social networks were limited and consisted of very few peers, thus limiting the possibilities of active participation. The number of peers in the children's social networks correlated significantly with aspects of the children's mentalization ability. Children who use AAC display their mentalization abilities independently in social interaction and through e-mail messages to peers. A wider construct that will have relevance to mentalization in ordinary situations is described encompassing several different abilities. The development of these abilities is dependent on the child's capacity for adapting a cognitive flexibility when reflecting and theorizing on what is happening in a given situation. The development of mentalization is also dependent on a child's close friendships, active participation in interaction, functional language ability, and varied social networks consisting of both peers and adults.

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## List of papers

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

I.

Sundqvist, A., & Rönnberg, J. (2010). Advanced theory of mind in children using augmentative and alternative communication. *Journal of Communication Disorders Quarterly*, *31*, 86-97.

II.

Sundqvist, A., Plejert, C., & Rönnberg, J. (2010). The role of active participation in interaction for children who use augmentative and alternative communication. *Communication and Medicine*. Accepted for publication.

III.

Sundqvist, A., & Rönnberg, J. (2010). Social network and theory of mind abilities in children who use augmentative and alternative communication. Submitted.

IV.

Sundqvist, A., & Rönnberg, J. (2010). A qualitative analysis of e-mail interaction of children who use augmentative and alternative communication. *Augmentative and Alternative Communication*. Accepted for publication.

Winter, spring summer and fall

all you got to do is call
and I'll be there, yes I'll be there
- You've got a friend
James Taylor, 1971

#### Introduction

A great deal, if not all, of what we do in life is aimed at getting to know more about ourselves and getting to know more about others. As human beings, we are interested in social contacts and we want to talk to and relate to others. By exploring different social arenas and interacting with different people we will learn more about who is 'like me' and more about who or what is 'not like me'. It is through interactions that we are able to understand the world and the minds of the people in it. The ability to understand and think about feelings, emotions and thoughts in others as well as in oneself has been termed mentalization. This thesis concerns different aspects of mentalization in children who are not able to talk and not able to move around independently. Due to language, cognitive and mobility issues they may not have the ability to explore, express or develop an understanding of the world and an understanding of the mind of others.

## **Outline of the thesis**

This thesis starts with an overview of the development of mentalization, followed by a brief presentation of different theories regarding contributing factors behind the mentalization development. Additionally, the role of interaction and social networks is described in relation to mentalization. Research specifically in the field of augmentative and alternative communication (AAC) is discussed in the following section. Different factors possibly responsible for the development of mentalization in children who do or do not use AAC are also described. Following a brief summary of papers, I – IV, the findings regarding the development of mentalization in children who use AAC are described in relation to abilities and factors such as language, cognition, interaction, participation and social networks. Finally, clinical applications and suggestions for future research are discussed.

## The Development of Mentalization

...a robust trait that will develop in virtually every human

being so that society can count on it and try to foster and grow it.

Frans de Waal, 2009, p. 209

Mentalization is a complex skill integrated in our social competence and social cognition. The development of mentalization is often described as occurring in stages (Wellman & Liu, 2004) where the child gradually acquires skills in understanding that other individuals might think, act and feel differently than the child itself, as well as understanding thoughts and feelings within themselves (Meltzoff, 1999).

Imitation and shared attention are referred to as early mentalization abilities (Meltzoff & Decety, 2003). From birth, the child starts to figure out a sense of self. This is one of the central developmental trajectories in the child's development. The first step in understanding about other people can be observed through the child's imitation ability. In the early interaction between the child and the caregiver, they engage in reciprocal imitation, which will strengthen the social attachment between them (Heimann, 1998; Zeedyk & Heimann, 2006). It will, furthermore, give the child many ways of practicing 'this is me' and 'that is you' (Meltzoff, 2007). This social learning situation involves observing others, listening to others and learning from others. Another important ability is to share attention, to be able to look at the same object as another person, and to perceive the 'sameness'. This will allow for a common ground for interacting about what is looked upon (Meltzoff, Kuhl, Movellan, & Sjenowski, 2009).

The feeling of empathy is another building block for social interaction and learning. De Waal (2009) describes the development of empathy as involving three layers, one core automatic emotional contagion, followed by a perceived concern for others and more advanced levels of perspective-taking. Empathy can, according to de Waal, be viewed as a Russian doll. The inner part concerns an innate reflexive state-matching (emotional

contagion) to others. This may be exemplified by the infant who cries when hearing other infants cry, or when we laugh when someone else laughs and yawn when someone else yawns. The next doll, which is developed from the core, is a concern for others. This can be observed when we know not to play as rough with a younger sibling as with an older brother. It can also be seen in the small child who moves up to a crying friend and puts an arm around him or her to consolidate. The outer doll represents perspective-taking and increasingly advanced mentalization abilities. It is through experiences in relating to other people and other settings that the layers of empathy develop. These layers become increasingly advanced and contain more multifaceted empathic reasoning (De Waal, 2009).

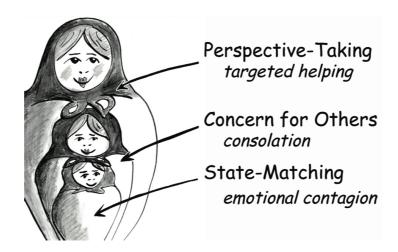


Figure 1. The Different Layers of Empathy (De Waal, 2009)

Imitation, shared attention and empathy are basic social skills, essential for human development (Meltzoff et al., 2009) and the building blocks of reasoning about mental states (Yamaguchi, Kuhlmeier, Wynn & van Marle, 2009). The ability to understand mental states, such as beliefs, desires, emotions and intentions of others is what has been referred to as *theory of mind* (ToM) or *mentalization* ability (Siegal & Varley, 2002; Wellman, Cross, & Watson, 2001; Yiramya, Erel, Shaked & Solomonica-Levi, 1998).

Gradually, during the child's first years, skills are acquired in understanding that other individuals might think, act and feel differently than the child itself. To be able to understand that another person is thinking is called first order ToM (Wimmer & Perner, 1983) and is an important prerequisite for understanding the purpose of interacting with other individuals. An

understanding that other people may hold a *false belief* is often referred to as one aspect of first order ToM and this is usually achieved by age four. The development of first order ToM is fundamental for acquiring a second order of ToM. When a second order ToM is developed around age seven, the child understands that another person understands something about someone or something else (Baron-Cohen, Leslie, & Frith, 1985). This will enable the child to make sense of another person's reactions to a situation and the other person's reactions to the child's interaction (Baron-Cohen, O'Riordan, Stone, Jones, & Plaisted, 1999).

Mentalization continues to develop through the childhood years, but is increasingly dependent on the cultural and social stimulation the child experiences (Flawell, 1999; Welch-Ross, 1997). Examples of complex mentalization abilities that are developing later are subtle understanding of social deception such as bluffs, white lies, (Happé, 1994) and faux pas understanding (social blunders) (Baron-Cohen et al., 1999; Wellman & Liu, 2004). Other aspects thought to represent an understanding of how older children understand minds are the interpretation of ambiguous events. Ambiguous events were assessed in a study by Bosacki and Astington (1999) where a scenario that evoked several possible interpretations was described to the child. The child was then asked to present two alternative interpretations to the story. Understanding of irony and sarcasm are other possible late developing mentalization tasks (Happé, 1994). If children with intellectual disability are exposed, in a training situation, to novel social situations involving complex mentalization abilities, they are able to develop an understanding of these mentalization abilities (Danielsson, Sundqvist, Rudner, & Rönnberg, 2010).

Previously, the research in the field of ToM has largely focused on the narrow capacity to understand false beliefs (Sterck & Begeer, 2010). In this thesis the original and broad definition of ToM - to impute mental states to self and to others (Premack & Woodruff, 1978) will be employed as a definition of mentalization ability. A broader view, rather than a narrow view, will have more relevance to the use of mentalization in every-day social interactions (Astington, 2001; Flavell, 1999). In the continuation of this thesis, the broad ability will be referred to as mentalization and the term ToM will refer to specific subcategories of the mentalization ability.

## **Theories of Mentalization Development**

Although, the stages and milestones of understanding beliefs, thought, desires and emotions as well as first and second order ToM are fairly agreed upon, there is disagreement as to the causes of development. Several different accounts of mentalization development have been put forth. Four dominant theories of mentalization development will be described followed by sections relating to the research on mentalization and the role of linguistic abilities as well as biological results to support neurological correlates of mentalization.

## **Modularity Theory**

Modularity theory suggests that mentalization is a core innate biological ability, consisting of a module or several modules. These separate modules are automatically triggered by the environment. The environment does not, however, determine or alter the ToM maturation process (Baron-Cohen, 1989; Fodor 1992; Leslie, 1994; Siegal and Varley, 2002). As the modules are triggered, an understanding of the module is possible. Several different, sequentially acquired, modules are described, and when they have matured, adult mentalization ability is attained. One of the first modules is for example called the 'Theory of Body' and develops in the child's first year. It will enable the child to recognize that other individuals are able to move on their own (Flavell, 1999). Other modules concern intentionality of individuals and understanding of goals and attitudes as well as a selection processor that allows for executive functions. The development of mentalization is considered a maturation process where age is an important factor and individual differences and experiences are less important (Leslie, 1994).

## **Simulation Theory**

Simulation theory states that the acquisition of ToM takes place when the child mentally simulates what he or she thinks the other person might feel, think or do (Harris, 1991). The child is using his or her imagining capacity to understand others, by first having an understanding of self. The child develops a more advanced mental state thinking as practice in taking other roles improves their simulation skills. Consequently, if the child has limited opportunities for social practice their mentalization ability may become underdeveloped.

## **Theory Theory**

'Theory-theory' states that the development of mentalization originates from rich innate abilities that are the basis of the theories of mind that the child forms (Meltzoff, 1999). Important abilities such as joint attention, imitation and memory help the child to start creating theories to make sense of the world. The developing child builds theories that change as the child experiences new events and tries to understand them. The theories of the child enable mentalization development through a continuous series of reorganizations of the child's thoughts based on the input from other individuals and the environment (Gopnik & Meltzoff, 1997). The social environment the child experiences will determine how and in what way the child will develop an understanding of others (Gopnik & Wellman, 1994).

## **The Executive Function Hypothesis**

Another theoretical standpoint is that one underlying cognitive ability is responsible for the mentalization development. Studies have shown mentalization ability to be correlated with executive functioning (Carlson, Moses & Brenton, 2002; Gordon, & Olson, 1998). Frye (2000) and Zelazo (1998) propose that a domain-general executive functioning and cognitive flexibility capacity is responsible for abilities such as ToM but also other nonverbal abilities. This ability enables the child to gradually be able to hold and manipulate items and facts in mind, regardless of whether it is mentalization or physical causality. Increases in complexity are dependent on degrees of embedded judgements (if-if-then). An example of this would be "if Anna has changed location of a key, if Pelle does not know about this, then he will look in the wrong place". An inability to complete this task would stem from not being able to keep the two 'if-statements' active while concluding the 'then-statement'.

Another possible account to consider, besides the above-mentioned theories, is the role language plays for the understanding of mentalization, since we use mentalization when we talk to other people and try to understand other people.

## **Linguistic Abilities and Mentalization**

Language is a means of relating to and interacting with others,

of being (or becoming) in the world

Per Linell, 2005, p. 45

Many mentalization tasks require language understanding of the child in order for him or her to be able to reason about the task. The causative relation between language and mentalization ability is, however, uncertain (Fischer, Happé, & Dunn, 2005; Hale & Tager-Flusberg, 2005; Hughes & Leekam, 2004). It is plausible that a bidirectional link exists where general language ability and mentalization ability are co-dependent on each other to develop (Slade & Ruffman, 2005).

One problem in separating language abilities from mentalization abilities may reside in the definitions as such. Bloom (1988) defines language as the interaction of content, form and use. The content of language is the general ideas one may communicate about (i.e., object knowledge, object relations and event relations). The form of the language is the shape or contour of what has been said (phonology, morphology and syntax). The use of language (or pragmatics) is described as 1) the use of language for different goals or functions, 2) the use of information from context to determine what we say in order to achieve goals, and 3) the use of the interaction between persons to initiate, maintain and terminate conversations. This definition of language incorporates the abilities one needs to be able to interact with others, one such ability being mentalization. This is as reasonable definition since there is little use of language if one does not know how to use it, fill it with content or put it in a form that others may understand.

Language is, thus, not only found in one individual's mind. Rather, it may be viewed as the communicative action that publicly takes place between participants in interaction (Linell, 2009). If language is to be viewed as a collaborative achievement, jointly constructed by the communicators (Clark, 1996), the division between language and mentalization is fuzzy. Language, meaning, feelings, intentions and interaction are intertwined and not just individually received or transmitted.

Cognitive abilities such as nonverbal reasoning, auditory and visual working memory and language can be seen as co-opted abilities underlying the development and production of

mentalization abilities (Siegal & Varley, 2002). Depending on the mentalization task different cognitive abilities may need to be allocated and therefore different cortical regions may be activated. By examining how the brain is activated with brain imaging techniques, depending on different tasks, it may be possible to visualize the neural networks of mentalization.

## The Neurological Basis of Mentalization

Recent research seems to support the view of emotional (state-matching and concern for others) and cognitive empathy (mentalization) as separate entities (Preston & de Waal, 2002). The core abilities of imitation, emotional contagion (state-matching) and emotional recognition have been related to the inferior frontal gyrus (Norris, Chen, Zhu, Small & Cacioppo, 2004; Shamay-Tsoory, Aharon-Peretz & Perry, 2008). This area has also been suggested to be related to the mirror neuron system and activated automatically when viewing actions of others as well as when viewing and imitating emotional faces (Decety & Jackson, 2006; Dimberg, Thunberg & Elmehed, 2000). Broca's area is also located within in this gyrus. Broca's area is responsible not only for the production of language, but also language functions such as understanding the meaning of syntactic structures as well as understanding human actions (Fazio et al., 2009). This complexity is noteworthy for the relationship between language and mentalization abilities.

The higher cognitive function of cognitive empathy (perspective taking/mentalization) is related to the medial prefrontal cortex (Decety & Jackson, 2006; Shamay-Tsoory et al., 2008; Walter, Adenzato, Ciraramidaro, Enrici, Pia & Bara, 2004). Brodmann areas 11 and 10 were especially critical for the understanding of cognitive empathy (Shamay-Tsoory et al., 2008). Interestingly, Brodmann area 10 has also been shown to be activated in executive functioning tasks and analytical nonverbal problem solving tasks such as Raven's progressive matrices. This area is also of interest in retrieval of episodic memory, especially in the right hemisphere (see review Calbeza & Nyberg, 2000).

Thus, there seem to be two systems responsible for mentalization abilities, one named 'emotional empathy' which is related to earlier developing abilities such as imitation and action understanding. The other system is a 'cognitive empathic system' (mentalization abilities) activated in the same area as executive functioning tasks and retrieval of previously experienced events. Although there are two separate systems, both systems will be evoked in every empathic response, but to a varying degree depending on the social context (Shamay-Tsoory et al., 2008). The medial prefrontal cortex is sensitive to social content regardless if it

is emotional, but is only sensitive to emotional content when the content is also social. The inferior frontal gyrus is sensitive to emotional content regardless if it is social or not, but is not sensitive to social content if it is not emotional (Norris et al., 2004).

To sum up, four major explanatory theories have been suggested to the development of mentalization. Modularity theory, on one hand, views mentalization as domain-specific modules that develop as the child grows. Theory-theory, on the other hand, views interaction as essential for the development of mentalization through series of reorganizations of earlier capacities and abilities. Simulation theory suggests that the child understands him or herself first and through mirroring others in themselves develop mentalization. Finally, the executive functioning hypothesis states that there is no difference between the capacity to understand that a ball will bounce if there is an obstacle and to understand how someone will react. These are two possible scenarios where you need a flexible thinking, in a social and a non-social way. Language and cognitive abilities are closely related to mentalization. It is difficult to separate the abilities of language and cognition from mentalization abilities. We use our mentalization ability to explore language and to learn more about the world and vice versa (Meltzoff, 1999). The complexity is also evident when exploring brain imaging studies where two systems of mentalization systems seems to be functioning together, emotional empathy related to for example imitation and action understanding, and cognitive empathic system related to cognitive and language abilities.

The complexity of mentalization makes it difficult when developing and using mentalization assessment instruments. It is important to consider the possible cortical activation that the test may evoke and try not to measure several aspects (i.e. memory, complex linguistic structures, or vocabulary) at the same time as this will tax several different processes and may not measure the mentalization ability specifically. However, it is also of importance to try to assess mentalization with tasks that are of relevance and correlated with social skills occurring in ordinary situations. When interacting in an ordinary situation we use all abilities, such as vocabulary, working memory and emotional saliency. Is it possible to assess mentalization and consequently learn something about how the child functions socially?

#### **Mentalization Assessment**

The most well known test of mentalization is the Sally-Anne procedure of false-belief understanding (Baron-Cohen et al., 1985; Baron-Cohen et al., 1999). This is a test of first

order ToM. By the age of four, most children understand that another person may have a (false) belief that differs from what the child knows. Before the age of four, the child usually equates what it sees with what everyone else knows as well. The test consists of a story that is played out with dolls subsequently to which the child is asked questions about mental beliefs. In this thesis, a Swedish version of the story was used (Dahlgren, Dahlgren Sandberg, & Hjelmquist, 2003) and the names of the dolls were substituted with Swedish names. The story and test is as follows:

The dolls Anna and Pelle were playing together. They were hiding a key under an upturned box or its lid. Pelle first hid the key under the lid. When Pelle had left the room, Anna removed the key from under the lid and placed it under the upturned box. Pelle returns.

The experimenter asked the child, "Where will Pelle look for the key?" (Belief question). To ensure that the child remembers and understands the story, a reality question ("Where is the key?") and a memory question ("Where was the key?") was asked (Dahlgren et al., 2003).

A further step of this procedure would be to test second order ToM with the same doll play situation as described by Baron-Cohen et al. (1999). The doll play is acted out as in the first story, with the exception that Pelle is looking through the keyhole seeing Anna switching the location of the key. The child was then asked, "Where does Anna think that Pelle will look for the key?" and "Where will Pelle look for the key?" (Baron-Cohen et al., 1999). Second order ToM is understood by the age of around seven.

As the child experiences the social world, the abilities that are considered a growth of mentalization have been tested through the understanding of short stories (Happé, 1994). These stories assess understanding and detection of irony, white lies, bluffs, figures of speech and similar aspects.

Baron-Cohen et al. (1999) has described social blunders (faux pas) recognition as another way of assessing advanced ToM. A faux pas is a social construct and comes about when a person says or does something without considering that it may have a negative effect on another person. For example:

James bought Richard a toy airplane for his birthday. A few months later, they were playing with it, and James accidentally dropped it. "Don't worry" said Richard, "I never liked it anyway. Someone gave it to me for my birthday."

Children older than 10 years of age and adults, with knowledge of western culture, would experience this as a social blunder and they would realize that this was an embarrassing act on Richard's behalf. A younger child might also feel embarrassed listening to the same passage, but the embarrassment lies with James who has bought such a bad gift. Bosacki and Astington (1999) examine ambiguous stories as yet another way of assessing advanced ToM. They argue that the capacity to use alternative thinking and taking on different conceptual roles, showing empathic sensitivity, explains individual differences in adolescents' ToM understanding and social competence. These tests represent an attempt to develop instruments that assess mentalization in situations that the child might have experienced or can imagine. There has been some concern that commonly used tests of mentalization do not assess abilities that correlate with mentalization requirements in ordinary situations (Begeer, Malle, Nieuwland, & Keysar, 2010; Leudar & Costall, 2009). There has been a unexplored understanding that ToM tests are measuring capacities which will have a relevance to how the person function in ordinary situations, but the commonly used tests of mentalization ability do not always correlate with ratings of social competence or social functioning (Dahlgren et al., 2003). Therefore, there is a need to develop tests that assess mentalization that have a strong ecological validity and are measuring aspects of mentalization that are relevant in real life.

It is in interaction with other individuals that we use our mentalization ability, to adapt and to negotiate the communication project initiated in cooperation with our communication partner (Hale & Tager-Flusberg, 2005). Mentalization, just as language, may reside not in the mind of the individual, but rather in the interaction that takes place between the individuals.

## **Interaction and Dialogue**

It has been suggested that children construct an understanding of mind within the context of social interaction (Carpendale & Lewis, 2004). Being in interactions where emotional content is highlighted and discussed will help the child to understand about other

people's minds as well as understanding more about themselves (Hughes & Dunn, 2002). The way a mother talks to her infant has predictive power for the successive development of mentalization. This phenomenon is termed 'mind-mindedness' and is signified by the mother's use of mental state language (for example; think, believe, like) when talking to (or instead of) the infant, regarding what she believes the child is focused on (Meins, Fernyhough, Wainwright, Das Gupta, Fradley, & Tuckey, 2002). An example of this is if a mother speaks instead of her, yet not speaking, infant when they playing a tickle-game: "I like being tickled".

Few studies have, however, examined mentalization in ordinary interaction. Some studies have assessed how mentalization is executed in semi-structured play tasks. In a study of social interaction in children with autism, children's playtime with a parent was analyzed. Parts of interaction was selected and coded with regard to content congruency (Hale & Tager-Flusberg, 2005). If the child was able to respond in a manner that was in tune with the adult's response, it was coded as congruent. Using a broad test-battery of tasks that included many different mentalization aspects, such as false-belief tasks, role-play, and moral judgement, a correlation was substantiated with if the child was in tune with the communication partner in the interaction or not.

Another aspect that has been studied in interaction is repair-strategies. Repairstrategies are used to clarify and move the conversation forward (Beeke, Maxime, & Wilkinson, 2007; Collins, Markova, & Murphy, 1997; Schegloff, Jefferson &, Sacks, 1977). When a breakdown in conversation occurs, the communication partner will usually request clarification and the speaker must initiate repair to promote continued and effective communication (Volden, 2004). In a conversation, there is an abundance of repair, and participants may use repair-strategies that save face and that do not unveil the individual (Bloch & Wilkinson, 2004; Plejert, 2004). These repair-strategies are important windows into the interaction partners' mentalization ability. Volden (2004) studied repair-strategies in interaction between children with autism and their caregivers. It was concluded that repair strategies are not only connected to mentalization ability but also to memory. Analysis of the repair strategies that occur in interaction display what the child thinks that he or she needs to say in order to be better understood. It also illustrates how the child is able to adapt the message when he or she appears not to be understood. It may also implicitly tax the child's working memory, as the child needs to remember what has been said and the clarification asked for, while at the same time trying to reformulate the utterance.

Interaction in diverse situations with different people leads to a greater understanding of other people and to a feeling that they are more or less 'like me' (Meltzoff et al., 2009). The development occurs concurrent with the child's experiences of the world and the communicative interaction that develops about feelings and thoughts about the world. Individual differences in the child's interactional abilities and mentalization abilities are related to the child's social network (Carpendale & Lewis, 2004). This will be dealt with in the subsequent section of the thesis.

#### **Social Network**

To be included in a varied social network is important for mentalization development. Mentalization develops through a reconstruction of the child's theory of what he or she used to know, and, therefore, the child benefits from many and varied social contacts (Meltzoff et al., 2009). Children interact with a diverse set of individuals from the moment they are born. These individuals range from the immediate family of parents and siblings, to extended family and family friends to children in the neighbourhood and in the play-school setting. It has been suggested that an understanding of mentalization improves with in-depth interactions with a variety of extended family members (Lewis, Freeman, Kyriakidou, Maridaki-Kassotaki, & Beridge, 1996). As the child grows older, children at school and other peer relationships become increasingly important (Levitt, 2005). As peer relationships become more important, the child experiences a range of different social situations and thus a growth in social competence (Levitt, 2005). It is, hence, important to be in a social network of many acquaintances, but it is also important to have close friends. Close personal relationships are thought to be of importance to the development of mentalization, as the content of the interaction in these relationships is more likely to be focused on mental states and feelings. To be able to make friends, there has to be an initial connection through a social network of interactions over time (Chamberlain, Kasari, & Rotheram-Fuller, 2007).

To explore and to disentangle the different components of mentalization and to illustrate the impact certain factors may have on the development of mentalization, children who use augmentative and alternative communication (AAC) have been the focus of the current study. This is a group that has been shown to demonstrate mentalization deficits, but the reason for this deficiency has not been clarified.

#### Mentalization in Children Who Use

## **Augmentative and Alternative Communication (AAC)**

Children who use AAC have in a few studies been found to demonstrate mentalization deficits (Dahlgren, Dahlgren Sandberg & Larsson, 2010; Dahlgren, et al., 2003; Falkman, 2005). The reasons for this is unclear. Children who use AAC often have mobility issues along with their complex communication needs. Therefore, they are seldom able to independently explore the world to the same degree as children without disabilities. Children with motor control problems may not be able to imitate other people or may have problems controlling gaze for joint attention (Martinsen & von Tetzchner, 1996). Such early mentalization abilities are, thus, difficult or impossible to master for a child with motor difficulties. Language is another possible problem. If the child does not have an early alternative means of expressing itself, there will be a reduced amount of practice in interaction, and in understanding language and social situations, with peers and adults alike. Not being able to practice social interaction may lead to fewer opportunities to find out more about if others are 'like me' or not. Thus, there are many different problem areas which might explain why these children experience deficits in understanding or expressing mentalization.

The section below will discuss how *language*, *interaction*, *active participation*, as well as *a social network* may work as possible contributional factors to the development of mentalization abilities for children who use AAC.

## The Contribution of Language

Children who are in need of AAC may belong to one of three different groups based on their reasons for using AAC (Martinsen & von Tetzchner, 1996). The three functional groups are:

- a) The expressive group This group needs AAC as a permanent means of communication. The motor control impairment of these children makes it difficult or impossible to communicate using their speech. They do not, however, have problems understanding speech
- b) The supportive group Individuals in this group are temporarily in need of AAC. This group also comprises individuals who need AAC as an addition to the speech they are able to produce

c) The alternative group – This is a group who needs AAC as a complement in order to be able to understand speech and as a means to express themselves

Early implementation of an alternative way of communication is very important (Cress & Marvin, 2003). The augmentative and alternative system chosen, needs to be able to develop with the child's maturing communication requirements and the system needs to be flexible, yet individually tailored (Martinsen & von Tetzchner, 1996). The child needs to have an efficient way of letting the caregivers know what he or she wants and requests. The communication system should make it possible for the child to communicate in a way that is efficient (i.e. as quickly as possible), effective, (i.e. the intended meaning is delivered), and socially acceptable (Light & Binger, 1998). Since an important mentalization benchmark is to be able to understand feelings, thoughts and beliefs, it is important that the child can express this in symbols. The children who participated in the current thesis primarily used Blissymbolics but also some other alternative communication such as body language, sounds, signs, pictograms, PCS-pictures or digital pictures (Table 1).

Alternative and Augmentative Communication	Example: Happy
Bliss	glad, lycklig
Body language	"Laughing"
PCS	
Pictograms	glad
Digital pictures	
Signs	

Table 1. Different modes of Augmentative and Alternative Communication

**Blissymbolics** 

"I would have been just another vegetable if I hadn't had Bliss"

#### An individual who uses Bliss

Blissymbolics is a communication system composed of more than 3000 bliss-words. An iconic and dynamic communication-system, like Blissymbolics, enables the user to express novel ideas by combining different symbols. Blisssymbolics provides the possibility of producing grammatical inflections such as the plural and the definite articles; it also enables talk about the future as well as the past (Beukelman, & Mirenda, 2005). When communicating with Blissymbolics, the individuals have the possible to express themselves in a versatile way and if additional charts also are available, the communication may be tailored to individual needs. The language form, content and use has the possibility to be efficient, effective and socially acceptable (Light, 1989).

#### **The Contribution of Interactional Practices**

"My task is to do as much as I can, so that he can do as much as he can by himself"

## Assistant to a child who uses AAC

Interaction with an individual who uses AAC requires adapted actions from the individual who uses AAC, as well as from the interaction partner/s. The individual who uses AAC is often dependent on the communication partner to be the voice of the symbol pointed to, or to associate the symbols pointed to with the intended word. This requires a lot of effort and communicative competence, on both parties (Light, 1989).

Light (1989, p. 143) defines communicative competence, as "...the ability to functionally communicate within the natural environment and to adequately meet daily communication needs." The acquisition and integration of different capacities such as linguistic, operational, strategic and social skills are necessary to develop communicative competence (Light, 1989). An effective use of these skills is needed to be perceived as a competent communicator. Linguistic skills refer to the use and understanding of language. Operational skills refer to the skill and knowledge of using the AAC-system at hand, and strategic skills are the skills used to make the interactions easier (for example introductory statements). Social skills refer to the ability of the child to know how to act and adapt to

different social situations (Light, 1989) and are dependent on an understanding of other people.

The skills of the communication partner are also of importance in interaction. Light, Collier and Parnes (1985) describe the interaction between a non-speaker and a speaker as often being asymmetrical and controlled by the speaker. There is also a timing-issue, since AAC is time-consuming, and there is a chance that the child is not given the time necessary to take his or her own interactional turn. It is common that the individual who uses AAC does not take an active part in the interaction and leaves the interactional responsibility to the speaker (Clarke & Wilkinson, 2007; Clarke & Wilkinson, 2008). Both parties need to commit to the conversation to be able to achieve a more symmetrical interaction where both the individual who uses AAC and the speaker are actively participating.

Thus, the communication skills of both the child who uses AAC as well as of the communication partner are of vital importance for the development of the child's mentalization ability. If the child is not included in the interaction and not allowed to be in control of his or her own contributions, there is a risk of a less developed mentalization ability.

## The Contribution of Active Participation

"It is a great challenge to relate to this pupil every day so he feels that he is one of all pupils in the class"

Teacher to a child who uses AAC

To be able to participate actively in interaction is important for the child's developing identity (Almqvist & Granlund, 2005). Participation is a subjective phenomenon and as such difficult to define. In a study where children with disabilities were asked about their view on participation, the conclusion was that it was divided into three themes (Eriksson & Granlund, 2004). One of the themes related to positive experiences of being in control and belonging by being active in the interaction. Another theme entailed the ability to be able to act in a situation or a context and the third concerned the availability of activities and interaction possibilities within the environment (Eriksson & Granlund, 2004). To actively participate in interaction would, therefore, entail being in control in a wide array of activities and being able to take action independently. The child has to be allowed to be in control of the

communication situation independently and the communication activity has to be allowed to originate from the child.

A link between discourse skills and mentalization abilities has been demonstrated in children without disabilities (Welch-Ross, 1997). Children who were active participants in the interaction also displayed higher mentalization ability. Children's reasoning about conflicting states correlated with the information the children provided in a discussion about past events. As the children and their mothers discussed a jointly experienced event the children's ability to coordinate their own event representation with the representation of their mothers were important to the efficiency of the discussion (Welch-Ross, 1997). Hale and Tager-Flusberg (2005) also demonstrated that children with autism who show content congruency in the interaction and participate actively, score higher on a test battery of mentalization. It is apparently important to be able to understand minds to be able to engage in everyday social exchanges and vice versa (Astington & Jenkins, 1995).

If the children are going to be able to use a variety of mentalization abilities, there has to be a social network around them which consists of peers and adults, as mentalization skills are used for different purposes with different individuals, for example in pretend play or when making joint proposals (Astington & Jenkins, 1995). This will be dealt with in the forthcoming section.

## The Contribution of the Child's Social Network

"It is pretty exiting to have a person like him in the class"

Classmate of a child who uses AAC

The social network of an individual who uses AAC is often limited, with few peers resulting in a greater experienced loneliness compared to individuals without disabilities (Cooper, Balandin, & Trembath, 2009). Skär and Tamm (2002) report that children with mobility issues often are excluded from being with peers in different settings and have more difficulties making friends. The parents may with good intentions overprotect the child with a disability, preventing him or her from participating in social situations outside the home (Skär & Tamm, 2002). The social network of a child with multiple disabilities is often a reflection of the parents' social network and does not display a growing independence the way the social network of a child with typical development would (Wilder, 2008). It is important that a child with complex communication needs also gets the opportunity to explore important

peer relationships outside the family. For obvious reasons, there are often adults interacting with children with disabilities, since they need help and support in many areas of their lives. It is therefore necessary that these adults are capable of helping the child to connect with children in school (Skär & Tamm, 2002). The child needs to experience peer relationships as well as adult relationships to be able to develop self-reliance, positive feelings of belonging and identity growth (Eriksson & Granlund, 2004; Skär & Tamm, 2002). The lack of experiencing diverse social settings may lead to secondary disabilities such as low self-esteem and underdeveloped social skills (Tamm & Skär, 2000).

Today, children with disabilities are often placed in general classrooms instead of special schools. This is a positive trend for many reasons. Just being placed in an integrated classroom increases interaction with peers without a disability and might lead to increased levels of engagement in the activities of the school day (Hunt, Farron-Davis, Beckstead, Curtis, & Goetz, 1994). Experience with a variety of social situations and different social relationships correlated positively with social competence (Levitt, 2005). This experience comes from practice in real-life situations (Chamberlain et al., 2007). Being underexposed to social stimulation, having a limited social network and few close relationships may have a detrimental effect for the development of mentalization.

#### Mentalization Assessment of Children Who Use AAC

"If I didn't have a language I would just sit silent and think, and talk with my eyes"

#### An individual who uses Bliss

Children with complex communication needs who use AAC have in some studies been found to have a delayed ToM development (Dahlgren et al., 2010; Dahlgren et al., 2003; Falkman, 2005). Falkman, Dahlgren Sandberg, and Hjelmquist, 2005 have in a small longitudinal study concluded that the children were delayed but not deviant in their ToM development. Cognitive ability and working memory did not seem to be an explanatory factor to these children's difficulties, since they performed on a par with matched control group on everything but ToM tasks. Their results point to a specific delay of ToM in addition to the general cognitive limitations that four of the six children in the study had. This result is similar to another study where, compared to a matched control group, the children with severe speech difficulties underperformed on false-belief tests (Dahlgren et al., 2010). Worth noting is, however, that this was not a clear-cut mentalization deficit, since 64 % of the children with

severe speech difficulties in the study did *not* have mentalization problems. The two tasks used to assess ToM ability were the Sally-Anne procedure (in a Swedish adaptation) and 'thought pictures'. In the 'thought picture-test' the child was shown a picture with a critical object hidden and the child could lift the flap to see what was underneath. The child was then asked to choose from several pictures and point to a picture portraying what a novel viewer would expect to see behind the flap. Results from the language understanding and working memory tests correlated highly with these ToM tasks. Examining a combined measurement of ToM (Sally-Anne and thought pictures), there was a positive correlation with nonverbal IQ, possibly indicating a relation with nonverbal reasoning and mentalization tasks.

Some concern has been expressed as to the relevance of false-belief testing for real life situations and, a conclusion is that a combination of language competence and intellectual level is the best predictor of ToM (Dahlgren et al., 2003). A broader test battery, including several mentalization tests has proven to correlate better with every-day use of mentalization than a narrow false-belief test-battery (Hale & Tager-Flusberg, 2005).

It is not clear if children who use AAC are delayed or deviant in their mentalization development. There are several aspects of the child's cognitive and language ability, as well as aspects in the social world that may be of relevance for how, why and in what way the child may develop mentalization abilities.

## **Mentalization in Disability Research**

By applying a multifaceted perspective on the study of a complex cognitive phenomenon, such as mentalization, one is able to pursue an understanding at several different levels of description and explanation (Bhaskar & Danemark, 2006). When using an approach that triangulates data, variables that may confound the data may be disentangled. Conducting disability research entails collecting empirical data of the phenomena at hand with the aim of finding mechanisms that may produce, facilitate or hinder the development or presence of the ability. When a complex phenomenon is examined, it is possible to stratify at least three levels of examination. The most fundamental level is the biological, the next level is named the psychological and the highest level is called social and cultural (Rönnberg, 2005). By integrating the knowledge generated at different levels, collected with different methods, with relevant theories applied to the concept of mentalization, a more holistic view of this phenomenon may be generated.

A child who uses AAC is in a vulnerable communication situation, both at the psychological, social/cultural and might be as well on the biological level. At the psychological level aspects that could be of interest to study are the child's cognitive and language abilities. Is there an underlying cognitive ability that is connected to the mentalization development, as for example the executive hypotheses theorize, or are mentalization abilities core-abilities as the modularist claim? At the social level, examinations of the interaction with the child who uses AAC would be of interest to study, as well as the configuration of the social network around the child. Some of the theories behind the development of mentalization, for example theory-theory and simulation theory, suggest that the child develops mentalization as a consequence of being in social situations and it is, therefore, of interest to study how and in what way a child who uses AAC may interact or have the ability to interact in social situations. A limited social network may also inhibit the child's ability to get to know themselves in the light of others and this will have consequences for the developing mentalization abilities. Is it, furthermore, possible to enhance the social network of the children who use AAC and give them time to practice mentalization abilities in ordinary situations?

## **General Aims**

The overall aim of this thesis is to investigate and analyze possible contributions of different abilities and factors to the development of mentalization in children who use AAC. Since mentalization is a complex phenomenon, the investigation employs a combination of methods and theoretical perspectives. A second aim is to develop an ecologically valid test of mentalization, relating to social abilities used in ordinary situations. A third aim is to implement e-mail communication in order to increase the children's social networks and their possibility to actively participate in interaction. The following research questions are addressed in this thesis:

- 1. What is the relation between mentalization abilities and other cognitive and linguistic abilities? Do children who use AAC demonstrate mentalization deficits compared to comparison groups? (Paper I)
- 2. Do children who use AAC participate actively and use mentalization abilities in communicative settings? (Paper II and Paper IV)
- 3. Do children who use AAC have a varied social network consisting of both peers and adults? Is the social network related to the children's cognitive and mentalization abilities? (Paper III)

## **Methodological Design**

In order to capture the complex nature of abilities involved in the mentalization of children who use AAC, a variety of methods have been adopted in the current thesis, ranging from statistical analysis to qualitative approaches such as Conversation Analysis and analysis inspired by grounded theory. The empirical data collected entail test scores, questionnaires, video observations and transcripts as well as e-mail messages. 14 children who use AAC have participated in this study. The children were between 6-14 years of age. In addition, two comparison groups matched on nonverbal cognitive level were utilized: a group of younger children without disabilities and an age-matched group of children with intellectual disabilities. The methods employed and the children participating in the study are described in detail in the sub-sections below.

## A group and individual difference approach

Paper one included 14 children who use AAC, 14 children with mild intellectual disabilities and 14 children without disabilities. A multivariate analysis of variance (MANOVA) was performed to investigate differences between mentalization abilities of the children. The independent variable was group (AAC group, comparison group without disabilities, and comparison group with mild intellectual disability). The dependent variables were five different mentalization abilities: inferential understanding, attribution of first-order ToM, attribution of second-order ToM, irony, and faux pas understanding. Based on an a posteriori median split of nonverbal intelligence across all groups, additional *t* tests were performed analyzing the effect of nonverbal intelligence on working memory (auditory and visual) and mentalization ability. Correlational analysis of the different test results was performed within all groups and within the AAC group separately.

Paper three investigated the social network of 14 children who use AAC. Quantitative aspects of the children's social network were calculated (median, mean and range). Correlations between the social network and mentalization abilities, cognitive and language abilities were calculated with Spearman's rho.

Additional measurements of Paper four investigated correlational aspects (Spearman's rho.) of the e-mail communication and mentalization abilities.

## **Conversation analysis**

Paper two was designed as multiple case study of three children who have well-developed mentalization abilities and use AAC. Excerpts of the children's interaction with an adult and with a peer were video-recorded for subsequent analysis. By means of Conversation Analysis (Goodwin & Heritage, 1990; Schegloff, 2007), it is possible to conduct in-depth studies of verbal as well as non-verbal communicative resources, e.g. speech, body language, facial expressions, gestures, and for this study, symbol language. Of specific importance is the focus on methods and resources that participants themselves make relevant in interaction. Any detail in interaction may be potentially important and the methodology is employed in order to achieve as complete a picture as possible of the participants' abilities, resources and contributions to interaction.

## **Grounded Theory Inspired Analysis**

In Paper four the children's e-mail correspondence was analyzed. Using a qualitative approach, inspired by grounded theory, the contents of the e-mail correspondence were analysed. The aim was to identify and categorize the phenomena found in the e-mail messages (Dahlgren & Fallsberg, 1991; Strauss & Corbin, 1990). Through an inductive approach, relevant codes were developed for words or sentences that formed meaningful units. These codes were named and codes were compared with each other, trying to make a decision of which codes belonged together. Until discrete topics were developed, each new unit was compared to every other unit. Topics that belonged together were grouped in categories. These categories were then named.

## **Participants**

This study faced several methodological challenges due to characteristics of the studied group. Children who use AAC represent a heterogeneous group. They may differ in diagnosis, age, gender, mobility, mode of communication, educational setting, pedagogical profiles of the school, human and technological resources and differences in family life. These differences may directly or indirectly influence the child's abilities and possibilities of cognitive, communicative, and mentalization development.

The four papers of this thesis share participants from a group of children who use AAC (see Table 2). The children included needed AAC to express themselves and had a cognitive ability within normal limits (nonverbal IQ > 70). All children currently use or have previously used Blissymbolics as their major mode of communication. This made the sample group limited, but yielded a greater similarity in the group studied. Table 2, below, describes in which paper the children participated and the characteristics' of each child; sex, how he or she access their communication system, their major modes of communication, and their mobility. Finally, the table depicts the children's chronological age and calculated nonverbal mental age (derived from Raven's Colored Matrices) at inclusion time.

Table 2. Participant characteristics

Participated in paper:	Sex	Access	Major modes of Communication	Mobility	CA	Nonverbal MA
I & III	M	Points	Bliss/gestures/eyes	Wheelchair	8.0	5.5
I & III	F	Head-mouse	Bliss/sounds/gestures	Wheelchair	10.0	6.0
I, II, III, & IV	M	Points	Bliss/sounds/gestures	Pony Walker	6.5	6.5
I & III	M	Points/speech	Speech/writing/Bliss	Walker walking	12.0	7.0
I & III	F	Scanning	Bliss/sounds/eyes	Wheelchair	12.0	7.0
I, III, & IV	M	Head-mouse	Bliss/sounds/eyes	Wheelchair	12.0	7.0
I, III, & IV	M	Points	Sign/Bliss/sounds	Walking	8.5	7.5
I, II, III, & IV	F	Head-mouse	Bliss/sounds/eyes	Wheelchair	10.0	7.5
I & III	F	Head-mouse	Sign/Bliss/sounds	Wheelchair	11.0	7.5
I, III, & IV	M	Head-mouse	Bliss/gestures	Pony-Walker	11.0	8.0
I & III	F	Points/speech	Sign/speech/gestures	Walking	12.5	8.0
I, II, III, & IV	F	Head-mouse	Bliss/sign/sounds	Wheelchair	12.5	9.5
I & III	M	Points/speech	Sign/speech/gestures	Walking	10.0	10.0
I & III	M	Points/speech	Sign/speech/bliss	Walking	13.0	7.0

## **Summary of Papers**

## Paper I

## Purpose

The aim of Paper one was to examine whether school-aged children who use AAC display delayed or deviant development of mentalization relative to matched comparison groups. In addition, possible factors contributing to the development of mentalization were assessed. The research questions of focus were: Is ToM development affected by the possible lack of a social interactional trigger, or by a core-deficiency, or is the development more dependent on the children's cognitive capacities (Bishop, 1997; Siegal & Varley, 2002)?

#### Methods

The AAC-group, consisting of 8 boys and 6 girls, was group matched with regard to nonverbal mental age (7.2) to a younger group without disabilities (8 boys/6 girls). A second comparison group was also included. This group consisted of children with mild learning disabilities (9 boys/5 girls) matched for nonverbal mental age and chronological age (10.6). Several tests assessing cognitive and language abilities were administered. In addition, a mentalization test-battery was administered. This test-battery entailed false-belief testing (first and second order ToM), picture sequencing, attribution of first and second order ToM, as well as understanding of more advanced ToM (Baron-Cohen et al. 1999; Happé, 1994). Previous research has concluded that the common false-belief may not always be appropriate and may not always correlate with the child's ability to mentalize in every-day interaction test (Beeger et al., 2010; Dahlgren et al, 2003; Hale & Tager-Flusberg; 2005).

Therefore, in addition to the commonly used false-belief task, a new instrument was developed and applied to investigate socially relevant mentalization in children who lack expressive speech yet are proficient communicators: the Socio-Emotional Test of mentalization (SET). The instrument assessed the child's ability to attribute thoughts and emotions to characters in short stories. The stories were developed to reflect ordinary aspects of a child's life and were based on true stories. The original stories were collected from adults retelling events from their childhood. These stories assessed understanding of inference, attribution of first and second order ToM and understanding of irony and faux pas.

#### Results and discussion

The children who used AAC were not delayed or deviant in their mentalization development relative to their mental age and relative to the comparison groups. They passed the false-belief tasks at the age expected from studies of typically developing, and SET appears to capture more advanced mentalization abilities. Nonverbal cognitive ability correlated significantly with mentalization ability assessed with verbally loaded SET and with the visually loaded picture-sequencing task. The observation of well-developed mentalization abilities in children who use AAC is a new discovery and deserves theoretical and clinical attention.

By evaluating the different theoretical views describing mentalization difficulties and emerging mentalization skills, one may conclude that an early exposure to an accessible means of communication (e.g., AAC for children with speech impairment) is a plausible factor contributing to the children's development of mentalization. The current data-set, however, does not represent a large sample, and generalizations may not be applicable to all children using AAC. Nevertheless, within the limits of their early and frequent use of AAC, the group poses an interesting challenge to our conceptualizations of mentalization skill. These children do seem to have been included in interaction about mental states and feelings. This sample of children using AAC possessed the necessary cognitive skills for conversations about mental states and it might be that these early conversations also promoted their cognitive development. Thus, the mentalization skills and cognitive skills tested are closely connected.

There was no evidence of a core deficit in mentalization in the children who use AAC. Rather, the mentalization skills correlated significantly with co-opted systems such as nonverbal logical thinking (Raven's Colored Progressive Matrices) and were possibly promoted by interaction through an early implemented symbol language. Contrary to previous research, the AAC-group did not differ significantly from any of the comparison groups on the mentalization test results.

## Paper II

## Purpose

The aim of Paper two was to identify practices in the children's interaction in everyday school situations that manifested themselves as active participation of the children.

Active participation is supposed to be of great importance for developing and exhibiting mentalization in interaction.

#### Method

The study investigated three children who use AAC (see table 2). The children included in this study were Bliss symbol users. By using Conversation Analysis to study social situations, we used an inductive approach without preconceived notions about what we might find. Conversation Analysis is a multi-modal, in-depth analysis of communicative resources that are important to the interaction such as body language, speech, sounds, signs and symbols (Goodwin & Heritage, 1990; Schegloff, 2007). Three different settings were analyzed for each child: interaction with a peer, a lecture situation with an adult, and a formalized role-play situation. In addition to a regularly used notation system, supplementary transcription symbols were developed in order to visualize specific aspects important to Bliss-communication in the settings investigated.

#### Results and discussion

The study identified three practices which induce active participation of the child who uses AAC. The first practice was the child's sense of control, if he or she was treated as a competent communicator (e.g. could initiate and allocate turns etc.). The second practice signified the importance of co-construction of communicative projects (Linell, 2009) and the possible negative impact of being imposed on a communicative project. A communicative project is defined as an ongoing task that requires the concerted effort of two or more individuals (Linell, 2009). Finally, an important practice was different means of being included in interaction.

When the child is active and engaged in the interaction, there will be many occasions of displayed mentalization. There was, however, several occasions where the communication partner hindered the active participation of the child. Practices where the child did not receive sufficient time to interact, or when the communication partner governed the communicative project are practices that are less favourable for active participation. The communication partners' abilities to follow, share or sometimes inhibit a need to shape communicative projects initiated by the child, were important for the active participation and engagement of the child in interaction.

# Paper III

# Purpose

It is of vital importance to get ample interactional opportunities to be able to learn and develop social understanding through experience. The third study focused, therefore, on the shape of the children's social network and the social network correlations to the children's cognitive and mentalization abilities.

### Methods

In Paper three, 14 children who use AAC participated (see table 2). The Social Network Inventory was used to obtain an overall description of the child's cognitive and language abilities as well as detailed descriptions of the child's formal and informal social network (Blackstone & Hunt Berg, 2008/2003). For the purpose of this study, the investigation was restricted to the social network analysis aimed at obtaining an estimate of the child's social network at home and at school. An interview was made with a teacher from the child's school and another interview was conducted with the child's parents. The child participated in both interviews. We were interested in how many children vs. adults were present in the child's network and the relative closeness of these communication partners. The participating children's test results of cognitive abilities from Paper one were used to find possible correlations between the social network and cognitive abilities.

## Results and discussion

The results of this study showed that the social network of the children with complex communication needs was very limited. There were a small number of peers in the children's social network and very few good friends. An expanding social network is important since it is through experiencing new social situations that the child will learn the socio-cultural aspects of interaction. Interaction is also a very important pathway for learning so having a limited social network can be disadvantageous to the child's general development (Chamberlain et al., 2007; Meltzoff et al., 2009). Children who were included in general classes had more acquaintances than children who attended special classes, but there were no difference when comparing their number of daily communication partners. There was a significant relationship between an understanding of second order ToM and the numbers of peer acquaintances in the child's social network. It is problematic however, to speculate about the direction of the relationship. The child might have gained friends because of his or her

developed mentalization ability, or he or she might have developed a mentalization ability when interacting with the peers. A developed mentalization ability was, however, not enough to be able to make close friends, since very few of the participating children had a close friend. There was a negative correlation between nonverbal cognitive ability and the number of adults in the children's network, but there was no correlation between cognitive ability and peers. Children with lower nonverbal cognitive abilities have more adults as communication partners, whereas children with higher nonverbal cognitive abilities have more children as communication partners.

The results of this paper are discouraging as the children's social networks are small. The majority of children had no close friends and had only a few peer acquaintances, but many adult professionals. There was no correlation between the observation of children having close friends and mentalization abilities. Thus, there appears to be other than the studied aspects that were important when making close friends. However, there was a correlation between the child's understanding of second order ToM and the child's number of acquaintances, signifying the importance of mentalization skills in interaction with others and possibly indicates a pathway to induce mentalization and thus the social network of the child.

### Paper IV

## Purpose

The fourth study entailed an implementation study where the participants e-mailed each other. The focus of paper four was the contents of e-mail messages sent and if developing friendships and mentalization abilities were visible in the exchanges represented by different strategies and topics.

### Method

Originally, 12 children participated in this study. However, the final analyses of e-mail messages were restricted to the six participants who had sent at least 12 e-mail messages. Over a period of 12 weeks, the children engaged in e-mail communication. The contents of e-mail messages were analysed qualitatively. A method inspired by grounded theory was used to generate discrete topics that were clustered into six descriptive categories.

### Results and discussion

A total of 175 messages were sent. Six descriptive categories emerged from the data. The most frequently occurring category was Social Etiquette (e.g. Hello, Happy Easter, Thank you), which accounted for 50% of the topics in the messages. The other important categories for the children were Personal/Family statistics, Personal Common Ground, Preferences, Pastime activities, School/afternoon care and E-mail Queries and Testing.

The children used different categories for separate purposes in their writing. The first messages to an unknown child usually contained the category Personal and Family Statistics as the child asked and explained matters of a personal matter (e.g. regarding age, siblings or grade level). Other topics that were frequent were Preferences (e.g. I like blue) and School/afternoon care (e.g. I'm going to bake) and Pastime Activities (e.g. I'm going to an amusement park). When the children were acquainted to each other, the topics within the category of Personal Common Ground became more frequent. This category contained topics related to a shared activity of the children, an activity mentioned in a previous message or an activity in 'real-life'. E-mail interaction gave the children means to increase their social network, as well as reasons to practice social skills and their mentalization ability in a socially rewarding situation. This is a fruitful way of giving time and space to put the child's mentalization into use, and may also be an interesting pathway to the development of mentalization.

# Additional analysis of paper IV

### Correlations Between Cognitive Abilities and E-mailing Measures

The published analyses in paper IV were restricted to the correspondence of participants who had mailed at least 12 messages during the intervention period. In an additional analysis, all correspondents' messages were studied. Possible differences between the children excluded in the initial analysis (i.e. the children who did not send many messages and did not make many new contacts) and the children who made many new contacts and wrote more than 12 messages were examined. A measure of perceived independence in producing e-mail messages was also added to the analysis. The teachers were asked to estimate each child's independence in writing letters e.g. responding to e-mails as well as initiating new e-mails. Questions regarding independence of choosing topics and independence of formulating sentences were rated as always (3), often (2), sometimes (1), or never (0). This was expressed

as a mean between responding to and initiating new e-mail messages. Test measurements from Paper one regarding nonverbal mental age and mentalization were used.

Spearman's rho was used for the correlation calculations (Table 3). Mentalization ability correlated significantly with frequency of e-mail messages and with estimated independence of the child in writing e-mail messages. New contacts taken (composed of new contacts taken/possible new contacts) were also correlated positively with mail frequency. A positive correlation between mentalization and new possible contacts almost reached significance.

Measures	1	2	3	4	5
1 Frequency of e-mail messages	-	.80**	.65*	.38	.63*
2 Independence in Writing		-	.81**	.61 <sup>Y</sup>	.51
3 Mentalization Ability			-	.67*	.60°
4 Nonverbal IQ				-	.51
5 New possible contacts					-

Table 3. Correlations between Mentalization, Nonverbal Cognitive Ability and E-mail measures

Note. \* 
$$p < .05$$
. \*\*  $p < .01$ .  $p < .10$ 

It may be suggested that to understand more about mentalization will make you more interested to find out more about other children and more interested to make new contacts. The opposite relationship could yield intervention possibilities; a child may by writing to others and find out that others are more or less like me, therefore develop theories of other's minds.

# **Summary of findings**

The four studies have explored and analysed different aspects of mentalization ability in children who use AAC. We also tested the viability of different theoretical notions by selecting children with full-fledged experience of Blissymbolics, as well as a newly developed test for socio-emotional mentalization. The four studies generated the following results:

- 1) Children who use AAC (with IQ above 70) are not delayed in their mentalization ability compared to typically developing children matched to nonverbal mental age.
- 2) Nonverbal cognitive reasoning is positively correlated with mentalization ability in children who use AAC, as well as in children with learning disabilities and in children without disabilities.
- 3) The social-emotional test of mentalization (SET) captured central aspects of mentalization capacities developing in middle childhood.
- 4) Children who use AAC and have a developed mentalization, display their use of their mentalization abilities in everyday social situations when they are actively participating. There is, however, many instances where their ability to be active in the social situation is hindered by the adult communication partner.
- 5) Children who use AAC have a very limited social network consisting of few peers and many professional adults.
- 6) There is a positive correlation between how many peers (acquaintances) are present in the children's social networks and an understanding of second order ToM.
- 7) It is possible to enhance the social networks of children who use AAC by initiating e-mail exchange with other children. The children will thus learn a new way of interacting where they can be active and initiate communication with peers.
- 8) There is a positive correlation between mentalization test scores and frequency of e-mail messages. There is also a positive correlation between the estimated independence of the children and mentalization ability and frequency of messages.

### General discussion

The main findings of this thesis regarding mentalization are discussed in relation to the implications the findings may have for children using AAC. The children who use AAC in this study did not differ from the comparison groups on mentalization abilities and this might be considered contrary to results of previous research (Dahlgren et al., 2010; Dahlgren et al., 2003; Falkman, 2005). Plausible explanations for this difference will be explored as the children's cognitive and language abilities are described. Possible reasons for the children's developed mentalization abilities are, furthermore exemplified as participation and social networks are discussed. The findings are also discussed in relation to theories of mentalization development. Finally, clinical suggestions and further research are described.

### **Mentalization Abilities**

The children who use AAC did not demonstrate mentalization deficits compared to the comparison groups (a group without disabilities and a group with intellectual disability). As expected from a normal developmental trajectory, all children with a mental age over 4.5 years of age passed the false-belief test of first order ToM (Sally-Anne-procedure). The same was true for second order false-belief ToM where all the children in the AAC-group, as well as children without disabilities, above the mental age of 7.5 passed this test. The children in the intellectually disabled group had more difficulties with the task. This issue is however, not explored further in this thesis.

The advanced mentalization abilities tested in the SET-procedure are acquired around the age that previous research suggests (Baron-Cohen et al., 1999; Happé, 1994). Irony understanding occurred around the age of 9 (Happé, 1994) and faux pas understanding occurred around 10 years of age (Baron-Cohen et al., 1999). The SET-procedure measured aspects of mentalization understanding that develops with increasing nonverbal cognitive maturation. Results from previous research on mentalization abilities in children who use AAC have been inconsistent. Dahlgren et al. (2010) concluded that the children who use AAC in their data-set, as a group, were delayed in understanding the linguistically complex Sally-Anne procedure, whereas there were no difference in understanding linguistically easier 'thought-pictures' compared with a matched comparison group. However, individual variation within the AAC group was noticeable; 9 out of 14 children actually passed the Sally-Anne procedure and 7 out of 14 passed the thought-pictures. This made the 'thought-picture' a more difficult task although the researchers had chosen it because it was

linguistically simple. Perhaps the ability to understand the mentalization aspect of the test is dependent on several abilities, one of which may be the child's nonverbal cognitive level. The composite score of mentalization correlated with nonverbal mental age, as did the thought-picture score on a group level. However, when examining individual results, a clear-cut view was not apparent. Some of the children with higher nonverbal mental age were found in the group that failed the test and vice versa. Nonverbal mental age does, consequently, not explain all the variance. Holck, Nettelbladt, and Dahlgren Sandberg (2009) showed that speaking children with cerebral palsy actually performed better than a comparison group of children with typical development on a task which requires inferential understanding; a measure that displays a mentalization ability. Furthermore, false-belief tests did not show any significant difference between the mental age matched groups.

The results of the current thesis are in line with the results of the previous research in the sense that the development of mentalization is complex and cannot be explained by one single factor. There are most definitely different individual and extrinsic factors which influence mentalization, and it is of importance to disentangle the factors that may or may not influence its development. In the following possible factors are put forwards that may contribute to mentalization development and the complexity of mentalization understanding.

#### **Mentalization Assessment**

We use our mentalization ability in interaction with other individuals and it is through social interaction we learn about other's minds (Carpendale & Lewis, 2004; Hale & Tager-Flusberg, 2005). In recent years it has been suggested that new and broad test measure needs to be developed that capture aspects of mentalization that will have a stronger correlation with the mentalization skills needed in everyday situations (Beeger et al., 2010; Dahlgren et al, 2003; Hale & Tager-Flusberg; 2005).

In Paper one, a broad mentalization test battery that consisted of the following parts was administered: 1) the Sally-Anne procedure of false-belief testing (first and second order ToM) 2) The Socio-Emotional mentalization Test (SET), which assesses the understanding of inference, first and second order ToM, faux pas and irony in short stories, and 3) a picture sequencing task of nonverbal mentalization.

The aim was to develop a mentalization measure that was both ecologically valid and able to inform us about the child's functioning in real life. In addition to a commonly used

false-belief test, a new measure was developed, the SET. The test consisted of six short stories and the child was asked to nonverbally attribute emotions and feelings to the participants in the story. The contents of the stories aimed at portraying ordinary and familiar situations, for instance someone passing you without saying "Hi" or someone saying that they liked something when they hated it. The stories were constructed with simple vocabulary and straightforward sentences. Each task was also supplemented with a picture to alleviate working memory demands. Although the tasks were supplemented with pictures to help the child remember the gist of the story, several subtopics of the story were, nevertheless, important to keep in mind to be able to understand the underlying mentalization aspect. It is important to note that our aim was to focus on the child's ability to understand the mentalization aspect without additionally taxing language and working memory.

As a complement to the SET test, a picture sequence task was administered. This task may be viewed as a visual test of mentalization (Berger, Aerts, van Spaendonck, Cools, & Teunisse, 2003). The test measures the child's capacity to reason logically through the visual modality instead of having to explain the sequence with words.

# **Mentalization and Cognitive Abilities**

There was a positive correlation between the results of SET, picture arrangement and nonverbal intelligence. The two mentalization tasks use different modalities. The SET is auditory presented and the picture arrangement is visually presented, although both require a mentalization ability in order for the child to be able to solve the task. The mentalization abilities tested in this thesis seem to be connected to a domain-general ability, suggesting the need for cognitive flexibility in the child to be able to solve the tasks. The three tasks all have in common the need to be able to make and remember several "if" statements to be able to solve the "then" conclusion (Zelazo, Jacques, Burack & Frye, 2002). This may be illustrated by the following examples:

SET - "if the fishing rod is gone" "if the brother is unhappy" "then his statement of being happy is ironic"

Picture Arrangement - "if she is going for a picnic, if she needs stuff, then she needs to pack"

Colored Progressive Matrices (CPM) - "if that square is in the left corner, if that square is at the bottom, then this square is in the bottom right"

Mentalization did not correlate with grammatical language understanding or vocabulary understanding. The short stories did perhaps contain simple enough language that this did not obstruct the understanding of the mentalization aspect.

The connection between nonverbal problem solving and mentalization abilities might also be compared to results observed in brain imaging studies. Separate studies that have investigated neural networks of problem solving (CPM), through brain imaging, and other studies that also studied cognitive empathy (mentalization), show that the same brain area in the prefrontal cortex is activated (Sabbagh, Moulson, & Harkness, 2004; Shamay-Tsoory et al., 2008). This observation might suggest that these two tasks share an underlying domain-general ability located in the pre-frontal cortex (Brodmann area 10).

The children studied in the current thesis did not have a deficit or delayed mentalization ability compared to the comparison groups. A broad battery of commonly used tests and a newly developed test (SET) was administered. One conclusion was that the nonverbal cognitive level contributes to the children's ability to solve the mentalization tasks. The data does not support the view of a core-mentalization module unrelated to other cognitive abilities. On the contrary, it was found that abilities such as nonverbal cognitive reasoning were related to the visual and verbal mentalization tasks.

# Mentalization and Language

The children's cognitive abilities are important capacities to consider when evaluating mentalization ability. Other aspects that were similar for all children in the study are also important to consider. Common for all of the children who use AAC in this study was that they had an early alternative language implementation. This may possibly have enabled social talk and given them many opportunities to practice social understanding in interaction. The chosen language for all of the children was Blissymbolics. It is a cognitively demanding language and is not a first-hand choice for everyone. This fact may have several implications. In reflecting on what symbol language to implement considerations would for instance be the child's perceived cognitive ability, expected development of language and the family/day-care's involvement in the child's communication system. This means that the children were viewed as competent by the professionals and were expected to develop their language further. This may also be reflected in the way the children were talked to and the way the expectations were set.

Another important factor is Blissymbolics in itself. In using their language, the children might think meta-cognitively about language, though implicitly, since the symbols reflect how the language is made up. For instance, the symbols for happy and sad are iconically different, although reflecting the similarity (the heart) as feeling symbols do (e.g. happy  $\mathring{\circ} \uparrow \circ$  angry  $\mathring{\circ} \downarrow )$ . This might help the children to reflect about feelings and different emotions, as well as other aspects of the language, and this may also be pointed out explicitly when the children learn Blissymbolics.

# **Active Participation and Mentalization Ability**

Interaction involving children who use AAC is demanding in different respects, and the communication behaviours of participants are of importance for the development and maintenance of mentalization abilities. It is important for the child's self-reliance and developing identity that he or she is able to be active and participate in the interaction. An actively participating child gets the opportunity to use and to develop his or her mentalization ability to achieve an efficient communication. If the child is not allowed to be active, a learned helplessness may develop where the child becomes passive. In such a situation, the child may in some sense have "given up" engaging in the social practices necessary in order for mentalization to develop. In Paper two, interaction between three children with a welldeveloped mentalization ability and adults and peers was analysed. In the data investigated, there were many instances of interaction where the child was actively participating and independently in charge of the interaction. Several instances of interaction were noted, however, where the child in some sense was pacified by not receiving the time, space or even the voice to be active in the interaction. This may have implications for if and in what way these children continue to use and develop their mentalization abilities. If there are too many instances where the children's active participation is not requested, this may result in interaction where the child leaves all the responsibility for the interaction to the communication partner.

In Paper four, the e-mail intervention study, the children were independently and actively participating with peers. The children were able to initiate and to continue interaction with peers, which may have implications for the way they understand other people, and how a theory of other's mind develops. This will also have implications for how they understand themselves. If they need to reflect and express in words to what they do, what they like, why

they do things and subsequently receive feedback on their contribution, their understanding of themselves might also grow.

When re-examining the data in Paper one and three, including all participants, an interesting observation was made. There was a significant positive correlation between mentalization and the frequency of e-mail sent as well as the rating of independence of letter writing. A tendency towards a significant correlation was noticeable between the number of new contacts and mentalization as well. The children who were able to understand higher order mentalization aspects also showed a greater interest in making contacts and writing more letters, as well as being able to do so in a more independent way. The children displayed that they had an important prerequisite for communication: the ability to understand that other individuals may think in a different way. In this small sample, there was no significant correlation between the e-mail measures and the general cognitive level of the children or with their receptive vocabulary. It would, however, be premature to conclude that the cognitive level and language level of the children were without importance. It seems plausible that a certain threshold of language understanding and cognitive level must be reached, which all the children in this study had, to be able to communicate and to do so in a functional way.

The majority of the children independently formulated and chose the contents of the email messages. They took responsibility for their own communication. The children had the ability to communicate functionally in this new situation, thus displaying communicative competence. Some children did not, however, show independence in the e-mail interaction. This means that their writing was accomplished largely in collaboration with the teacher's aid. The teacher's aid had to suggest topics to the child that the child could choose from, or the teacher's aid had to help the child to suggest how a sentence/message could be started. None of the children, however, were viewed as passive in the interaction, although they might have needed support to some extent. The less independent children were also the ones who scored lower on mentalization tasks. They could perhaps not understand that another person may be different from them and find excitement in this. Nevertheless, the e-mail message writing might be quite an important experience; to step 'out of one's own shoes' and ask about another person, seeing what is similar or not - what is ordinary to me, is exciting to someone else. To be given a chance to explore the message interaction by the scaffolding help of their teachers may help the child to develop advanced theory of mind (Carpendale & Lewis, 2004; Siegal, & Varley, 2002; Lewis, et al., 1996), complex grammar and semantics (Vygotsky, 1986).

#### **Social Network**

A child who uses AAC does not have many opportunities to use their mentalization skills with peers at school. When analyzing the individual social networks in Paper three, it is apparent that they were extremely small. The median number of close friends was zero. The social network consisted mostly of professional adults. This may have an impact on the children's identity-development, self-worth and self-reliance (Tamm & Skär, 2000).

There are of course many possible reasons for the limited social networks. One factor is the attitudes of the classmates and the professionals. If the child is not included in the social network of the class and always seen as "the disabled kid", the child will not be regarded as a member of the class even though he or she is integrated in the class. Working on attitudes and perceptions of children and adults in the school is a task that perhaps needs to be done in order to give the child who uses AAC a chance to be included on similar terms and conditions as the other children.

"It is fair to change a whole organization because of one child because it will

pay off for the rest of the children in the long run."

Spec Ed. Teacher in a school with a child who uses AAC

### **Social Network and Mentalization**

Not being included in a social network may also have consequences for the development of mentalization. In Paper three, there was a correlation between an understanding of second order ToM and the number of acquaintances of the child. It is difficult to speculate about the direction of this relationship. It is possible that the reason that some children made friends more easily was that they already had well-developed mentalization ability. It is also possible that it was through the multiple peer relationships that the mentalization ability developed. There was, however, no correlation between any aspects of mentalization and close friends. Being a close friend entails something more than just mentalization. It is probable that children who use AAC have difficulties making friends just because they are different and their classmates view them as different and not as possible friends (Tamm & Skär, 2000).

Two subgroups within the data were of special interest: children who attended general vs. special classrooms. Within these subgroups, there were noticeable differences and

similarities. Children included in a general classroom setting had more acquaintances than children in a special classroom. This is perhaps not that surprising, since regular classes tend to be larger than special classes. The difference does, however, disappear if the analysis is conducted on daily communication interaction. This means that children in a general classroom have more acquaintances, but they do not interact with them that often. Children in special classrooms have fewer acquaintances but interact with them more often. There was no difference between the groups regarding close friends. It is not possible from these data to confirm the notion that a child in a general classroom will have more friends to interact with than a child in a segregated classroom, or vice versa. It is, however, important to note that none of the groups had many friends or acquaintances. This is alarming. Early friendships are important for the development of the child's social and mentalization skills, as well as for the child's experience of independence and self-identity. As the children grow older, they will benefit from the experience of peer relationships and friendships that will enable them to discuss and talk about personal matters (Hughes & Dunn, 1998; Hughes & Dunn, 2002), and a limited social network will not facilitate such social situations.

The e-mail study, in Paper four, provided the children with an expanded social network, and all children enhanced their social network with peers because of the e-mail interaction. Social media, such as e-mails and other net-based resources are very important for children and adults without disabilities, and could certainly be an important pathway to friendship for children who use AAC.

#### **Final Conclusions**

The current thesis has demonstrated how complex the concept of mentalization is. The ability of mentalization is dependent on several aspects within the individual and in the environment. The results suggest that mentalization ability is a domain-general capacity with abilities that are developed through the interaction in, and experience of varied social situations.

The capacity of the child to adapt a *cognitive flexibility* in solving a task seems to be a plausible explanation to the positive correlations between social and non-social problem solving tasks, thus favouring the view of a domain-general capacity behind the mentalization development as suggested by for example the executive function hypothesis (e.g. Carlson, et al., 2001; Frye and Zelazo, 1998).

However, mentalization ability is, foremost, an ability used and needed in a social setting, and the constitution of such settings is important to the development of mentalization. There are positive correlations between the number of friends that the child interacts with and aspects of mentalization, signifying the role of interaction to the development of mentalization. Mentalization abilities were observed both in real-life and e-mail interaction. The abilities are displayed when the children are active in interaction and when they organize e-mail messages from general topics to topics concerning matters of personal common ground. The frequency and pattern of interaction in e-mailing is also positively correlated with mentalization abilities. These results are in favour of the theory-theory view on mentalization, where mentalization is developed from a rich innate state through the experiences the children make (e.g. Gopnik & Meltzoff, 1997). As mentalization is correlated with the interaction pattern of the children, the claim that maturation is the key source for developing mentalization, as the modularists (e.g. Flawell, 1999) would state, seems less plausible. The simulation theorists' claim (Harris, 1991) that children understand others by first understanding themselves is neither supported or refuted by the data.

Mentalization, in a broad sense, consists of several important abilities (Figure 2). Early mentalization skills are for example the ability to imitate or to show emotional state matching (the inner core of the Russian doll) and this is dependent on an ability to attend to someone else. These abilities are, as the theory-theory suggests, nurtured and matured through the experiences the child makes when being an active participant in varied interactions. The Russian doll of empathy with its cognitive empathy and different perspective taking are dependent on the experiences the child makes and the availability of different interactions to partake in. This will lead to an understanding of first and second order ToM. As the child experiences different social situations, more advanced mentalization abilities are developed, such as faux pas and irony understanding. Other possible aspects of mentalization yet unknown to us might also exist. The mentalization flower, depicted in figure 2, consists of abilities that in some respects may be considered an expression of mentalization, but not in every instance. It is possible to express for example imitation or irony without having an underlying mentalization understanding of the action produced. The mentalization core of the flower is the combination of the different 'petal' abilities experienced in the interaction the child is embedded in.

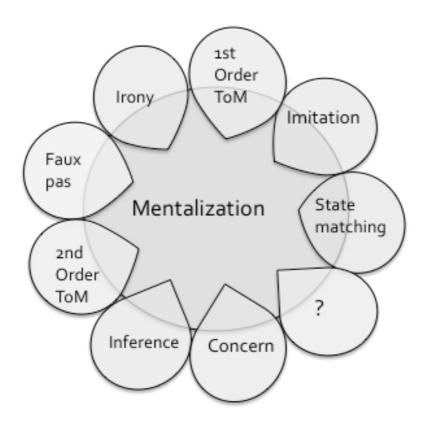


Figure 2. A Broad Definition of Mentalization

The ability to adapt a cognitive flexibility may be at the centre of the development of mentalization (see Figure 3) but the development occurs through experiences made through interaction. The children's ability to understand and express themselves with language and their ability to understand and express their mentalization abilities are realized through social interaction. When making friends, the child gets the opportunity to further develop their mentalization ability through figuring out about themselves as well as getting to know others, as they develop a sense of 'this is me' and a sense of 'that is you'. Being able to be an active participant in interaction is also of vital importance. It is the combination of abilities within and factors in the settings that are of importance, and if one ability or factor is lacking or neglected this will have consequences for the development of mentalization.

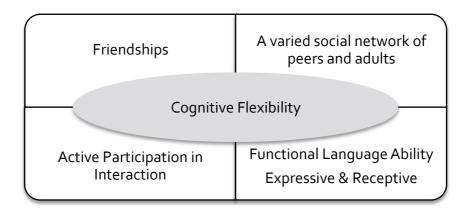


Figure 3. Factors Influencing the Developing Mentalization Ability.

The children who use AAC in this thesis were not delayed or deviant in their mentalization ability. It is perhaps of relevance to adapt a salutogenic perspective and examine possible reasons why these children, contrary to previous research, do not have a delayed mentalization development. These children did have a functional language understanding, a proficient AAC use, and the AAC system had been implemented early. They were also within normal variation of nonverbal intelligence, which presumably is of importance if adapting to the domain-general theory. This does not mean, however, that no threats to the children's continued development of use of mentalization in interaction exists. If the children are not able to participate and use their mentalization abilities actively in interaction with peers and adults, there might be a stagnation and underuse of the abilities they have. It is, therefore, essential that these children receive the opportunity to actively participate in interaction in a varied social network consisting of peers and friends; in order to get to know more about themselves and to get to know more about other persons.

The fundamental constituents of mentalization are thus not simply found in one individual's mind. Rather, it may be viewed as the interplay between the abilities within the individual and the communicative action that publicly takes place between participants in interaction.

## **Clinical Implications**

Light et al. (1985) has decades ago described and exemplified communication practices of caregivers of children who use AAC. These practices are, in theory, well known to the professionals interacting with children who use AAC. The professional adults are often, however, not aware of the strategies they actually use. It would benefit the children as well as

the professionals to regularly make video-recordings to raise the awareness of one's own communication practices. It is difficult to be aware of one's own way of communicating, especially since the professionals have competing purposes for the interaction. They have a limited time for teaching a subject, but at the same time, they should strive to make the student participate actively. If focus most of the time is on the subject matter instead of on participation, it may lead to communication practices where the student becomes pacified.

The assistants and teachers also exhibited an unawareness of how spoken language may differ from written language. Many teachers aimed to make the children produce talk with the same form as if they were communicating written language. Blissymbolics and other symbol languages should strive to be equivalent to a spoken language in many contexts. The children should be able to speak like other children, not like a book. This means that it is important that the interaction is socially accepted as well as being effective and efficient. Spoken language is context dependent and does not consist of "full sentences" in the sense that written language does. Other ways of expression may often be acceptable ways of speaking, and this goes for children who use AAC, too. Such issues need to be addressed further.

Awareness about integrated children in regular schools should be increased. Integration is a positive practice since the children need to view themselves in the light of others to develop mentalization ability among other capacities. However, it is not enough to be placed in a regular school. In order to be included, instead of just integrated, specific measures needs to be taken. It is essential to broaden the social network of the children and to find alternative ways in which a child with disabilities may be included. This would entail working on other children's as well as the professionals' attitudes. The child who uses AAC should be viewed as an asset in the school, giving the other children and adults chances to learn. Another specific measure is to introduce an e-pal, a friend or a mentor who speaks the same language.

### **Further Research**

An important continuation of this thesis is to further to develop the Socio-Emotional mentalization Test (SET) and to examine other groups known to experience mentalization deficits, such as children with cochlear implants (CI) and children with autism. There is research which suggests that children with CI who have received their implants early will

have a better mentalization development compared to children who received the implant late (Heimann, Sundqvist, & Lyxell, 2010). This would be interesting to examine further.

The ecological validity behind mentalization testing is also a relevant venue for further studies. Of particular interest, is to compare test results with how mentalization is expressed in everyday situations. One way of investigating such aspects would be to use Conversation Analysis, since the method entails the collection and analysis of rich data of everyday interaction. Analyses would comprise comparisons between social practices and results from tests of mentalization, cognition, language, executive functions and memory. Another important venue for further research is to develop Internet options and to explore the use of social media for children who use AAC as another way to enhance their social network, but perhaps also as one way to develop mentalization ability. It is also important to further examine the contribution of early mentalization abilities such as imitation, joint attention and gaze to the development of more advanced mentalization abilities. Such an aim might be realized in a longitudinal study where such early skills are studied and followed up later to examine the correlation to advanced developing mentalization abilities. Another important examination could be to study how mothers talk to their children, as some research demonstrates that the words and patterns of mothers' talk to their infants have implications for how the children later develop mentalization abilities.

I don't get him as he has a disability, I get him as an ordinary person

Classmate of a child who uses AAC

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Nu är mammas bok äntligen färdig!

Mommy's book is finally finished!

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