

# Theory of Mind in Children Using AAC

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## Introduction

The ability to understand the mental states - beliefs, desires, emotions and intentions - of other people helps us in acquiring social bonds and relationships. This capacity is often called Theory of Mind (ToM) (Siegal 2002, Wellman, 2001). During the preschool years the ToM capacity develops at a rapid rate, and continues to develop during the first ten years of life.

The capacity to understand other people is one important aspect of being human. A child with severe speech impairment is able to have a relatively intact cognitive capacity and language understanding, but due to motor-coordination problems he or she is unable to speak, to socialize and to play in the same way as other children do (Light, 1985; Light, 2000). This may distort social experiences.

Language problems have been suggested to be a plausible cause of ToM difficulties. There is a strong relationship between language and ToM, but the causative nature of this link is unclear (Fischer et al., 2005; Hughes & Leekam, 2004). Bishop (1999) separates out three different explanations of the relationship between language and ToM. One possibility is that there is a general cognitive limitation which affects working memory and processing speed. This could be a common primary cause of both the language and the ToM deficits. Another is that there exists a primary cause which manifests itself as an immature social cognition, which leads to poor communication and language skills. A third cause to the social interaction problems may be distorted social experiences (Bishop, 1997). It is perhaps, then, not an underlying social problem or general cognitive limitation which cause the child's ToM deficit, but rather a secondary deficit due to the child's poor and inadequate social experiences.

In this study we were interested to study if children with severe speech impairment who use augmentative and alternative communication have a delayed or perhaps deviant development of Theory of Mind. We focus on both the social as well as the cultural aspects of ToM. Hence, we constructed tests which build upon real life situations that could be experienced by children attending the first six years of school.

## Method

### Alternative and Augmentatives communication group

Sixteen children and adolescents who were dependent on alternative and augmentative communication (AAC) as their primary way of communication participated in this study. Inclusion criteria were AAC using children (aged 7-16) who were attending regular compulsory schools. The children were between 6 and 14 years of age at inclusion time, with a mean age of 10.5 years (n=16). The AAC group consisted of six girls and ten boys. Matching to a younger normal developing control group (mean age 6.6 years) with regards to nonverbal intelligence was performed (n=12).

### Procedure/Materials

To assess the children's cognitive ability a battery of nonverbal and verbal tests were administered (Raven's coloured progressive matrices, working memory: Word-span test/Visual-span test, The test of reception of Grammar – TROG, and Peabody Picture Vocabulary test – PPTV). The first-order and second-order ToM task was a modification of the well known "Sally-Anne-procedure" (Baron-Cohen et al, 1999).

If the child was able to grasp the second order belief condition the test continued with a combined test of social cognition. This test was composed of two ambiguous stories designed to test attributing mental and emotional states and alternative thinking, five stories attended to test detection of social faux pas and five stories targeting irony/sarcasm understanding (Baron-Cohen et al., 1999; Bosacki & Astington, 1999; Happé, 1994).

Ambiguous social stories, social blunders/faux pas and Sarcasm/Irony detection have been shown to be one way of eliciting older children's understanding of mind (Bosacki & Astington, 1999; Channon, 2005; Shamay-Tsoory et al., 2005). The stories were composed of a short vignette illustrated with a picture. This was followed by questions pertaining to ToM and predicting feelings of the involved person. The children responded by pointing to one of seven Smilies symbolizing mental states such as happy, embarrassed, angry and ironic.

## Results

T-tests reveal no differences between the two groups on any test scores, including ToM. For the AAC group the results indicates that the most important measures which are correlated with ToM are nonverbal intelligence, vocabulary knowledge and working memory ( $r = .79, p < .01$ ,  $r = .83, p < .01$ ,  $r = .75, p < .01$ ). Age is strongly correlated with all measures in the control group. This is however not the case in the AAC group.

## Discussion

One can observe a progression of ToM attainment with increased nonverbal intelligence for both groups, and within the control group with increasing age. There is no significant difference between the nonverbal intelligence matched control group and the AAC group with regards to any test results. Contrary to earlier research, this implies that the children in the AAC group does seem to acquire a ToM, in spite of the fact, that they experience a less than optimal social environment. It does not seem to be the social environment, as such, that causes the problems with ToM and it is rather unlikely that this severe speech impairment is caused by a primary social cognition defect. Thus, it is rather the general cognitive limitation which affects the development of ToM.