

## Theory of Mind and Blindness in Young Children: Towards Testable Hypotheses

### **Introduction**

There is growing evidence that the ability to interact socially, to interpret the often unstated interpersonal cues and messages is a fundamental aspect of childhood development (Baron-Cohen, 1996). This ability, often labelled ToM (Leslie, 1987), has been the topic of numerous theoretical and empirical studies (Green, Pring and Swettenham, 2004; Perner, Ruffman and Leekham, 1994; Premack and Woodruff, 1978; Wimmer and Perner, 1983). This paper is an exploration of some key themes surrounding ToM, inviting responses and discussion on this topic and specifically on the impact blindness may have on child development in this area. There is a gap in the literature with regards to the value of vision in developing a ToM. Yet, it is suggested, blindness provides a fascinating test of the dominant theories of ToM, and draws out some of the central theoretical issues underlying this phenomenon.

### **Theory of Mind**

A broad definition of ToM is an individual's ability to understand and appropriately predict another individual's behaviour (Whiten, 1992). This ability seems to occur through decisions being made regarding that other person's experience and how they may interpret situations and interactions. ToM, a term first introduced by Premack and Woodruff (1978) in connection with primate research, is not just an observation of behaviour resulting in conclusions being drawn, but it is an ability to reflect on those conclusions and a willingness to adapt assumptions made. It is an understanding

of the difference between a person's perception or belief and reality. It is an ability to 'mind-read' (Baron-Cohen, 1996).

If an individual does possess a ToM and they can make assumptions about the thoughts and beliefs of others, they will be able to realise that other humans will think of things in relation to their own previous knowledge or experience. An example of this is as follows: if Child A puts some sweets on the kitchen table, leaves the room and Child B then puts them away in the cupboard, an observing third person ought to realise that Child A will have a *false belief* that the sweets are still on the table. Child A arrives at this conclusion or false reality because their experience and knowledge does not enable them to be aware of Child B's actions after they left the room (Wimmer and Perner, 1983).

An ability to predict the behaviour of others is thought to enable us to better operate in communities or social groupings (Mitchell, 1996). It is for this reason that the standard psychological assessment of developing ToM is the 'false belief test', a form of which is the well known 'Sally-Ann test', which is similar to the scenario outlined above. The original false belief task to assess the development of a child's ToM was composed by Wimmer and Perner in 1983. The work of these researchers and others, such as Baron-Cohen (1996), show that children display an awareness of the perspectives of others and ToM at the age of four or five as opposed to the ages of seven or eight suggested by Piaget (Schaffer, 1996). Some (Gordon, 1986 and Heal, 1986) have proposed that a person's ToM is linked to an ability to 'project ourselves imaginatively into another person's perspective, stimulating their mental activity with our own' (Carruthers and Smith, 2000, p. 3). Mitchell (2003) suggests that a ToM

could be linked to Gardner's (1983) discussion of the development of inter and intra personal intelligences as these are the skills of perceiving and recognising intentions and motivations of others verses the understanding and ability to express our own emotions.

A ToM is composed of the mental representation and consideration of an article as well as the physical entity itself (Wellman, 1992). This is the understanding that thoughts of something are not identical to the object itself. Wellman states that this 'mental hypothesising' is based on belief-desire psychology where beliefs and desires lead to actions occurring. He notes that all actions taken by people are based on a desire that is constrained by belief. An example of a test of a child's understanding of people being propelled by desire whilst constrained by belief is that of a boy who has a puppy, the puppy is lost and could be in the garage or under the porch; wherever the boys thinks the puppy is most probably going to be is where he will look first, thus having his desire to search being influenced by his belief of the puppy's actions. Wellman highlights that by considering the action we see others carrying out we can reverse the process and judge what their intentions, beliefs and desires are. Baron-Cohen (1996) concurs that mind reading involves creating a list of possible conclusions, but states that we can never know for certain the mind of another. He also notes that mind reading is often a subconscious act of which we are unaware we are participating in much of the time.

### **Theories of Theories of Mind**

ToM is not a new concept. There are, however, three current dominant theories regarding Theories of Mind: Theory Theory; Simulation Theory and Modularity Theory (Astington, 2000; Carruthers and Smith, 2000).

*Theory Theory:* According to this view, associated with the work of Wellman (1990) and Gopnik (2000), a theory of the psychological state of others is created by the child building concepts from the experiences they have of, and information that they gather from, the social world they are engaged in. In other words, the child has a capacity for reasoning and creates a theory about another's mind from their own experiences which allows them to predict behaviours. This suggests that a child's ToM could be quite different from that of an adult due to differing experiences of socialisation linked to age. An inability to develop ToM could, in this instance, be attributed to a damaged or absent ability to learn from experience (Carruthers and Smith, 2000).

*Simulation Theory:* This theory, associated with the work of Gordon (1986), Harris (1989) and Heal (1986), sees ToM as being created by emulating the behaviours and assumed thoughts of others in order to simulate what they would be feeling and believing. This simulation will enable an individual to conclude what actions another may be likely to take in any given situation. An inability to develop a ToM could, in this instance, be attributed to a child's damaged capacity to imagine or to participate in 'counter-factual reasoning' or false belief (Carruthers and Smith, 2000).

*Modularity Theory:* According to this view, associated with the work of Baron-Cohen (1996) and Leslie (1991), a ToM is developed due to innate skills and abilities evident in each individual at certain ages or developmental stages. If this theory is accepted,

it is not the environment that leads to the development of ToM, but natural developmental patterns which are triggered by that environment or experiences of that child. A lack of ToM can, in this instance, be attributed to a damaged specialist module or area of the brain in the individual linked to this innate capability (Carruthers and Smith, 2000). Some have suggested that research showing cross-cultural similarities in acquisition and timing of mind reading skills lend support to this theory (Vinden and Astington, 2000).

All three of these theories presume that the majority of children will have an ability to read the minds of others (Baron-Cohen, 1996). Both Theory Theory and Simulation Theory relate to an emerging understanding of social relationships, whilst the Modularity Theory has its foundations in a presumption that innate abilities lead to maturation of ToM. All three theories acknowledge that there is a possibility for each to be disrupted, leading to a minority of children not developing a ToM. This disruption, however, is believed to result from differing difficulties such as a disrupted ability to learn (Theory Theory), difficulty in sympathising with others (Simulation Theory) or an interruption in natural maturation (Modularity Theory). The processes children experience and develop to achieve a ToM differ in each theory and the triggers that lead to the development of this ability may also differ. However, the differences between these theories are not distinct enough to mean that more than one theory could not be supported.

Also, to draw the focus towards the subject of this paper, although elements of more than one theory may be plausible, it could be claimed that if an individual does not possess sight the ability to theorise about others is a more complex process, thus

leading to a delay in blind children developing ToM (which might corroborate the Theory Theory). However, if children without sight do not ever achieve a ToM this may be due to environmental triggers not being able to allow natural developmental patterns to be followed (which would suggest either the Modularity and Simulation Theories).

ToM, if the Theory Theory or Simulation Theory is to be credited, is a form of social learning, in other words a learning situation which would not be evident unless children were involved in social and cultural settings (Bailey, 2003). With immersion in a culture comes the process of cultural learning and this is the process whereby humans begin attempting to understand other people who are similar to them. ToM plays a part in cultural learning and understanding the minds of others. Trevarthen (1998) suggested that there is an innate desire in us all to immerse ourselves in and learn from a culture through sharing thoughts and desires with others, this links in part to the Modularity Theory of ToM which suggests that the ability and need to understand and read the minds of others is innate. Mitchell (1996) states that prediction of, and explanation of, the actions of others allows us to survive and even prosper in a community.

Whichever theory of ToM is deemed to explain the development of this ability, there are three key elements that Harris (1989) considers need to be developed in order for ToM to be achieved. These are:

- Self-awareness;
- The capacity for pretence;
- The ability to distinguish reality from pretence.

### **Theory of Mind in Children**

*Self awareness:* Most children do not appear to possess a ToM until the age of four when this ability begins to develop (Baron-Cohen, 1996). Children aged eighteen months, when presented with a mirror, do not appear to show an understanding that it is themselves reflected back at them. This, perhaps, shows an uncertainty of the concept of themselves (Mitchell, 2003) and, therefore, they would be unlikely to be able to hold concepts relating to the behaviour and experience of others or a ToM.

*The capacity for pretence:* Another quality that shows development towards acquiring a ToM is engagement in pretend or symbolic play which can occur as early as two years old (Leslie, 1987; Carruthers, 2000; Baron-Cohen, 1996; Harris and Leever, 2000; Bailey, 2002). Understanding the difference between reality and fantasy or thoughts may contribute to the development of a ToM and, according to Wellman (1990), this could occur as early as two or three years old. Chandler, Fritz and Hala (1989) state that children as young as two can intentionally deceive others through play which shows an awareness that one can have a false belief and that this can serve a purpose.

*Distinguishing reality from thought:* Another quality that leads to a ToM is an understanding of the difference between reality and thought. Research by Wellman (1990) and Leslie (1987) suggest that this occurs in children between the ages of two and three. Until children have this awareness of the distinction between thoughts and reality, the ability to predict how others will interpret experiences will be impossible as they will not be able to decentre themselves from their individual opinion and

experience. False belief and being able to predict the behaviour of others by assessing their own thoughts is a common marker of progression in the development of a ToM.

In arguing that children have a natural desire to interact with others in their community, Trevarthen (1998) proposes that the motivation behind this is to attempt to understand the social world by sharing experiences with others. This interaction with others could aid the overall development of a ToM. For example, Perner, Ruffman and Leekham (1994) state that children with a large number of siblings appear to develop a ToM slightly sooner (at approximately three years) than those from smaller families (where the average age is four years). It could be due to the greater number of interactions these children experience with other individuals of similar developmental stages that a faster capacity for mind reading can occur.

Gopnik et al (1999) support this suggestion and argue that ToM is, however, not just an end to an egocentric existence, but is a realisation that others may have an 'alternative or conflicting view' (Schaffer, 1996; p 183) to one's own, and an understanding that everyone may not have identical knowledge due to differences in experiences. Schaffer (1996, p 184) highlighted that 'once a child is capable of representing to itself the mental states of another person, social interactions assume a much more sophisticated form'. There are, however, some conditions, assumed to be genetic, which affect this normal developmental pattern of acquiring a ToM.

Autism is a condition, identifiable at approximately four years of age, which affects about ten in ten thousand children (Gopnik et al, 1999). Autistic children do not appear to possess the natural ability to mind-read and struggle with automatically responding to people's behavioural clues, they have difficulty understanding false

belief (Carruthers and Smith, 2000) and translating or communicating effectively through gesture or facial expression. This difficulty with predicting people's actions and reactions to situations, or mind-reading, has been termed 'mindblindness' (Baron-Cohen, 1996). Unless difficulties are experienced, such as those by autistic children, then reading the minds of others is usually a subconscious activity (Bailey, 2000), but mindblindness can have a negative impact on an individual's capacity for social interaction as the behaviour of others cannot be read or reacted to in a predictable manner because an understanding of these social rules are not held by the child. However, there is some evidence that children with autism can learn to compensate for this lack of natural ability by 'carefully observing the regularities' of others' behaviour and creating general rules and overcome their inability 'to link their own mind and those of others' (Gopnik et al, 1999; p. 54).

Leslie (1991) and Baron-Cohen (1996) have both suggested that autism is a sign of a very 'male brain' focused and compartmentalised in comparison to the more 'female' linguistic and emotion brain. We know that fewer females than males are diagnosed with autism, but could this, if we look at it from another perspective, mean that a ToM is more developed in females? We know that females use facial expression more readily than males, but there is as yet little or no evidence to suggest that boys' ToM skills are less developed than girls' (O'Connell, 1998).

Another condition which impacts on children's ToM and is suspected to be genetic and which has many opposing traits to autism is 'Williams Syndrome'. Children with 'Williams Syndrome' have tendency to be more sensitive to the feelings and actions of others. Instead of mindblindness, children with 'Williams Syndrome' appear to

have mind insight. These children may succeed in social arenas, but they struggle with physical tasks such as sorting items into groups and following maps or paths. Even with these children's social skills, their understanding of the issues that they speak about is limited and superficial. (Gopnik, Meltzoff and Kuhl, 1999).

### **Theory of Mind in Non-Human Animals**

When discussing ToM it is important to look at the experiences of non-humans as well as humans. The need for this arises because the theories of how a ToM may develop (Theory Theory, Simulation Theory and Modularity Theory) suggest either a social or innate reason for its existence. If it is an innate developmental pattern that triggers ToM then it is reasonable to hypothesise that related non-human animals such as Chimpanzees and Bonobos, with which we share an estimated 99% of our genetic make-up (Bailey, 2003), will also reflect this or a similar ability. If it is reliant on social interaction and experience, then because humans are unique in the way in which we socialise, partly because of our sophisticated forms of culture and communication (Bailey, 2003), other animals such as primates may not reflect a ToM. Returning to the work of Harris (1989), it is useful to use his suggested key elements which lead to the development of ToM in our examination of primatological data.

*Self-awareness:* In general, primates such as chimpanzees and orang-utans appear to differ from monkeys and gorillas in having a concept of the self. However, in an example of an exception to the rule Povinelli (1993) reported how a gorilla called KoKo, hand-reared by Patterson (1984), could recognise its self with the help of a mirror and noted changes in appearance by touching the part of their body affected by that change. The question that, as yet, remains contested is whether recognition of the

self is possible in all apes. A possible, alternative, explanation is that as KoKo was raised in such a dramatically different environment to what is natural, natural behaviours were usurped by learned behaviours, in this case the development of an image of the self (Mitchell, 2003).

*The capacity for pretence:* A form of pretence is deception of which the two main contrasting types are learned and insightful deception (Mitchell, 2003). Learned deception is when a creature deceives another, but without premeditation or an understanding of the other's false belief. This is a learned behaviour due to the successfulness of whatever action is undertaken, but is not insightful of the behaviour of others. Insightful deception is when deception occurs with the deceiver predicting how another will respond to their behaviour. This shows some understanding of the mind and beliefs of others (Mitchell, 2003). Some investigations carried out with chimpanzees to establish basic capabilities that could lead to a rudimentary ToM were based on the possible ability to illustrate insightful deception (Whiten and Byrne, 1988). Experiments carried out with the chimpanzees to consider if they could illustrate insightful deception have not been conclusive. Some of the chimpanzees appeared to show intentions to deceive, but not until some training had occurred, which may actually lead it to be learned rather than insightful behaviour. The absence of a common language between trainers, researchers (Premack and Woodruff, 1978, Povinelli et al, 1992) and chimpanzees also means that true results regarding intentionality cannot be gathered, the researchers had to draw conclusions based on action alone. In children insightful deception occurs around the age of four years, the same time as ToM appears to develop.

One key issue which could limit the chimpanzee's ability to demonstrate a ToM is their lack of understanding of the importance of an individual's sight in gathering knowledge. Studies by Povinelli and Eddy (1996, cited in Mitchell, 2003) showed that chimpanzees would beg for food to a trainer even if the human's eyes were covered so that the trainer could not observe the chimpanzees' behaviour. Chimpanzees did, however, realise the importance of the trainer's face being towards them, as they would not beg to a trainer with their back turned, but the knowledge of the important role the eyes played in gathering information in order to respond to another was not understood by the chimpanzee. This reflects one of the limitations to development of a ToM in chimpanzees, but could also highlight an obstacle faced by blind children who cannot observe the eyes of another.

### **Theory of Mind and Blindness**

Blindness, unlike autism, is not necessarily a genetic issue, but does appear to interrupt an individual's natural development of ToM. O'Connell (1998) suggests that blind children may not be at as much of a disadvantage as might first be thought as children do not interact with others through observation or imitation, but through thinking about the other person's minds and thoughts. However, if blindness affects their ability to mind read this would be as much of a barrier as the inability to observe or imitate. McConachie and Moore note that 'severe visual impairment without other disabilities is rare in developed countries' (1994, p. 237) so blind children often have a number of difficulties to learning to overcome in order to develop ToM.

Early empiricist philosophers such as Locke (1690) and Hume (1758) believed that, due to their divergent experiences, blind children will have different concepts to

sighted children and that this will lead to different thoughts. For example, due to the fact that born-blind children have no primary experience of sight, they could not “possess the same colour concepts as the sighted” (Landau, 1997; p. 10). As with colour, non-verbal, visual communications are images which cannot be created in the mind unless previous experience can be had to compare it to. Urwin (1979), however, suggests that although developmental delays are possible because of sight problems, these delays are certainly not inevitable.

Bloom and Lahey (1978, cited in Rogow, 1983) recognised that “facial expression, pointing and gesture” (p. 58) are used by children from the age of two. These gazing skills can be used to engage interaction and play an important role in turn taking. Blind children, though initially displaying facial responses to emotion, do not use expression to engage others and use other ways to interact and illustrate turn-taking such as physical touch or verbal cues. As Rogow (1983, p. 60) states ‘the sighted child searches with his eyes, the blind child searches with his hands’. All babies smile (Warren, 1977), but imitation appears to reinforce this ability to facially express oneself. Therefore, blind children, as they do not have the visual input which allows them to imitate, tend not to smile or facially react to visual stimuli. ‘Mutual gazing in heightened play exchanges in the early months’ (Urwin, 1979; p. 111) is reported to be one of the significant preverbal activities not engaged in by blind children.

Replicating or ‘mirroring’ the facial expressions of others can lead to an individual producing the emotion represented by the expression. Therefore, it has been suggested that we can ‘catch’ emotions from observing and mimicking others (Gordon, 2000). Gordon (2000) also suggests that as part of developing and utilising a ToM we use

tactics such as tracking someone's gaze or replicating their facial expression to help us simulate expression which may allow us in turn to simulate emotions and subsequently more accurately simulate the thoughts and behaviours of others. Gordon suggests that unless we acknowledge and use this 'natural copy-cat mechanism' (2000,p. 13) then we would be less able to attribute mental states or emotions to others. This concept is obviously of less concern if one subscribes to the Modularity Theory than it is if supporting a Theory Theory or Simulation Theory, which rely more completely on the observation, simulation or copying of the behaviours of others to develop ToM.

Meltzoff (1996) notes that babies began to copy or reproduce the movements that adults made with their body, they noted that this occurred at a very young age starting when the infant's were just a few weeks old. Iverson and Goldin-Meadow (1998, cited in Abdulla, 1998) have observed that hand and arm gestures were used by all speakers they observed, sighted and blind. These gestures and pointing to request things or communicating intent appear to occur in both blind and sighted children between 9 and 12 months, even though blind children cannot see the object they may be pointing at. Indeed gestures used by the blind were similar to those used by sighted individuals when discussing similar topics, these gestures were used even if speaking to other blind individuals. This hints at the possibility that gestures are, therefore, not part of speech and culturally learned, but perhaps evidence that gestures communicate a thought process which forms the foundations of speech, even if those visual thoughts cannot be observed by the listener.

### **Cognitive and linguistic development in blind children**

The relative centrality of experience has become a recurrent theme in child development research, and this takes on renewed significance when considering the development of blind children. For example, Dunlea (1989, cited in Landau, 1997) argues that blind children will always have difficulties learning about visual concepts:

Mary can be *told* that George caused the ball to contact her, or she can infer it, but she cannot *know* it on her own. (p. 12)

Conversely, Urwin (1979) states that blind children's understanding of objects and concepts can be improved by 'spontaneous explorations' of objects and toys.

Unwin proposes that questioning is extensively used by blind children to understand their world and goes on to state that:

Development of dialogue can provide a route through which the blind child gains access to what is going on around her, allowing her to build a model of her world. (ibid., p. 126)

McConachie and Moore (1994) highlight that vision is what allows us to recognise how actions make objects move, or how people impact on objects; therefore blind children are disadvantaged and cannot even truly recognise that objects continue to exist when released from a grip. Bigelow (1990, cited in McConachie & Moore, 1994) and Preisler (1991, cited in McConachie & Moore, 1994) suggested that even slight differences in vision ability could make an impact on developmental patterns.

Peterson, Peterson and Webb (2000) found that during tests of blind and sighted children with false belief tasks that the majority of six year old blind children failed. At the age of eight there were still developmental difficulties identified with the blind children, however at twelve there was little or no difference between results from the

blind and from the sighted groups. This suggests that although false belief understanding may be delayed initially in children without sight, this is not a permanent delay implying that the lack of sight is eventually compensated for by experience or the child developing strategies to overcome missed cues.

A recent study by Green et al (2004) assessed ToM understanding in children with visual impairment compared with children with normal vision. There was a clear difference in the achievement levels between the two groups, with blind children less successful in false belief tests when compared to mainstream children with similar IQ and verbal mental ages. It was, however, found that children with lower levels of IQ and/or verbal mental ages took longer to achieve in the false belief tests in both blind and sighted groups.

Keeler (1958) highlights the delay in first word usage in blind children and Burlingham (1961) notes that blind children add words to their vocabulary much slower in the early years than their sighted counterparts. This suggests that blind children have some noticeable language delays when compared to sighted children which could possibly compound their delays in developing a ToM.

### **Testing the Theories of Theories of Mind**

Table 1 outlines the three key theories of ToM and issues that may occur with a blind child's development in this area. If the Theory Theory is followed it is believed that children will develop ToM by testing out hypotheses created through social interactions. Delays could occur due to differences in social experiences between a blind and a sighted child. Issues leading to a delay may not be highlighted easily but

could be due, in part to missed visual cues, or feedback being lost or misunderstood by a blind child due to its verbal rather than multi-sensory nature. With the Simulation Theory, where children imitate social interactions and mannerisms seen to be used, often effectively, by others, delays could occur with a blind child's development because comparison with others is difficult if experiences are not visually similar. This is because life experiences without vision are very different to those of a sighted child. It is suspected that with the Modularity Theory, where developmental patterns are considered to be innate, there should not be delays as the development of ToM is a natural stage and not related to the non-verbal, visual communication that is inaccessible to blind individuals. However, environmental triggers may be disrupted due to a lack of visual information.

Table 1: hypothetical relationships between theories of ToM and the development of blind child

<i>Theory</i>	<i>Psychology</i>	<i>Nature of Theory</i>	<i>Predications regarding blind children (leading to testable hypothesis)</i>
Theory Theory	Developmental Psychology	Problem-solving	Missed or misunderstood cues
Simulation Theory	Social Psychology	Comparison with others	Blind child has only visual cues or verbal imitations to rely on

Modularity Theory	Evolutionary Psychology	Innate	Delays linked to visual environment
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## **Conclusion**

This paper raises a number of issues regarding the three main theories of ToM which dominate discussion in this field: Theory Theory (Gopnik, 2000); Simulation Theory (Gordon, 1986) and Modularity Theory (Leslie, 1991). These theories assume quite different processes occur in order to acquire a ToM. However, they can also be complimentary in development. For example, development of a ToM could be mostly reliant on or triggered by social interaction (Theory Theory or Simulation Theory), but there could be a biological predisposition (Modularity Theory) explaining the sudden increase of development in this area at the age of four. There is also some evidence to suggest that there is a genetic link, as chimpanzees seem to have basic skills related to acquiring a ToM (Povinelli, 1993). However, it is also argued that the absence of a shared language and limited understanding of the role of eye contact in communication limits non-human's ability to mind read (Povinelli and Eddy, 1996, cited in Mitchell, 2003), and, therefore, language delays and absent visual cues could also affect a blind child's ToM development (Burlington, 1961; Gordon, 2000). It is, therefore, predicted that blind children will have an increased probability of a delay in the development of a ToM, due to an inability to observe visual, non-verbal communication and apparent language delays. However, this is thought to be a temporary delay as increased cognitive abilities and language development will eventually compensate for the lack of vision.

Issues of this sort are relevant to general discussions on Theory of Mind, the age it begins to develop and how these mind-reading skills are acquired. It is also relevant to those working with blind and visually impaired children as a delay in Theory of Mind can impact on their capacity to socially interact particularly with children of similar ages. They are also relevant when considering methods of teaching and learning.

Within learning environments we often make assumptions that children will possess some level of ToM in order to process teacher's explanations and also to engage in academic discussion with others. A blind or visually impaired child may illustrate delays in these capacities, but if the reasons behind these delays are known we, as educators and developmentalists, may be able to take action to minimise delays in this area.

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