Environmental Factors’ Influence Upon the Deception Task in Theory of Mind

Katie Robertson
Department of Psychology
Bethel College
300 East 27th St.
North Newton, KS 67117 USA

Faculty Advisor: Dr. Paul Lewis

Abstract

Is theory of mind, particularly the deception facet, affected by environmental influences? Previous studies have shown that the ability to attribute mental states such as desires, beliefs, or intentions to oneself and others (ToM) occurs in children of three or four. Research has also been conducted to further investigate whether outside factors influence the acquisition of this developmental milestone. They show to varying degrees that interaction, with older individuals, affects a general theory of mind score. However, little research has been gathered about environmental influences on deception. The concept of deception may be especially complex because it involves insight not only into the difference between the protagonist’s and onlooker’s mental state, but into the causal links between the two (Astington et al., 1988). Because deception may be a higher indicator of ToM, it might be more difficult to grasp and thus more susceptible to environmental influences. This present study specifically examines the effects father occupation and number of older siblings has on this theory of mind-related, deception task. Forty-eight children, ranging in age from three to eight, from a local play school, answered questions relating to false belief, appearance reality, and deception tasks. Incorrect and correct answers were recorded and socio demographics were completed. Correlational analyses replicated previous findings: children performed at higher levels on all tasks as a function of age. In addition, one-way ANOVAs showed that children with white collar fathers had significantly higher deception scores than those with blue collar. There is also a significant increase in deception scores in children with two older siblings than those with less than two. These findings replicate and extend previous studies indicating environmental influences on theory of mind. The complex nature of deception and various validity matters are discussed.

Keywords: Theory of Mind, Deception, Environmental Influences

1. Introduction

What enables a child to play house or pretend that a banana is a phone? What mental abilities are involved in a child’s capability to lie? When do children recognize themselves and others as things that think? These types of questions have fascinated researchers and encouraged studies pertaining to theory of mind. Children acquire theory of mind when they begin to recognize mental states such as beliefs, intents, and desires, in themselves and others. ToM involves the development of a set of meta-representations; a set of explicit and interconnected concepts for representing those representational states. These meta-representations are dependent on a certain level of executive functioning which very young children may lack.

Younger preschoolers frequently think that there is only one perspective on an event and that appearances and beliefs always match the reality. Research has indicated that this way of thinking gives way to a new understanding of perception, action and talk between the ages of two and six. More specifically, Carlson et al. (1988) state, “During the preschool years, striking changes take place in children’s performance on many theory of mind tasks” (p.672). The specific tasks that have been looked at in previous research include, false belief, appearance reality, and deception. These assessments test children’s ability to understand that beliefs can be false, that appearances may not reflect reality, that certain individuals may perceive the very same scene in different ways and that these differences
can create the possibility of deception.

The false belief task is a standard measure of ToM in many studies. This task is such an important indicator of this particular mental capacity because the ability to recognize that others have beliefs about the world that are incorrect is a significant milestone in theory of mind development. There are three subdivisions of false belief; unexpected false belief, explicit false belief, and contents false belief.

Wimmer and Perner (1983) developed tests for standard unexpected false belief by using two story plots that dealt with a protagonist putting an object into one location, and then the object being moved to another location in the protagonist absence. In their study of 36 children ages three to nine, Wimmer and Perner (1983) found that “None of the 3-4 year olds, 57% of the 4-6 year olds, and 86% of the 6-9 year old children pointed correctly to location x in both sketches”\(^\text{(p.103)}\)

The explicit location false belief task was used by Carlson and Moses (2001) in which stories with pictures were shown. Then, belief and reality questions were asked about locations of an object according to the depiction in the story. Findings show that there are a greater number of errors in this explicit version than in the standard version. Carlson and Moses (2001) explain this difference in this manner, “the greater number of errors in the explicit version is perhaps not surprising given that in this version children were merely told about the real location of the desired object rather than observing it directly”\(^\text{(p.1036)}\)

The contents false belief task was tested by Gopnik and Astington (1988) by showing children deceptive objects and then revealing the true nature of the objects. The 43 subjects were then asked what they thought the object was when they first saw it, assessing how well they understood representational change and then asked what another child would think the object was, assessing false belief, and finally they were asked what the object looked like and what it really was which tested their understanding of the appearance-reality distinction. Gopnik and Astington found that “Most 3-year-olds answered the representational change question incorrectly. [and] Most 5-year-olds did not make this error”\(^\text{(p.26)}\) These results seem to point to a transitional period in mental abilities around the age of four.

Carlson et al. (1988) looked at the role of Inhibitory processes in deception and false belief tasks. Inhibitory control can be described in theory of mind deception tasks as the ability to suppress the truth when trying to tell a lie, or in the case of this research tricking an experimenter. Carlson et al. varied the amount of inhibitory control that was required for a deceptive task of misleading an experimenter about a toy’s location in two ways. Children in the low-inhibition situation used pictures or arrows to convey the false location, whereas in the high-inhibition condition children had to point their fingers to communicate the wrong location. The high-inhibition situation was hypothesized to be more difficult because it was well practiced and reinforced. Children are reinforced frequently when young to point to the correct object, for example pointing to a car when someone says car. The results of Carlson et. al. supported their hypothesis, “3-year olds deceived significantly more often in the picture condition...than in the pointing condition”\(^\text{(p.679)}\). They also found that four year olds performed significantly better in the pointing condition. These findings seem to emphasize the importance of the ability to inhibit a truthful response in deception.

Literature emphasizing the influence nature has on a child’s mental development can be seen in Nelson, Plesa, and Hensler’s (1998) proposal of an experiential approach to theory of mind development. Foote & Lonergan (2003) describe this experiential view by stating, “…that the child’s theory of mind develops as a result of the interaction between the internal processes of the child and environmental influences acting upon the child”\(^\text{6(p.45)}\). Some of the environmental influences that could affect this development would be sibling interaction.

Foote & Lonergan (2003) studied conflicts between siblings looking for specific features that related to false belief understanding. Mental state terms and specific types of arguments were the variables that were focused upon in this research. There were 22 children (3-5 yrs old) that were given eight false belief tasks and were taped playing with an older sibling. Foote and Lonergan (2003) found that, “use of other-oriented arguments by the target child was significantly associated with success on false-belief tasks after controlling for age and general language ability”\(^\text{6(p.45)}\). Other-oriented arguments can be described as interactions that involve reasoning or compromise. This type of negotiation can relate to thinking about others’ mental states because the child has to reflect about incorporating the interests of the partner or the interests of them both. Their findings suggest that certain qualities of sibling conflicts are related to children developing false belief understanding.

Another environmental component in developing theory of mind are adults or parents. Guajardo & Watson (2002) studied whether exposure to social conversation with adults involving mental state talk could improve theory of mind development. They conducted two experiments in which three to four year olds were put into two treatments. The first condition involved training through adult social discourse about concepts that related to mental states while the second control condition involved no training. This discourse involved book reading with interspersed discussions about characters’ thoughts and actions. This type of interaction was chosen because, as cited in Guajardo
& Watson (2002), “sophisticated representational demands occur more frequently in caregiver-child conversation during book reading than in other types of interactions” (Sorsby & Marlew, 1991). Theory of mind pre and post tests were administered to assess possible improvement. Guajardo & Watson (2002) found that the training was not effective in the first study however, “modifications of the training procedure led to significant improvements on measures of false belief and deception from pretest to 1st posttest” (p.1). So, social conversations seem to have an influence on children’s theory of mind development.

I hypothesize that results will corroborate previous findings, that as age increases a child’s theory of mind capabilities will increase as well. I also hypothesize that because the deception task is more difficult to grasp it will be more susceptible to environmental influences. This being said, I hypothesize that in the deception task, in particular, the more siblings one has the greater the scores will be and that a parent influence will be visible in deception scores as well.

2. Methods

2.1 participants

Parents of 47 children (24 female, 23 male) from local preschools gave informed consent for their child’s participation in this study. The age of the subjects ranged from 32 months to 102 months with the mean age=60.47 months. The minimum amount of siblings a child had in this study was zero with the maximum being four, while the median siblings=1.

2.2 apparatus

The materials used in the protocol included; two puppets, one girl and one boy (African American or Caucasian were available), one rubber bouncy ball, one Band-Aid box filled with crayons, two box-like containers (one red and one blue), a green filter, a sponge painted to look like a rock, and pictures. The pictures included colored drawings of a closet, a bed, a girl, a boy, and a castle.

2.3 procedure

The protocol that was utilized consisted of five tasks relating to false belief, deception and appearance reality. Two experimenters, first, warmed the child up with introductions, talking, and at times play interaction with the puppets or ball. Next, the protocol was administered over the course of about 15-30 minutes. Experimenters kept track of the subject’s answers as they were given. They were instructed to check correct or incorrect blanks based upon the child’s replies and write any elaborations as needed. The protocol employed was based off of the Carlson and Moses (2001) theory of mind battery. Those who administered the protocol followed a typed up procedure script that included written dialogue for prompts, responses, and questions relating to false-belief, deception, and appearance reality, for each of the five tasks as follows. Please note that the appearance reality task was administered according to the Carlson and Moses (2001) battery however it is not described in detail because this study does not deal specifically with this task.

2.3.1. location false belief

In this first task two puppets, Tim and Jane, play with a ball briefly and then Tim puts the ball in the blue container and leaves. Jane gets the ball out, plays with it momentarily and then puts the ball back in the red container. Next, Tim comes back, wanting to play with the ball, and at this point the child is asked, “Where does Tim think the ball is?” and “Where is the ball really?” Answers are recorded accordingly.

2.3.2. explicit location false belief

Task two consists of two stories about John and Jenny being narrated with the use of pictures when appropriate. The children are told that John really wants to find his kitten and that he thinks the kitten is in the closet but it is really under the bed. Participants were then asked “Where will John look for his kitten?” and “Where is the kitten really?”
The same story line is then followed again substituting Jenny for John and puppy for kitten. Additionally, the terms bed and closet are given in reverse order from the previous plotline. After the same questions are asked, answers are recorded.

2.3.3. contents false belief

In task three children are shown a band-aid box and asked what they think is inside. After discovering that there were crayons inside they were asked, “When you first saw the box, what did you think was inside, band-aids or crayons?” Then the child was asked, “If you showed the box to one of your friends, what would they think was inside the box?” Answers are recorded accordingly.

2.3.4. deception

Task four is centered around the child tricking the experimenter about the location of a ball. The two experimenters begin by bouncing the ball with the child and then Experimenter one (E1) leaves the room. Experimenter two (E2) convinces the child to play a trick on E1 by putting the ball in the red container but telling E1 that the ball is in the blue container. The question “Where is the ball now?” is interjected at this point in time. After the child answers and also understands the plan, E1 re-enters and asks where the ball is. The child should then point to the blue container, and is subsequently asked (while E1’s back is turned) “Where does E1 think the ball is?” and “Where is the ball really?” Then E1 looks for the ball, is deceived, and answers are recorded.

3. Results

The sample was split into two age groups: 1.) younger children with the age of 47 months or below (three years 11mos) and 2.) older children of 48 months or above (four years). Correlational analyses were done with age and the two different theory of mind indicators. An upward trend in scores with age can be seen in both of the correlations. The first correlation with variables age and false belief, yielded r=.57, p<.001. A correlation between age and deception was significant at r=.51, p=.001. An ANOVA testing the influence of father occupation type for older children on deception scores was statistically significant. A significant increase in scores can be seen in the older children when looking at father occupation type for older children, F(1,28)=31.54, p<.001. Also, a significant increase can be seen in deception scores in the children of white collar fathers versus those who have blue collar fathers, F(1, 28)=5.41, p=.027

Figure 1. Age2 and Deception Scores
Figure 2. Effect of Collardad on Deception Scores
Additionally an ANOVA testing for the influence of older siblings upon deception scores was significant, F(3,39)=3.25, p=.032. Figure 3 shows that those with two older siblings scored higher on the deception tasks than those with less than two older siblings.

4. Discussion

The findings substantiate previous research claims that as children age they develop greater theory of mind abilities. Children’s mental capacity for understanding that beliefs can be false, as well as comprehension of deception, increases as they age. Understanding that another individual has an incorrect belief requires representing that wrong belief in relation to one’s own knowledge. Wimmer and Perner (1983) confirm the correlational results from this study suggesting that “Around the ages of 4 to 6 years the ability to represent the relationship between two or more person’s epistemic states emerges and becomes firmly established” (p.104).

The results also support the hypotheses that the deception task may be more susceptible to environmental influences. This may be due to the complex nature of deception and its role as a higher indicator of ToM. As cited by Price (2008), Gombos (2006) found that, “lying places a high cognitive load on a person’s executive functioning especially working memory and decision-making” (p.32). When children lie their executive processes are hard at work actively managing and controlling mechanisms of thought. This control of thought, or inhibitory processes, is especially important when lying.

It is plausible that children would have difficulty with deception because in order to place false belief in another person they first have to understand the concept of how one acquires a false belief. The key concept to point out here is that not only do they need to have a mental representation of what is taking place in another person’s mind but they also must be able to inhibit their truthful thoughts. Carlson et al. state, “Although inhibitory functioning develops throughout childhood, one of the most important periods of change is the preschool period, the very time at which rapid changes are occurring in theory of mind performance” (1988, p.672). This provides some additional explanation for the findings that many three year olds have difficulties with deceiving an experimenter because they have yet to fully develop theory of mind as well as inhibitory capacities.

When talking about inhibition it is important to note that Carlson et al. believe that pointing heavily strains inhibitory control skills. They conclude that deceptive pointing requires reactive and proactive inhibition which are different levels of suppressing thinking. Also, pointing to correct objects when one is young, is reinforced in our culture, so this too may pose an obstacle for a child. It is pertinent to recall that in the procedure utilized for this research the child is asked to deceptively point. So, perhaps this method added to the difficulty of the task, which may further open up the deception task to environmental influences.

The findings also support the hypothesis that home environment and family members can have an influence upon
a child’s deceptive capabilities. As cited in Foote et al (2003) “In particular siblings are potential sources of influence on sociocognitive abilities such as perspective taking, reflection about internal states, and developing an understanding of how the mind works and how it influences behavior” (Boer & Dunn, 1992). In the results one can see that children with two siblings have higher deception scores than those with less than two. It is important for the reader to note however, that three older siblings does not follow the increasing trend, perhaps because of the data sample. There were only two participants in the study that had more than two siblings, so this small number impairs the statistical power. Also, the effect of having no older siblings may be so high due to the fairly large amount of children in the study without older siblings. Another explanation for the seemingly optimal number that two siblings has upon deception scores, is that it is not simply the quantity of siblings that matters but the quality of the interaction that takes place. As cited in Carpendale & Lewis (2002), “It is the nature of the relationships that children experience that influences development rather then just the number of people in the household” (Hughes, Deater-Deckard & Cutting, 1999 p.2). The important factor in sibling interaction that can influence theory of mind scores lies in the language used in mental state talk. For example, words such as know, think, or believe might be directly related to improving mentalistic understandings. So, talking about mental states with siblings can be a helpful when it comes to improving theory of mind abilities. As cited in Carpendale and Lewis (2002), “Once children can talk about the social, emotional, and psychological world they can begin to reflect on or think about people’s activity in psychological terms” (Chapman,1991;Piaget 1945/1962; Vgotsky 1934/1986).

Results also support the hypothesis that a parent influence would be visible in deception scores. The findings show that those children with white collar fathers have higher deception scores than those with blue collar. I believe that this outcome is also a testament to the positive influence mental state talk can have upon children. Guajardo & Watson’s (2002) research supports this because, “…through participation in conversations, the children showed improved performance on standard measures of theory or mind understanding as compared with those children who did not participate in any training” (p.1) Perhaps white collar fathers have had more schooling and thus may have more intelligent conversations, involving mental state talk, with their children. Also, it is possible that white collar fathers are more inclined to read to their children which is pertinent to theory of mind development because of the sophisticated representational demands accompanied with this interaction, as cited previously (Sorsby & Marlew, 1991).

The deception facet in theory of mind development is an intriguing concept because of the complexities that are embedded into the task of deceiving. It is also interesting because of its susceptibility to influence from environmental factors such as number of older siblings as well as father occupation. The environmental influences seem to emphasize the importance of narrative discourse in the development of a child’s theory of mind. Nelson (1999) states, as cited in Guajardo & Watson (2002), “That narrative is an important route through which the cultural transmission of information about complex mind-behavior relations occurs” (p.1) With this in mind when thinking about applying these findings to the real world, as a parent, one would probably want to encourage sibling interaction. Adults also might try to alert a child to the beliefs, intents, and desires of others through conversation at an early age. Additionally, these results might encourage families to engage more in activities that involve mental state discourse, such as reading books or even compromising. It would be interesting for future studies to extend upon the results of this research and look further into exactly what particular kinds of narrative in the environment context improves deception scores. In terms of expanding upon this study I believe it would be stimulating to run analyses again with a larger sample size that may involve a more even distribution of different numbers of older siblings. Also, many more analyses could always be done to see if any other environmental influences effect deception scores.

5. References

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