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Young Children's Understanding of
Attentional Focus and Seeing leads to Knowing

Paula Bennett

A Thesis

in

The Department of Psychology

Presented in Partial Fulfilment of the Requirements
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ABSTRACT
Young Children's Understanding of
Attentional Focus and Seeing Leads to Knowing

Paula Bennett

The present study examined how knowledge of attentional focus and the understanding that seeing=knowing develop between 24- and 30-months of age. Twenty-seven 24-month-old children and twenty-three 30-month-old children participated in two tasks. In each task, children were asked to retrieve a toy with the help of one of two strangers - one who was blindfolded and one who was not. In the first task, children were asked to request a visible toy from a stranger. The 24-month-old children looked significantly longer to the stranger who was not blindfolded than to the one who was blindfolded whereas the 30-month-olds did not. In addition, both age groups touched the hand of the non-blindfolded stranger to retrieve the toy significantly more often than the hand of the blindfolded stranger. In the second task, a screen blocked the child's vision from seeing a toy being hidden under one of three cups. The children were asked to find the hidden toy with the help of one of the strangers; one of whom was blindfolded during the hiding phase. There were no significant differences in looking times at the two strangers in the two age groups. In addition, there were no significant differences in the number of times children chose to find the hidden toy under either of the two strangers cups in the two age groups. These results suggest that 2-year-olds have an understanding of attentional focus. Further, consistent with previous literature, the results of this study indicate that an understanding that seeing=knowing is beyond the grasp of children under three years of age.

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TABLE OF CONTENTS

List of Figures	vii
List of Tables	viii
List of Appendices	viii
Introduction	
Belief-Desire Reasoning	3
In Children Under Three Years of Age	6
Visual Perception	9
A Sensitivity to Eyes.	10
Understanding of Attentional Focus.	11
Understanding that Seeing=Knowing	
In Children 3 Years of Age and Older	16
In Children 2 to 3 Years of Age	24
The Present Study	27
Method	29
Participants	29
Task 1	
Materials	31
Procedure	31
Warm-up Period	32
Experimental Trials	33
Results.	35

TABLE OF CONTENTS (cont'd)

Task 2	
Materials	44
Procedure	44
Warm-up Period	44
Experimental Trials	45
Results	47
General Discussion	51
References	64
Appendices	70

LIST OF FIGURES

- Figure 1. Belief-Desire Psychology: A schema of the organization of the constructs of our everyday theory of mind.
(taken from Wellman, 1993, p. 13) 4
- Figure 2. The contrast between desiring and believing
(taken from Wellman, 1993, p. 17) 8
- Figure 3. Mean percentage of looking times as a function of gender in the two age groups for task 1 42

LIST OF TABLES

Table 1.	Mean Total Looking Times to the Target Person (Nonblindfolded) and to the NonTarget Person (Blindfolded) for each Age Group and Gender in Task 1	39
Table 2.	Mean Percentage of Looking Time to the Target Person (Nonblindfolded) as a Function of Age and Gender in Task 1.	40
Table 3.	Mean Total Looking Times to the Target Person (NonBlindfolded) and to the NonTarget Person (Blindfolded) for each Age Group and Gender in Task 2	50

LIST OF APPENDICES

Appendix A	French Recruitment Letter to Parents	70
Appendix B	English Recruitment Letter to Parent	72
Appendix C	Informed Consent Form - French Version.	74
Appendix D	Informed Consent Form - English Version.	76
Appendix E	Protocol Summary Sheet.	78
Appendix F	Source Table for Analysis of Variance for Task 1.	81
Appendix G	Source Table for Analysis of Variance for Task 2.. . . .	83

Young Children's Understanding of Attentional Focus and Seeing leads to Knowing

In recent years, research has transformed our view of the young child's "theory of mind" (i.e., common-sense psychology). The burgeoning literature on children's social understanding reflects much of our curiosity about how the young child uniquely perceives her/his social world. This research has particularly attempted to determine "when children understand what about the mind" (Wellman & Bartsch, 1994, p. 331). In addition, of interest to many researchers is the age at which children begin to think about and understand themselves and others much like we do. Theory of mind has often been used as a shorthand term to describe a mentalistic approach we ordinarily take to understand people's actions. That is, one way we understand others' actions is in terms of their mental states (e.g., beliefs, desires, intentions, emotions) and mental activities (thinking, attention). There is also a "coherence" (Wellman, 1993) in our theory of mind explanations. For instance, we see a three-year-old girl rummage through her toy-box. We may explain this girl's action based upon her belief that her teddy-bear is in that box, thus in order to fulfill her desire (i.e., goal), she engages in an intentional action (rummaging) which results in an outcome that pleases her or not.

When can young children engage in theory of mind explanations about their own and another person's actions? Currently, there is much controversy around this question. Researchers differ in their interpretations of children's capabilities and limitations at different ages. Several researchers (Wimmer, Hogrefe, & Perner, 1988; Perner, Baker, & Hutton, 1994) remain steadfast in their claim that children do not develop a "theory of mind" until their fourth year. However, recent research has challenged this claim. For

instance, Wellman and Woolley (1990) propose that even two-year-olds may possess some earlier form of a psychological theory about human actions. While researchers differ in their interpretations there is, however, clear consensus that the young child develops her understanding of the mind in a gradual manner.

A reason for a gradual acquisition of understanding of the mind is that children need to comprehend two aspects of mental states. Wellman (1993) has referred to these two aspects as Ontological and Causal. The ontological aspect refers to our ability to differentiate things that go on in our mental world (e.g., dreams, thoughts, ideas) as different kinds of entities from things that go on in our physical world (e.g., tasting an ice-cream, touching a teddy-bear). Children as young as 3-years-old know that when someone has a thought of a cookie that they cannot see it or touch it (Wellman, 1990). They know that the thought or idea of a cookie is different from the actual cookie. Wellman (1993) proposes then that an understanding of the ontological aspect of mental states indicates an awareness that “the contents and states of the mind are internal, mental and subjective” and that the “contents and states of the world are external, substantial, and objective” (Wellman, 1993, p. 12).

An understanding of mental states also implies an awareness of causality. That is, things that go on inside our minds (e.g., beliefs) cause us to act in certain ways toward the world. Further, things in the world can also cause us to form certain beliefs or thoughts about the world. In other words, causality implies that “mental states causes actions in the

world and the world causes mental states” (Wellman, 1993, p. 12). Wellman (1993) proposes that his belief-desire reasoning model can illuminate this dual (e.g., mind-world and world-mind) causality.

Belief-Desire Reasoning

In Wellman’s desire-belief reasoning model, the way we perceive (i.e., see) the world causes us to form particular beliefs (e.g., knowledge, ideas, suppositions, opinions) (see Figure 1). These beliefs are seen to frame our explanations (e.g., she looked in the toy-box because she believed her teddy-bear was there). Physiological states (i.e., emotions such as happy and sad) are linked to our desires (e.g., wants, wishes, hopes, aspirations). Both beliefs and desires, together, result in intentional actions and corresponding emotional reactions. For instance, the emotions of happiness and sadness are seen to result from either our desires being fulfilled or not, whereas the emotions of surprise and puzzlement are seen to result from a belief that does not match reality. Findings from research studies support this latter claim. However, in his review of studies, Wellman (1990) reports that while children tend to associate the emotions of happiness and sadness with desires by three years of age, it is not until five years of age that children associate the emotion of surprise with a failed belief. Wellman (1990) proposes that young children may tend to associate surprise with a pleasant or happy outcome because of their limited social experiences with this emotion (e.g., peek-a-boo games, “Surprise! I see you!”). In this way, the young child’s association (i.e., surprise=happy) would account for their failure to associate surprise with a failed belief (i.e., an unpleasant or disappointing outcome).

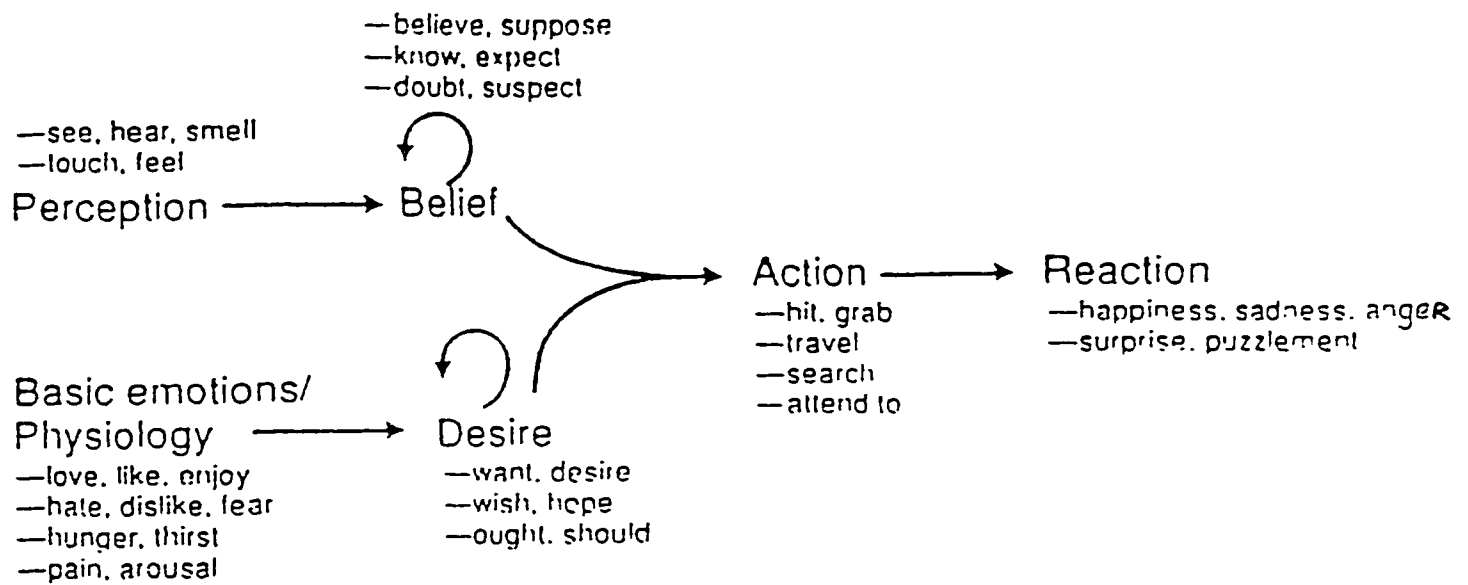


Figure 1. Belief-Desire Psychology: A schema of the organization of the constructs of our everyday theory of mind. (taken from Wellman, 1993, p. 13).

Researchers, overwhelmingly, concur that by 4-years of age children have a good grasp of belief-desire reasoning (i.e., a theory of mind). While there is some empirical support for belief-desire reasoning in 3-year-olds (Wellman & Woolley, 1990; Wellman, 1990), the consensus among researchers however, is much weaker. This is because 3-year-olds fail false belief tasks (Wellman, 1990). In a typical false belief task, children are told about a story character, Maxi, who places chocolate in a cupboard and then leaves the kitchen. During Maxi's absence, his mother enters the kitchen and moves the chocolate to a different location (e.g., the living room). The child is then asked where Maxi will look for his chocolate. Children younger than 4 years of age say Maxi will look in the living-room. These children fail to comprehend that Maxi can have a false belief. In other words, they do not consider that Maxi's actions will correspond to his belief (albeit false) rather than to reality (for them belief=reality). Some researchers (Wimmer et al., 1988; Perner, 1991) argue that this failure is evidence that children younger than four do not understand belief at all. Hence, they do not have a theory of mind. However, Wellman (1990) proposes that this type of task may be particularly difficult for younger children. In other words, young children may have some understanding of beliefs which allows them to interpret others' actions that does not involve a more complicated understanding of false beliefs.

In a recent study, Wellman (1990) investigated 2- and 3-year-olds' understanding of simple beliefs (i.e., beliefs that are not false). In one study, children were told a story about Jane who wants to find her kitten and it may be either in the playroom or in the kitchen. The child is asked first where he or she thinks the kitten might be (a control for

egocentricity) and he or she is then told that Jane thinks it is in the other location. Then the child is asked where Jane will look for her kitten. Wellman found that 3-year-old but not 2-year-old children could significantly state where Jane would look for her kitten. This finding was further supported in additional studies in which children were given different story tasks that would tap into their understanding of simple beliefs. Wellman (1990) concludes that these results indicate that a 3-year-old child can consider two contradictory beliefs (her/his own and a character's). Further, he argues that these studies clearly provide support for a causal understanding of the mind in 3-year-old children.

In Children Under Three Years of Age

There is widespread agreement that children younger than 3-years of age do not understand beliefs. However, Wellman (1993) proposes that the younger child does have some understanding of persons, namely - a simple intentional understanding of desires, perceptions, and emotions. These sorts of understandings enable the young child to possess some earlier form of a psychological theory of persons which, while being impressive, is however quite different from our own theory-like mentalistic understanding.

Wellman (1993) argues that the young child's psychological theory about persons is distinct from children older than 3 years of age in two ways. One is that the child's understanding of herself/himself and others is solely experiential. The child recognizes that she/he and others can have subjective inner experiences (e.g., seeing, wanting, feeling happy or sad) regarding objects. Further, the child perceives her/his own and another person's actions as intentional (that is on purpose, intended). This means that the child

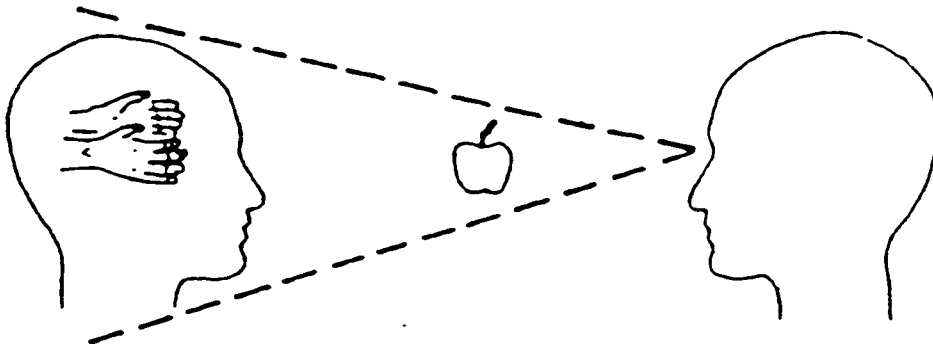
understands that their own and another person's inner experience (e.g., wanting) can produce an attitude or action that makes reference to or is *about* some object.

These intentional understandings are object-specific. For instance, in simple desire reasoning, Wellman (1993) proposes that younger children's (i.e., nine to twelve months) intentional understanding of a "psychological experiential sort" is limited to desired objects that are only in the here-and-now whereas eighteen to twenty-four month-old children can additionally understand that they and others may desire objects that are unavailable (e.g., locked up in the cupboard) and out of sight.

However, the child's understandings of intentional-experiential states is not representational. This is clearly illustrated in Figure 2. The child who has a simple desire reasoning is found in the top portion of the diagram which shows that such a child does not yet form a representation of the person as having a representation about the desired object. The child can only explain a person's action based upon their understanding of the person's "internal longing" for the object. In contrast, the child who has a more sophisticated understanding of belief-desire reasoning will be able to form a representation of a person having a thought about an object. Several researchers (Pratt & Bryant, 1990; Wellman, 1990) propose that this understanding does not occur until the third year of life.

In a recent study, Wellman and Woolley (1990) attempted to demonstrate the earliest age at which simple desire reasoning occurs in children. Two-year-old children were read stories of a character named Sam who wanted to find his rabbit and who either found it or not. The authors found that children significantly predicted that Sam would

Desire (wants an apple)



Belief (thinks that that is an apple)

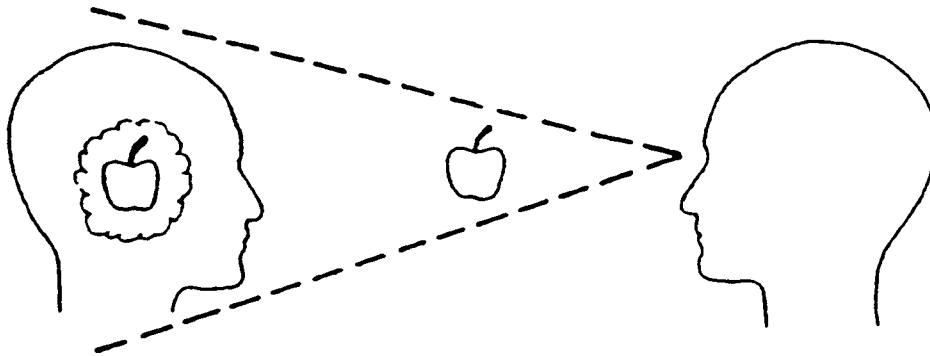


Figure 2. The contrast between the understanding of another person as desiring something and the understanding of another person as believing something, in terms of the mental representation of the objects of desire and of belief (taken from Wellman, 1993, p. 17).

continue to look for his rabbit when he did not find it in one location. Further, children were asked “Does [Sam] feel happy or does he feel sad?” after hearing that Sam found his rabbit, did not find his rabbit, or found a dog. Young children significantly stated that Sam would be more happy than sad when he found his rabbit. Wellman (1990) concludes that these results indicate that 2-year-old children understand that an internal longing will motivate an individual (either themselves or another) to satisfy his/her desire. In this way, the 2-year-olds’ theory of mind is quite different from that of adults; it is only a hypothetical understanding of the mind.

Visual Perception

In addition to an early intentional understanding of desires, Wellman (1993) proposes that there is also an early intentional understanding of perceptions. However, the recent flurry of studies on the young child’s theory of mind has mostly focused upon the young child’s understanding of desires and beliefs (Gopnik, Slaughter, & Meltzoff, 1994) and has largely neglected perception. This oversight may result in our having an impoverished understanding of the way in which young children develop their understanding of belief. While intentions and desires may be perceived as building blocks they are quite dissimilar to beliefs. On the other hand, visual perception “shares many features with beliefs” (Gopnik et al., 1994, p. 159) and an early conceptual understanding may be an “important precursor to understanding belief” (Gopnik et al., 1994, p. 159).

In what ways are visual perception and beliefs similar? The two are directly tied to the physical world - that is, reality. They have a “mind-to-world direction of fit; the child changes his mind to fit the world, rather than changing the world to fit his mind” (p. 159).

For instance, when we *see* someone put a cookie in the cupboard this then forms our knowledge of where the cookie really is. Further, since visual perception and beliefs are both representational states (i.e., we form a representation of the cookie in the cupboard) this may, then at times, “lead to misrepresentations of reality in a way that is not true of desire” (Gopnik et al., 1994, p.159). For instance, if someone moves the cookie from the cupboard, without our knowledge, this then results in our having an inaccurate perception of where the cookie really is. However, our desire for the cookie does not become false. Gopnik et al. (1994) further propose that metaphors we use for belief further indicate that visual perception and beliefs are clearly connected in our minds (e.g., we see the light). These similarities suggest that the child’s understanding of belief may, in part, be a result of his earlier conceptual understanding of visual perception.

A Sensitivity to Eyes

An understanding of visual perception develops in a gradual manner. Povinelli and Eddy (1996) propose three comprehension levels in which the child’s understanding of visual perception becomes increasingly more sophisticated. At the first level, there is no recognition that eyes provide information about the inner world of others. A preference for eyes has been found in infants as young as two to three months (Maurer & Barrera, 1981), however, this preference has been interpreted solely as an indication of the “widespread sensitivity” to eyes in our own and others’ species (e.g., mammals, birds, reptiles; Povinelli & Eddy, 1996).

Understanding of Attentional Focus

At the second level of comprehension of visual perception, the young child advances her knowledge of the function of eyes. She is able to perceive that seeing (i.e., the eyes) links her and other people to the external world. Through joint visual attentional acts (i.e., looking where someone else is looking), young children develop their attentional skills. Around 9-12 months of age, infants begin to follow someone's head turn to an interesting sight (Moore & Corkum, 1995; Morrissette, Ricard, & Decarie, 1995) relying on movement cues to locate the object of the person's gaze (Moore, Angelopoulos, & Bennett, 1997). The one-year-old infant is also seen to demonstrate a rich understanding of affect when she/he draws her/his caregiver's eye gaze to ambiguous objects (Gopnik, Slaughter, & Meltzoff, 1994). This latter understanding has been most clearly demonstrated in the area of social referencing. A one-year-old infant who engages in social referencing understands that an adult can provide an emotional response in a novel object encounter. In this way, she/he will look to the adult and use the adult's emotional stance about novel and ambiguous objects. Around 18 months of age, there is a further development in the infant's visual perceptual skills. Eighteen month-old children can accurately determine someone else's focus of attention through eye gaze alone (Butterworth & Jarrett, 1991). Further, findings from research studies on language learning suggest that 18-month-olds can use their ability to follow someone's eye gaze to learn the name of novel objects (Baldwin & Moses, 1994).

The hypothesis that infants are able to engage in joint visual attention and social referencing has generated considerable controversy. Some researchers presuppose that this ability indicates that infants have insight into the minds of others. For instance, an infant interprets another's shift in eye gaze as an intentional act (i.e., the person intends to convey information about an object to the infant). This implies that already at 9 months of age, infants are aware that others have mental lives, in particular, the mental activity of attention. While several researchers interpret joint visual attention and social referencing as evidence for mentalism, there are alternative interpretations. Various researchers argue for a more limited social understanding (for a review, see Baldwin & Moses, 1994). For instance, Moore and Corkum (1995) have proposed that the infant's ability to follow shifts in eye gaze may result from a rich history of social interactions with their caregivers. These social experiences build up the infant's expectation that she/he will see something interesting in the direction of her/his mother's gaze. The infant's understanding of visual perception is then much restricted - that is, she/he responds to eye gaze solely as a signal releasor (Johnson, Slaughter, & Carey, in press) and she/he does not attribute intentionality to the other person.

Research on young children's ability to follow another's behavioural cue (e.g., eye gaze, head turns, points) has largely focused upon infants. However, in a more recent study, Lee, Eskritt, Symons, and Muir (in press) examined 2- and 3-year-old's understanding of another's behavioural cues. These authors were particularly interested in determining young children's understanding of the function of eye gaze - that is, that eye gaze could be a source of information about someone's desire. They also examined 2-

and 3-year-old's ability to use other nonverbal cues (e.g., points, head turn) to infer someone's desire.

In their studies, 2- and 3-year-old children were asked to watch "Giggles the Clown" show on a television screen. They were required to determine which among the three objects Giggles desired by her nonverbal cues (head turn, eye gaze, and pointing). In one condition, Giggles turned her head, looked at the object, and pointed to it. In a second condition, Giggles turned her head and looked at the object. In a third condition, Giggles moved only her eyes toward the object and kept her head facing the child. Children were asked which object Giggles wanted. The authors found that 3-year-olds performed significantly above chance in all three conditions whereas the 2-year-olds performed significantly above chance only in the first two conditions. This latter finding indicates that 2-year-old children have difficulty in using eye gaze alone to infer another's desire. However, they succeed in inferring another's desire when eye gaze is combined with head turns and/or pointing. Lee et al. (in press) propose that these findings suggest that even 2-year-olds can infer another's desire. However, the 2- and the 3-year-olds only understand that head turns and pointing can act as attentional cues to indicate another's attentional focus. In other words, this study provides no support for the notion of intentional understanding (i.e., mentalism) in 2- and 3-year-old children.

However, the authors do entertain the possibility that their results may support Wellman's claim for a rudimentary theory of mind in 2-year-olds. Their results may suggest that 2-year-olds know something conceptually about a mental state if attentional

cues are used to make an inference about that mental state (Lee et al., in press). Their caveat is that future studies need to be conducted to determine this issue.

Researchers have also specifically studied visual perception: “asking at what age children understand what others can and cannot see” (Povinelli & Eddy, p. 19). Flavell and his colleagues are recognized as the pioneers of the research on visual perception (Povinelli & Eddy, 1996). In an early study, they charted the child’s development of the understanding of the function of eyes. Lempers, Flavell, and Flavell (1977) postulated that the child must pass four criteria in order to show an understanding that an individual (either themselves or another) can be “cognitively connected” (Flavell, 1988, p. 244) to something if they can see it. One criterion is that an individual’s vision should not be blocked (e.g., hands over eyes, blindfold) and that at “least one eye need to be open” (Lempers et al., 1977, p. 6). Second, in order to see an object the individual’s eyes need to be generally oriented in the object’s direction. Third, there must be no objects blocking the target object from the individual’s vision. Fourth, the child needs to be nonegocentric - what the child “sees and does not see with regard to [another individual or target object] has absolutely no effect on what [the child] sees” (Lempers et al., 1977, p. 7).

In their study, Lempers et al. (1977) assessed children’s knowledge about their visual perceptions at various ages (i.e., 1-, 1.5-, 2-, 2.5- and 3-years of age). The child was often retested on tasks in order to obtain the best performance. Children were tested in their homes and they were asked to show different things (e.g., a tube, a picture) to their mothers. On one task, children were asked to show an object to their mother when her eyes were closed. The authors found that not until two and one half years of age did

children consistently realize that in order to share a visual perceptual experience with their mother they had to open her eyes first. They concluded then that by the middle of the third year of life, but not before, children understood the “cognitive connection” (Flavell, 1988).

In a recent study, young children’s visual-perceptual knowledge was assessed in a task which required them to make a choice between two adult strangers (Povinelli & Eddy, 1996). The task was originally designed for chimpanzees (Povinelli, Nelson, Boysen, 1990; Povinelli, Parks, & Novak, 1991). The authors found that chimpanzees were quite successful at these tasks. Their goal in testing children was to determine whether the task measured “seeing leads to knowing” or a more simple understanding of seeing in order to say something about chimpanzee’s visual perceptions. They hypothesized that if the youngest children (i.e., 2.5-year-olds) could succeed at their task then it was a measure of “seeing”. Children (ranging in age from 2.5-years-old to 5-years-old) were trained to place their hand on a handprint in order to receive a reward (e.g., a sticker). Then a child was presented with two adult strangers who knelt at opposite ends of a table. Each stranger had a handprint in front of him or her on the table. The stickers were placed in the middle of the two strangers, on the floor, and were only given to a child if she/he placed her/his hand on the correct handprint. At the beginning of each trial, the child was asked to stand approximately 1.5 m away from the table with her/his back turned to the two adult strangers. When the child heard a knock (one of the adults knocked under the table) she/he was to turn around and choose one of the strangers. Each child received three conditions in which one stranger could see the handprint (this

stranger maintained his gaze at the handprint) and the other stranger could not see. In one condition, one stranger faced the table whereas the other stranger had his back turned to the table. In a second condition, one stranger placed his hands over her/his eyes and the other did not (both faced the table). In a third condition, one stranger placed a screen over her/his face and the other did not (both faced the table). They found that all children performed above chance levels in these three conditions. They concluded that it was further support that the 2.5-year-old child understands the function of eyes (i.e., seeing).

Understanding that Seeing=Knowing

In Children 3 Years of Age and Older.

At the third level of comprehension of visual perception, young children understand that seeing leads to knowing (i.e., the ability to infer someone's knowledge state based upon whether the individual sees or does not see an object). In recent years, there has been considerable debate over the transition period in children's understanding of seeing=knowing.

Taylor (1988) conducted one of the earliest research studies into the development of children's understanding of seeing leads to knowing in a conceptual perspective-taking task. She hypothesized that if children do not understand seeing=knowing then they will believe that their own and another's knowledge about an object is identical even when the other person did not see the object (i.e., a copy theory; for more detail, see Chandler,

Fritz, & Hala, 1989). Conversely, if the child assesses that the other person lacks knowledge about an object when he cannot see it then there would be support for the seeing=knowing distinction.

Two experiments were conducted with children at different age levels (3-, 4-, 5-, 6-, and 8-year-olds). Children were presented with three pictures, one after the other, of various animals and informed of the animal's identity (it is a giraffe), the animal's name (non-perceptual information), and what the animal was doing (animal's actions). Then they were asked to assess a puppet's knowledge on these three things. Each picture, was re-presented, in turn, however, the puppet had a restricted view of the picture in that he was shown either a picture that was blank, had unidentifiable parts showing, or one identifiable part showing. The authors found that the younger children (4- to 6-year-olds) did not attribute knowledge to a puppet when a picture was blank but they did even when an unidentifiable part was shown. With training on multiple interpretations (i.e., children were given a training condition in which it was demonstrated to them that restricted views of objects were ambiguous - that is, parts from different objects could have the same restricted view), however, 4-year-old children were able to assess that a puppet would not know the identify of a picture if the information was ambiguous. The authors concluded that not until 4 years of age could young children understand the "mentality-reality distinction".

In another early research study on conceptual perspective-taking, Wimmer, Hogrefe, and Perner (1988) explored 3-, 4- and 5-year-olds' understanding of seeing leads to knowing. Several experiments were conducted to test the hypothesis that children's

understanding of perceptual accesses of knowledge is based upon a causal connection.

Two children, approximately the same age (one was the target child and the other was an experimenter) sat at a table, directly across from one another. Children were presented with two conditions. In one condition, the target child saw the contents in a closed box whereas the experimenter child did not. In the second condition, the child experimenter saw the contents in a box whereas the target child did not. Children were asked who had knowledge about the contents (“Does (other child’s name) know what is in the box or does she not know that?” and “Do you know what is in the box or don’t you know that?”) as well they were asked to justify their answers (“How do (Why don’t) you know that?”).

The authors found that most 4-year-olds understood that visual access lead to either themselves or another having knowledge about the contents of a box. Further, they were able to justify their responses in a causal manner. In contrast, 3-year olds attributed knowledge to themselves when they saw the contents and they attributed ignorance to themselves and to the child experimenter when she/he saw the contents. Also, they were unable to justify their responses. The authors concluded in a similar vein to Taylor (1988) that an understanding of visual perception as a cue to the acquisition of knowledge about an object does not emerge until 4-years of age.

Using a simplified forced-choice task, Pillow (1989) examined the understanding that seeing leads to knowing in 3- and 4-year old children. In a series of studies, the child and an experimenter sat at a table directly facing one another. On alternating trials, the child or a puppet saw the contents inside a container. Children were subsequently asked who had knowledge about the object’s colour (“Do you know what colour the dinosaur in

here is?” and “Does (puppet’s name) know what colour the dinosaur in here is?”). In this study, both 3- and 4-year-olds correctly attributed knowledge (i.e., colour) to the viewer. To control for the possibility of egocentric responses, a second study was conducted in which the child had to choose one of two puppets. One puppet looked inside the container and saw the contents whereas the other puppet simply pushed the container (i.e., he did not see the contents). The child was then asked “Who can tell you what colour the dinosaur is?”. Pillow found that 3-year-olds correctly chose the knower at above chance levels. He concluded from these experiments that an understanding that visual perception leads to knowledge is present by three years of age.

Pratt and Bryant (1990) also administered a simple forced-choice task to examine whether young children understand that “other people gain knowledge about an object when they look at it” (p. 973). In a series of experiments, young children (ranging in age from 3-4 to 4-7 years) sat at a table with the experimenter seated directly across from them. Two other children sat at 90 degree angles to the child and the experimenter. The experimenter presented a box to the child which was then given to one child experimenter to look inside and then to the other to lift. Each child experimenter alternated their role of looking and lifting on trials. Children were asked “Who knows what is inside the box - John or Fiona?”. The authors found that an understanding of who knew and who did not know the contents of a box was present by 3 years of age. They concluded that 3-year-old children clearly understand that another’s visual informational accesses provides a source of knowledge about the external world.

The review of studies on seeing leads to knowing suggests that there are mixed results on 3-year-old's understanding that visual perception leads to knowledge. However, there are methodological problems with Taylor's (1988) and with Wimmer et al.'s (1988) studies which may account for poor performances in the 3-year-olds. In Taylor's study, in particular, task demands were complex in that much information was provided to a child about each picture. The mass of information may have confused the younger children and they may have not understood the purpose of the task. Such confusion may explain why these children responded most often with a "yes bias" indicating that they over-attributed knowledge to the other (who they may have perceived as knowing what was going on). A similar criticism about task demands was made about Wimmer et al.'s task by Pratt and Bryant (1990). These authors argued that Wimmer et al.'s (1988) double-barreled questions were often confusing for the young child which would lead to mistakes. Instead, 3-year-olds were better suited to straightforward simple questions which did not require them to consider two contrasting possibilities (e.g., "Did you know or did you not know?").

Povinelli and deBlois (1992) concur that the more straightforward questions posed by both Pillow (1989) and by Pratt and Bryant (1990) in their studies helped to improve the performance of the younger children. However, they argue that the mean ages of the 3-year-olds in their studies were quite high ($M=3-8$ to 4-2). For example, in one of Pratt and Bryant's (1990) studies the youngest 3-year-old recruited was 3.5 years of age and the mean for this group was 3-11 which suggests that most of the 3-year-olds were

approaching their fourth birthday. In this way, there may be slight differences in this group's understanding of people when compared to children one or two months older than themselves. Povinelli and deBlois (1992) propose that a more stringent test of 3-year-olds' visual-perceptual abilities is needed. This would involve testing young children in a very narrow age range. In their study, they recruited 3-year-olds who ranged in age from 2-11 to 3-5 and also 4-year-olds who ranged in age from 3-11 to 4-5. In contrast to the force-choice tasks used in earlier tasks, Povinelli and deBlois (1992) used a seeing=knowing paradigm originally designed for chimpanzees.

In their study, children were presented with an out of arm's reach apparatus which consisted of four handles corresponding to one of four trays on a table. On each tray, was a cup under which a "surprise" could be found. Children were familiarized with how to pull a handle in order to retrieve a particular cup. Also involved in the experiments were two adult strangers and the child's parent. In the experimental trials, a screen was placed in front of the cups blocking the child's vision such that he/she could not see where a toy would be hidden. The adult male strangers either took on the role of hider or of leaver which alternated over trials. Before an object was hidden under a cup, the leaver left the room closing the door behind him. The hider then hid an object under one of four cups. Once the object was hidden, the parent was requested to knock on the door to inform the leaver to come back inside the room. The hider and leaver then positioned themselves behind the cups and pointed to a cup. The hider pointed to a correct cup whereas the leaver pointed to an incorrect cup. The parent removed the screen and the child then responded by pulling one of the handles.

The authors found that the 3-year-olds had great difficulty with this task. These children were unable to determine who knew and who did not know where the object was hidden based upon visual informational accesses. In contrast, most 4-year-olds performed significantly above chance in choosing the hider as the one who knew where the toy was hidden. Also important in their findings was that none of the 3-year-olds could explain why they thought a toy was hidden under a particular cup. Four-year-old children were able to provide causal explanations. They concluded that understanding that visual perception leads to knowledge does not emerge until 4 years of age.

The task demand criticism that was made of earlier studies may also be directed at Povinelli and deBlois' (1992) study. In order to show an understanding that seeing leads to knowing, children in their study had to respond correctly to three questions (e.g., "Can you tell me where the leaver is?", "Do you think the leaver can see us right now?", "Do you think the leaver knows which cup I put the surprise under?"). While a simple yes/no response is only required, 3-year-old children are at a disadvantage when they are asked more abstract questions. For example, in pilot studies with 3-year-old children, the present author noted that the children ($n=10$) correctly responded to questions about another person's perceptual access to an event. All children correctly pointed to or said the name of the nonblindfolded person when they were asked "Who is watching me hide a toy?". The children were aided by the fact that the person who could see sat directly across from them. In other words, the information was concretely and visibly available to them. However, after the children chose a cup, they were asked "How did you know the toy was in that cup?" which, on the whole, they did not respond to or said "don't know".

This may be because the information or the answer to that question was no longer available to them (i.e., both strangers were now nonblindfolded). This finding may suggest that 3-year-old children understand more simple, direct questions about events. In other words, Povinelli and deBlois' (1992) questions were too complex for 3-year-old children.

In a series of studies on children's understanding of different aspects of perceptual modalities, (e.g., visual, tactile, auditory) there is further evidence to suggest that 3-year-old children perform best when presented with simple tasks. In other words, when they were asked to make an inference about more than one modality they were likely to make mistakes. In one study, O'Neill and Gopnik (1991) found that 3-year-olds did not understand that different modalities may result in different information about objects (i.e., children were asked to watch puppets perform an action - touching, looking and then they were also asked to do just as the puppet did - that is, children were both exposed to and experienced the modality). The consistent error found was that 3-year-olds tended to choose the puppet who saw an object as the one who knew rather than the puppet who felt the object, when the latter was true. In other words, these children showed a strong preference for the visual modality. Further, 3-year-olds' difficulty with the tactile modality was replicated in two other studies (O'Neill, Astington, & Flavell, 1992; Pillow, 1993). O'Neill and her colleagues concluded that the failure to understand that different aspects of modalities results in different kinds of information points to little understanding of others' mental lives. In contrast, Pillow (1993) concluded from his study, that while children fail to understand different aspects of modalities they still understand that

perception leads to knowledge. For example, children in his study were asked to determine whether someone had knowledge about an object if they performed: a) a perceptual act (e.g., looking) or b) a non-perceptual act (placing one's hand on top of a closed container within which the object is located). He found that 3-year-old children consistently understood that only a perceptual act could lead to knowledge about an object. These studies highlight the importance of studying young children's understanding of mentalism in a modality which suits them best.

In Children 2 to 3 Years of Age.

To-date, there is support for the notion that 3-year-olds have a rudimentary understanding of the mental lives of others. There is also evidence from other domains, including simple-desire reasoning, which provides some support for mentalism in children younger than three years of age. In addition, there is support for an understanding of mentalism in children's communicative acts (Tomasello & Kruger, 1992; Golinkoff, 1993; Shwe & Markman, 1997). Shwe and Markman (1997) found, in their study, that 30-month-old children provided clarifying signals (i.e., vocalizations, points) to the listener to repair mis-communications. These authors argue that the finding that children persisted to have their listener understand their message even when their goal was satisfied was support for an early understanding of the listener's mental state. While focus has been directed to the young child's understanding of simple desires and communicative acts, little research attention has been directed to the understanding that another person can gain information about an object when they look at it in children younger than three years of age.

Recently, O'Neill (1996) conducted a series of studies with old two-year-olds and young two-year-olds to ascertain their knowledge of others based upon another's informational access to an object. They hypothesized that children would communicate more information (e.g., point) about an object's location when their mother did not see where the object was hidden more than when she did see where an object was hidden. Children were trained to ask to use their mothers as helpers in retrieving a toy in a location out of arm's reach. They were presented with three conditions. In one condition, mothers closed their eyes and placed their hands over their ears when a toy was hidden. In a second condition, mothers watched as the experimenter hide the toy. In a third condition, the mother left the room during which time the toy was hidden. Children's communicative behaviours to the mother were examined once the experimenter said to the child "Tell Mommy what you want her to do". The author found that both the young and the old 2-year-olds communicated more information about the object's hidden location when the mother was ignorant about the location than when she was knowledgeable.

O'Neill's (1996) findings may suggest that very young children have some understanding of seeing=knowing. Two-year-olds were able to determine the amount of information to provide based upon whether their mothers had informational access or not. However, O'Neill (1996) provides a more lean interpretation to her results. She argues that children are sensitive to changes in the parent's engagement in the present situation. When a parent disengages herself from a situation, then the child feels compelled to fill her parent in on what has happened. While, these abilities indicate a more sophisticated understanding in which the 2-year-old can consider what "sensory and perceptual

information the communicative parent has" (O'Neill, 1996, p. 674) it does not imply an understanding of mentalism. On the basis of her conclusions, there is no evidence to suggest that 2-year-old children's visual perceptual abilities can be taken as evidence for mentalism.

However, in their article, Shwe & Markman (1997) propose that O'Neill's findings could be interpreted as evidence for mentalism. They argue that their task and O'Neill's task touches upon the same communicative abilities in 2-year-old children. In other words, Shwe & Markman (1997) argue that O'Neill's finding provides supporting evidence that young children adjust the amount of information they provide to another because they can take the listener's cognitive state (i.e., knowledgeable or ignorant) into account. This difference in opinion highlights the debate over 2-year-old's understanding of persons in theory of mind research. Currently, there is little evidence to suggest an understanding of mentalism in very young children (e.g., Wellman, 1993; Shwe & Markman, 1997). However, it should be noted that few studies have directly examined the sorts of understanding young children have of persons. Furthermore, these studies were plagued by methodological problems which may have placed heavy task demands upon the young child. For example, some problems noted with task complexity in these studies were complicated questions posed to the young child (Wimmer et al., 1988; Povinelli & Eddy, 1996), and the massive amount of information conveyed to the young child (Taylor, 1988). These problems indicate that there is a need for simpler research designs to be employed with younger children in order to obtain an accurate picture of the way they perceive themselves and the world.

The Present Study

Two tasks were designed to determine how knowledge of attentional focus and the understanding that seeing leads to knowing develop between 24- and 30-months. This age range was chosen because there is evidence to suggest that even 2-year-old children have a simple understanding of mentalism in the domains of desire reasoning and communicative acts. Further, an important consideration in the design of these experiments was that task demands would be reduced in comparison to earlier studies (e.g., Pratt & Bryant, 1990) and therefore more age-appropriate. In this vein, nonverbal responses (e.g., looking, picking up a cup, pointing) were only required. Also, questions were phrased in a simple manner so that the young children would not be confused by the experimenter's verbal instructions.

The purpose of the first task was to determine the age at which children could understand that seeing allows another person to be "cognitively connected" to the world. While Lempers et al., (1977) suggested that this is not present until 2.5 years of age his small sample size ($n=12$ for each age group) hinders the generalizability of his findings to the general population. Further, Povinelli and Eddy's (1996) study was not designed to determine the earliest age at which young children could understand others' simple visual-perceptual acts. In other words, it is not clear whether 2-year-old children understand that seeing allows themselves and others to be cognitively connected to the world. Further, there is a problem with the sample of 2-years-olds recruited. The mean age is quite high ($M=2-11$), ranging from 2-7 to 3-1. In an earlier paper, Povinelli and deBlois (1992) recognized the importance of using "very narrow age ranges" (p. 235) to determine the

abilities at each age level. It can be assumed that since the purpose of their validity study with children was to assess chimpanzee's competence and not children's that they were more lenient with their age ranges. This is important in light of the fact that little research attention has been directed to determining the earliest age at which young children have an understanding of attentional focus.

The present task was developed to be more stringent than Lempers et al.'s (1977) study. In their study, children were only required to take into account their mother's attentional state based upon her perceptual access to an object. In other words, this does not provide a stringent test of their understanding. This is because the child may remove her/his mother's hands because they only consider that their mother is no longer a participant in their game rather than actually assessing that the mother sees or does not see an object. In the present studies, a more stringent test was designed in which children were required to consider the information access of two adult strangers (one who was blindfolded and one who was not). In order to retrieve a toy, the child had to choose the nonblindfolded stranger. It was predicted that if children understand the "cognitive connection" they would request the help of the nonblindfolded stranger. Children's nonverbal behaviours were examined to determine which stranger they requested help from (i.e., looks, points, hand touches). If, however, young children fail to understand who the helper is then they will not show a preference for one of the two adults.

In the second task, we wished to determine the earliest age at which children understood seeing=knowing. We designed a conceptual perspective-taking task that was modeled on Povinelli and deBlois' (1992) seeing=knowing paradigm. However, we made

several modifications which simplified this task: a) verbal responses were not required; b) distracting variables such as a lever and the parent's involvement were removed to make the steps of this procedure less confusing to a young child. Similar to Povinelli and deBlois' seeing=knowing paradigm, children were required to make a forced-choice between two adult strangers. One stranger had visual information access (nonblindfolded) and the other did not (blindfolded). It was predicted that if young children understand that visual perception leads to knowledge that they would infer that the person who is able to see during the hiding of a toy would know where it is located. Conversely, they would understand that the stranger who was blindfolded during the hiding would be ignorant. If, however, young children do not yet have an emerging awareness of others' mental lives then they would not show a preference for either adult stranger.

Method

Participants

The participants were sixty-six English-speaking and French-speaking children divided into two age groups. Twelve children were excluded from the 24-month-old group; four because the child could not complete the task (i.e., these children were unable to wait the 15 seconds before a toy was given to them) and eight were excluded due to experimenter error (e.g., the videotaping was too poor to accurately code eye direction). The final sample for this age group was twenty-seven children ($M=24.73$, $SD=3.15$) ranging in age from 23 months, 28 days to 25 months, 16 days; 15 girls and 12 boys, of whom 62% were English-speaking and 38% were French-speaking children. In the 30-month-old group, two subjects were excluded because they could not complete the task

(i.e., they were too fussy) and two were excluded due to experimenter error. The final sample for this age group was twenty-three children ($M=30.95$, $SD=.37$) ranging in age from 30 months, 5 days to 31 months, 23 days; 10 girls and 13 boys, of whom 83% were English-speaking and 17% were French-speaking children. The children were recruited from birthlists provided by the Conseil de la Santé et des Services Sociaux de la Région de Montréal Centre after approval by the Commission d'Accès à l'information du Québec. A copy of the recruitment letters (French and English versions) sent to parents is provided in Appendix A and Appendix B. A formal assessment of socioeconomic status was made from information provided on the consent forms (for sample consent forms, see Appendix C for French version and Appendix D for English version). Socioeconomic scores were calculated using Blishen, Carroll, & Moore's (1987) socioeconomic index based upon the occupation of one of the parents. Since all participants recruited lived in two-parent homes the index score that was chosen for the families was the parent (mother or father) who had the more prestigious occupation. Overall, the socioeconomic index for the final sample was 55.82 (Blishen et al. reported that the mean socioeconomic index for the 1981 Census data was 42.74). The educational level that was determined for each family was based upon the parent who completed the highest level of education (for the final sample, High School: 13%, C.E.G.E.P, 11%, Technical College (D.E.C.) - 3%, Some University - 5%, Completed University - 54%, Master's Level - 6%, Ph.D. Level - 8%). From the

consent forms, it was also determined that 49% of the children in the final sample were first-born and 51% were second- or third-born.

All children participated in two tasks which were completed in one session that lasted approximately twenty-five minutes. There were four experimental trials within each trial which children had to complete in order to be included in the final sample. That is, if children were unable to meet the demands of one task they were eliminated (i.e., this was immediately apparent in task 1). Each of these tasks will be described in turn.

TASK 1.

Materials

Familiar and attractive toys were used, including Sesame Street character toys, a horse, a ball, a car, and keys. These toys were tested for attractiveness in pilot studies with both English-Speaking and French-Speaking children. Two blindfolds were also used for the experiment.

Procedure

Experimenters.

Three experimenters were involved in the present study (one was a graduate student and the other two were research assistants with completed undergraduate degrees in psychology). All three experimenters were female and they ranged in age from twenty-two to thirty-four years of age.

Familiarization Session.

Before the experimental session began, the experimenter and the two adult strangers played with the child in a waiting-room for approximately thirty minutes. This

was done in order to allow the child to feel more comfortable with the experimenters. Further, in the testing room, a short game of give-and-take was played between the child and the two adult strangers for approximately five to ten minutes. The experimenter emphasized each of the stranger's names to the child. For example, "Give the toy to (Mandy)". Also, the child was asked to point to each of the strangers when asked, for example, "Who's (Mandy)?" In this way, it was ensured that the child knew the names of each of the two adult strangers. A familiarization session was included for the present study in order to ensure that the child was comfortable with the three strangers.

Experimental Session.

During the experimental session, the child sat in a booster chair facing a table directly across from the two adult strangers; the experimenter sat to the left of the child at a 90 degree angle. The child's parent sat to the left of and slightly behind the child; the parent was within arm's reach of her/his child. The experimental session (i.e., task 1 and task 2) was conducted in approximately twenty-five minutes.

Warm-up Period.

In order to determine whether children would be more drawn to either the eyes or to the blindfold, two ten-second blindfold trials were conducted. In the first trial, one adult stranger placed the blindfold over her eyes and the other stranger placed the blindfold around her neck. The experimenter said to the child, "Look at (Mandy)! Look at (Martine). Look at them". A second trial was conducted with the strangers switching their roles.

Children were trained to request toys (Ernie and Elmo) from each of the two strangers in two warm-up trials. The goal was to demonstrate to the child that if he/she touched an appropriate hand that she would be given a toy. In the two warm-up trials, the two strangers wore their blindfolds around their necks. The experimenter placed a toy in the middle of the table out of arm's reach of the child. The experimenter then asked each adult stranger to lay her left arm on the table. The stranger's hands were positioned on each side of the child (equally distant) and were easily accessible to the child. The experimenter then said "Let's play with (Ernie)! Who can get (Ernie) for you? Show me".

After ten seconds, the experimenter instructed the child to touch one of the stranger's hands "If you touch (Mandy's) hand she will get the toy for you. Touch her hand". If a child was reluctant to touch a hand the experimenter would demonstrate to the child the result of a touching of a hand (i.e., she would first touch the child's hand then touch the stranger's hand saying "See. If you touch someone's hand they can get a toy for you") or ask the parent to assist (sometimes the child was willing to place her mother's hand on someone's hand). The parent sat to the left of and behind the child and he/she was within arm's reach of her/his child.

Experimental Trials.

Children were presented with four experimental trials in which one stranger was blindfolded and the other was not (i.e., she wore her blindfold around her neck). There were two orders of presentation which were counterbalanced. At the beginning of each trial, one of the strangers would place the blindfold around her eyes. The experimenter would catch the child's attention by saying the child's name. The experimenter would

then wave and say “Hi! (Stranger’s Name)” to each of the strangers. Only the stranger who was not blindfolded would wave and say hi back. This was done in order to demonstrate to the child who could see and who could not see a wave. The experimenter then placed a toy in the middle of the table out of arm’s reach of the child. The child was told “Let’s play with the (toy’s name). Who can get the (toy’s name) for you? Can you show me” (if the child was unsure where to look, e.g., looked to the parent - she/he was instructed to look at the strangers “Look at them! One of them can get the toy for you”). After fifteen seconds, the experimenter instructed the two strangers to lay their arms on the table and the child was asked “Touch someone’s hand to get the toy. Touch the hand”. Again, if children were reluctant to touch a stranger’s hand, looking toward and pointing to the correct stranger were accepted. Further, when children chose the incorrect stranger they were told that their choice was incorrect, “No, it’s not her. See, it’s her”. The nonblindfolded stranger would then give the toy to the child.

Dependent Measures.

Two dependent measures were coded (see Appendix E for sample Protocol Summary Sheet). One dependent measure that was coded was the amount of time that children looked to each stranger. Four looking time scores were calculated for each child. A second dependent measure that was coded was hand touches. A Yes/No response was coded for whether children touched a stranger’s hand (i.e., Did children touch a hand? Yes/No). In addition to whether children touched a stranger’s hand, a Target/NonTarget response was coded to determine whether children touched the hand of the non-blindfolded stranger or not.

Results

Two coders entered the data for analyses. A computer program was run to compare the two coder's data files for errors (e.g., different responses and missing numbers) and corrections were made by one coder to her file. The latter file was used for all analyses. Further, before analyses were conducted, data screening was done to ensure that there were no outliers and that the data was not skewed. No problems with the data were noted.

The purpose of task 1 was to determine whether 24-month-old and 30-month-old children clearly understood that seeing links themselves and other people to the world. An attractive object was placed in the centre of a table, in the presence of two adult strangers, one who was blindfolded and one who was not. The child's task was to determine which stranger would be able to retrieve a toy for him/her. It was predicted that the child would communicate more (e.g., look to, point to) to the nonblindfolded person than to the blindfolded person. It was also predicted that the child would be more likely to touch the hand of the nonblindfolded stranger than the blindfolded stranger to obtain the toy.

The general research analytic approach for task 1 was to test the prediction that children have an understanding of eyes as a cue to attentional focus. Analyses were planned for each of the two dependent measures. The first dependent measure was looking time and the following analyses were planned to determine to which stranger children looked to the longest: a) a 2 (Condition: Target Person versus NonTarget

Person) x 2 (Gender: Girls and Boys) x Age (24-month-olds versus 30-month-olds); b) comparison against chance responding to determine whether children's percentage looking times was greater than chance - this is a standard analysis that has been conducted to examine children's pattern of looking times in preferential looking paradigms. The second dependent measure was hand touches and the following analyses were planned to determine whether children touched the hand of the target (nonblindfolded) person significantly more often than the hand of the nontarget (blindfolded) person: a) t-tests to compare the two age group's performances and b) t-tests to compare the age groups with the limitation that children's correct responses were calculated as a proportion of the number of times they actually touched a hand.

The amount of time that children looked to each stranger was recorded from the videotapes. The primary coder calculated children's percentage of looking time at each stranger (i.e., the coder was one of the two strangers for the present study and she was not blind to the hypotheses). Inter-reliability data were obtained from a randomly selected 25% of subjects which was calculated by the experimenter for the present study. Two Pearson product-moment correlation coefficients were calculated: one for children's looks to the stranger on the left side of the child, $r = .92$ and one for children's looks to the stranger on the right side of the child, $r = .95$.

At the beginning of each session, children were presented with two warm-up trials (10 seconds each) in which one stranger wore a blindfold. This was done to allow children to become familiarized to each stranger wearing a blindfold. Children's percentage looking time at stranger was calculated to compare the percentage of looks

children made to the stranger who wore a blindfold and to the stranger who did not (i.e., looks to her eyes). We hypothesized that while children would find the blindfolded stranger to be an interesting event they would also be drawn to look at the person whose eyes was focused upon them. We predicted that children would find each stranger (the one who was blindfolded and the one who was not) equally appealing and that they would spend about the same amounts of time looking at each stranger. It was found that the 24-month-old children looked significantly longer to the stranger who wore a blindfold than to the one who did not, $t(26)=2.95$, $p<.05$. In addition, it was also found that 30-month-old children looked significantly longer to the blindfolded stranger than to the nonblindfolded stranger, $t(22)=5.44$, $p<.05$. These findings suggest that the children found someone wearing a blindfold to be a novel event.

A preliminary analysis showed no order (i.e., there were two order presentations to determine which stranger would be blindfolded: LRRL and RLLR - for example, on the latter, the stranger who sat to the right of the child was blindfolded on the first trial, was not on the second and third, and was blindfolded again on the fourth trial) effect in looking times over the four experimental trials to each of the two strangers in the two age groups. Hence, the data was collapsed across order in further analyses. A 2 (Condition: Target Person versus NonTarget Person) x 2 (Gender) x 2 (Age: 24 month-old versus 30 month-old) ANOVA was conducted on the children's mean total looking time across the four experimental trials to the target person (nonblindfolded) and to the nontarget person (blindfolded). This analysis revealed no main effects of Age, Sex, and Condition,

however, there was a three-way interaction between these three variables, $F(1,47)=4.80$, $p<.03$.

For each age group, a two-way ANOVA was conducted (Sex x Condition) on the children's mean total looking times across the four experimental trials. These analyses revealed no main or interaction effects for the 24-month-old group and no main effects for the 30 month-old group. However, there was a two-way interaction for the 30-month-old age group, $F(1,21)=7.06$, $p<.02$.

As shown in Table 1, planned comparisons indicated that there were differences in the gender's performance within the 30-month-old age group. In the 30-month-old group, the girls did not look significantly longer to the nonblindfolded stranger ($M=1.83$, $SD=.495$) than to the blindfolded stranger ($M=2.19$, $SD=1.32$) whereas the boys showed a trend to looking longer at the nonblindfolded stranger ($M=3.01$, $SD=1.17$) than to the blindfolded stranger ($M=2.38$, $SD=1.32$).

A comparison against chance responding (50%) indicated that the percentage looking times to the target person was greater than chance (54.63%) for the two age groups, $t(50)=2.11$, $p <.04$. However, comparisons against chance responding (50%), for each age group separately, indicated that there was a difference in performance between the two age groups. The 24-month-old children were shown to look to the target person (55.24%) greater than chance ($t(27)=2.33$, $p<.03$) whereas the 30-month-old children were not (53.88%), $t(22)=1.27$, $p>.20$.

Table 1

Mean Total Looking Times to the Target Person (Nonblindfolded) and to the NonTarget Person (Blindfolded) for each Age Group and Gender in Task 1

Age	Gender	Target Person	NonTarget Person
24-month-olds:	Boys	2.646 (1.107)	2.517 (1.140)
	Girls	2.732 (.873)	2.197 (1.017)*
30-month-olds:	Boys	3.054 (1.125) **	2.204 (1.277)
	Girls	1.825 (.495)	2.193 (1.323)
All Subjects		2.622 (1.019) *	2.273 (1.155)

* Significant at $p < .05$

** Significant at $p < .10$

Table 2

Mean Percentage of Looking Time to the Target Person (Nonblindfolded) for each of the Age Groups as a Function of Gender

	24-Month-Olds		30-month-Olds	
Gender	Boys	Girls	Boys	Girls
	51.85%	58.15%*	57.68%*	48.93%
	(14.70%)	(8.30%)	(12.60%)	(16.30%)

* Significant at $p < .05$

Further, within each age group as shown in Table 2, there were differences in performance across the two gender groups. In the 24-month-old age group, the girl's percentage looking time (58.15%) to the target person was greater than chance, $t(14)=3.84$, $p<.002$. The boy's percentage looking time (51.85%) to the target person was not greater than chance, $t(12)=.45$, $p>.20$. The individual data indicated that 87% of the girl's looking times to the target person was above chance whereas only 61% of the boy's looking times was above chance. Moreover, the worst performers in the 24 month-old group were the boys in that 25% spent less than 40% of their total looking time to the target person whereas none of the girls did (see Figure 3).

A different picture emerges in the 30-month-old group in how girls and boys perform. The girl's percentage looking time (48.93%) was found to be not greater than chance, $t(9)=-.21$, n.s. and the boy's percentage looking time (57.68%) to the target person was found to be greater than chance, $t(12)=2.21$, $p<.05$. The data indicated that 77% of the boys looked to the target person above chance levels whereas only 54% of the girls did so. Further, the girls in the 30-month-old group tended to perform more poorly (27% spent less than 40% of their total looking time to the target person) than the boys (only 8% spent less than 40% of their total looking time to the target person).

A second dependent measure coded in task 1 was whether children touched the hand of the target person in order to obtain the toy. It was found that few children in either age group (38% of 24-month-olds and 56% of 30-month-olds) were willing to touch a stranger's hand. In this way, only subjects who touched a hand (at least once on the four trials) were included in planned comparisons between the age groups (24-month-

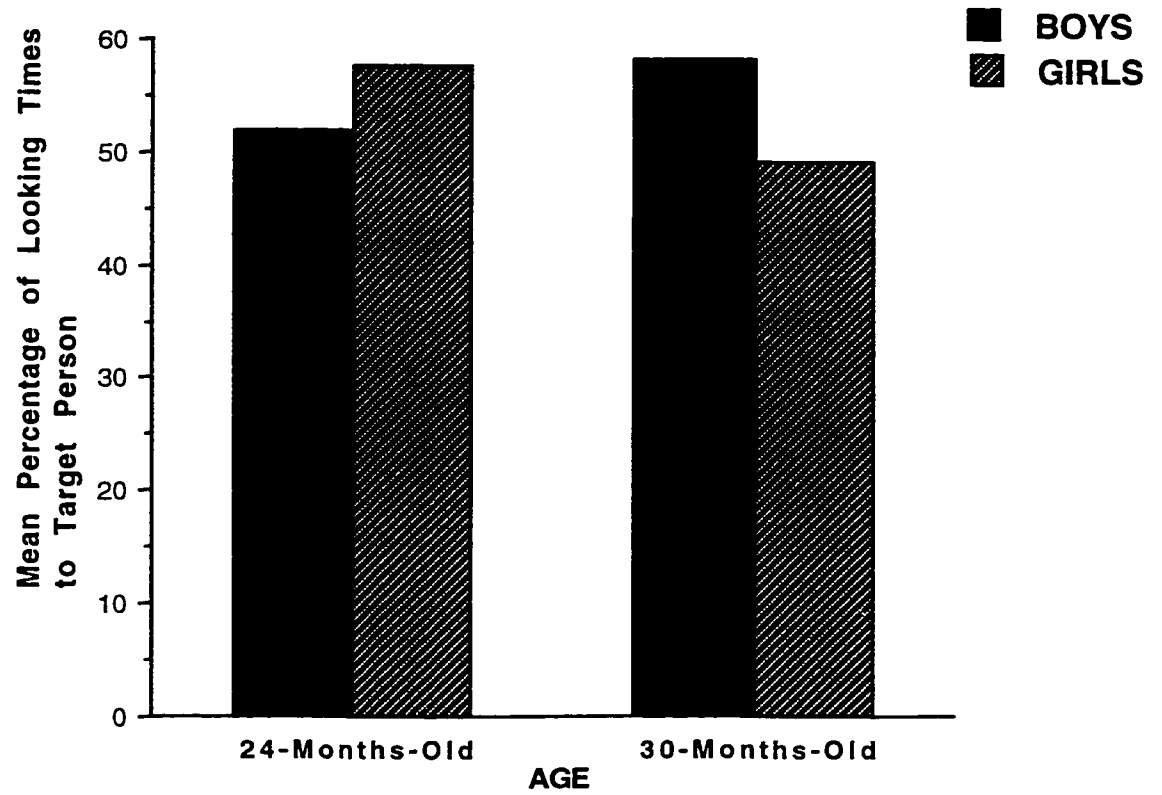


Figure 3. The Mean Percentage of Looking Times as a function of the Genders in the two Age Groups.

olds: $n=10$, Boys = 7, Girls=3 and 30-month-olds: $n=13$, Boys =8, Girls=5). On trials in which children did not touch a hand this was coded as an incorrect response. For example, if a child touched a stranger's hand only once (whether correctly or not) that child was included and the other times she did not touch a hand were coded as three incorrect responses. Hence, the dependent measure was the total correct responses (i.e., the hand of the nonblindfolded stranger was touched) out of all four trials. There was no difference in performance between the 24-month-olds ($M=2.00$, $SD=1.05$) and the 30-month-olds ($M=2.53$, $SD=1.99$), $t(21)=-1.12$, $p>.10$. This result indicates that when a comparison is made for children's frequency of correct responses on all four trials that the 24-month-olds were correct only 50% of the time and that the 30-month-olds were correct only 55% of the time.

However, within the group of children who touched either the hand of the nonblindfolded stranger or the blindfolded stranger, approximately 40% of the children started to touch a hand on the third trial. This may suggest that including a no response (i.e., for the first two trials) as incorrect for these children may be an underestimate of their understanding of who can get a toy for them. This is because they may simply have been reluctant to initially touch rather than not understand what was required of them. In this way, we decided to examine children's correct responses as a proportion of the number of times they actually touched a hand.

A comparison against chance responding (50%) indicated that the percentage of hands that were touched correctly was greater than chance for the 24-month-old group (62.50%), $t(9)=1.90$, $p<.05$. In addition, a comparison against chance responding (50%)

indicated that the percentage of hands that were touched correctly was greater than chance for the 30-month-old group (85.90%), $t(12)=5.12$, $p<.05$. These results indicated that the target person (nonblindfolded) was chosen significantly more often than the nontarget (blindfolded) person to retrieve a toy when children decided to touch a hand at all.

TASK 2.

Participants

The participants completed Task 2 during the same experimental session in which Task 1 was administered (see Methods for a description of the participants).

Materials

Children were presented with familiar and attractive toys including a cow, a yellow truck, and Sesame Street Characters (e.g., Ernie, Elmo, Big Bird, and Cookie Monster). The toys were tested for attractiveness in pilot studies. Two blindfolded were used as well as three cups and a solid black screen.

Procedure

Task 2 was administered to the same group of participants tested in task 1 and immediately followed task 1. The administration of the task took approximately fifteen minutes. In this task, three cups were laid out on a table directly in front of the two strangers and out of arm's reach of the child. The three cups were spaced equally apart on the table.

Experimental Session

Warm-Up Period.

Children were requested to watch each of the two strangers, who wore their blindfolds around their necks, hide a toy (Ernie or Elmo) under a cup. In each trial, the child was told to “Watch (Mandy). She is going to hide (Elmo) under a cup. Watch her!”. The hider then placed her hand on the cup where the toy was hidden whereas the other stranger placed her hand on an empty cup directly in front of her or on a cup in the middle position. The experimenter then said “Who has (Elmo)? Where’s Elmo? Can you show me?” After ten seconds, the two strangers pushed each of their cups directly in front of the child, the cups were equally spaced such that each cup was in direct line to each of the child’s arms. The child was instructed “Find (Elmo). Lift up a cup!” The child responded by picking up a cup and searching underneath for the toy.

Experimental Trials.

Children were presented with four experimental trials in which one stranger was blindfolded during the hiding of a toy and the other was not (i.e., she wore her blindfold around her neck). There were two orders for the hiding of a toy under a cup which were counterbalanced across children (for each child, a toy was hidden under the middle cup approximately 50% of the time: this was done to ensure that each stranger chose the middle cup at least once. A toy was hidden under the left and right cups approximately 25% of the time). A screen was placed in front of the cups blocking the child’s vision so that he/she could not see where a toy was being hidden. Once the screen was in place, the experimenter showed a toy to the child. She instructed the child to look at each of the

strangers and emphasized who could see and who could not see (“Look at (Mandy) She can (can’t) see the toy”). The child was then asked to pay attention to the experimenter “Watch me. I’m going to hide the toy. Are you watching me?” The stranger who was not blindfolded saw where a toy was being hidden by the experimenter whereas the one who was blindfolded did not. Once the toy was hidden, the screen was removed by the experimenter and the blindfolded stranger removed her blindfold. The child was asked to “Watch them. They are going to find the (toy’s name). Watch them”. The stranger who was not blindfolded during the hiding put her hand on the correct cup whereas the other put her hand on an incorrect cup. Children were asked “Who has the toy? Can you show me?” After twenty seconds, the cups were pushed forward and the child was asked “Find the (toy’s name). Lift up the cup!” The child responded by lifting up one of the cups and searching for the toy underneath.

Dependent Measures.

Two dependent measures were coded for Task 1. One dependent measure was the amount of time that children looked to each of the three cups. Initially, the focus of coding was in determining the looks that children made to each of the two strangers and to each of the three cups. However, because the coders found that the videotaping made coding of looking time to the cups and strangers difficult, it was decided to collapse children’s looks to the left cup (directly in front of the stranger) and to the stranger on the left side of child and to also collapse children’s looks to the right cup (directly in front of the stranger) and looks to the stranger on the right side of the child. The child’s look to the middle cup were coded independently of any looks to either stranger. In this way,

each children had three mean looking times (i.e., left area (left cup plus left stranger, middle area (middle cup), and right area (right cup plus right stranger). The second dependent measure was the first cup the child chose to pick up on all four trials (i.e., the child had a choice of one of two cups, one of which was the target cup and the other was the nontarget cup) The coders determined whether: a) children picked up the left or right cup and b) whether it was the target or nontarget cup - children could receive a score that ranged from 0 to 4 (0 - fails to pick up a target cup on all 4 trials; 1 - picks up the target cup on 1 trial; 2 - picks up the target cup on 2 trials; 3 - picks up the target cup on 3 trials; and 4 - picks up the target cup on 4 trials). See Appendix E for the Protocol Summary Sheet. Note that no child refused to pick up a cup on any of the four trials, however, some children did pick-up both cups at the same time. This latter response was coded as an incorrect response.

Results

The purpose of task 2 was to determine whether 24- and 30-month-old children could make an inference about someone's knowledge about the location of a toy (i.e., under one of three cups) based upon the person's visual access during the hiding. It was predicted that if children understand that seeing=knowing that they would look to and choose the cup of the person who was not blindfolded during the hiding of a toy under a cup. The general research analytic strategy for task 2 was to conduct: a) 2 (Condition: Target Person versus NonTarget Person) x 2 (Gender: Girls and Boys) x 2 (Age: 24-months versus 30-months) ANOVA to determine whether children would look longer to

the person who was not blindfolded during the hiding when they were asked “Who has the toy? Show me”; b) t-tests for the age groups to determine whether the 30-months performance was significantly different from the 24-months in picking up the target cup; and c) t-tests for comparison against chance responding for each of the two age groups in the percentage of choices of the correct cup.

The amount of time children looked to each of the three cups and/or strangers was recorded from the videotape. Inter-reliability data were obtained from a randomly selected 25% of subjects. Three Pearson product-moment correlation coefficients were calculated: one for children’s looks to the left area of the TV screen, $r = .95$, a second for children’s looks to the middle area of the screen, $r = .90$, and a third for children’s looks to the right area of the TV screen, $r = .92$. There were two orders of presentation used in Task 2 - LMRM and RMLM to determine under which cup a toy would be hidden (Left refers to left cup, M refers to middle cup, and R refers to Right Cup).

A preliminary analysis revealed no order effects. Hence, order was collapsed across data in further analyses. A 2 (Condition: Target Person versus NonTarget) x 2 (Gender: Girls and Boys) x 2 (Age: 24 month-olds versus 30 month-olds) ANOVA was conducted to determine whether the child’s mean total looking time was significantly longer to the target person than to the nontarget person. This analysis revealed that there was no main effect of Condition. However, there were main effects of Sex ($F(1,43) = 5.59$, $p < .02$) and Age ($F(1,43) = 5.57$, $p < .02$). There was also an interaction of Sex and Age, $F(1,43) = 5.84$, $p < .02$. The means and standard deviations are presented in Table 3. The results of planned comparisons indicated that 30-month-old boys looked significantly

longer to both strangers (blindfolded and nonblindfolded) than the 30-month-old girls, $t(22)=3.86, p<.05$. The second dependent measure for this task was whether the child picked up the correct cup in order to retrieve a toy (the child's score could range from 0 to 4). A planned comparison test was made between the two age groups. There was no significant difference between the 24-month-olds ($M=1.72, SD=1.07$) and the 30-month-olds ($M=1.96, SD=.88$) in the number of times they chose the correct cup, $t(50)=.403, p>.10$. Further, a comparison of the 24-month-olds percentage of choices of the correct cup (55.90%) against chance responding (50%) revealed that they did not choose the correct cup above chance, $t(23)=1.30, p>.10$. Similarly, 30-month-old's percentage of choices of the correct cup (53.41%) cup were found to be not greater than chance, $t(21)=.77, p>.10$.

Table 3

Mean Total Looking Time to the Target Person (Nonblindfolded) and to the NonTarget Person (Blindfolded) for each Age Group and Gender in Task 2

Age	Gender	Target Person	NonTarget Person
24-month-olds:			
	Boys	4.664 (2.115)*	4.769 (1.558)
	Girls	4.775 (1.293)	4.700 (1.837)
30-month-olds:			
	Boys	4.895 (1.513)	4.584 (1.777)
	Girls	3.085 (1.343)*	2.577 (.860)
All Subjects		4.430 (1.660)	4.227 (1.780)

* Significant at $p < .05$

General Discussion

The present study attempted to determine the earliest age at which young children could understand that eyes link themselves and others subjectively to the world as well as understand that seeing leads to knowing (i.e., eyes provide the source of information for an individual's knowledge acquisition about the location of a hidden toy). The study's results provides some support for the prediction that young children understand that when another's eye gaze is unobstructed then that person can have a "seeing" relation to objects out there in the world. In the first task, 24-month-old and 30-month-old children looked longer to the nonblindfolded person than to the blindfolded stranger when being asked who was able to retrieve a toy for them. Further, children (i.e., those children who touched the hand of the person) evidenced an understanding of the role of eyes, in human behaviour, in that they touched the hand of the person who could get a toy for them more often than the hand of the person who could not. The hypothesis that young children would understand that seeing leads to knowing was not supported by the present results; this is in line with researchers who claim that there is no understanding of a causal connection between visual "information access and resulting knowledge" (Wimmer et al., 1988) until the fourth year.

The data indicate that 2-year-old children understand the role of seeing. This present result extends the findings of previous literature (Lempers et al., 1977; Povinelli & Eddy, 1996) which did not find such an understanding in 2-year-olds. Lempers et al.'s (1977) failure to find an understanding in younger children is puzzling since their task was less stringent (e.g., they obtained the child's best performance and they also used an

experimenter mother who could inadvertently cue their child to do the expected action) than the present task. One explanation for Lempers et al.'s finding is that their task was not suited for younger children. For instance, their task closely resembled a peek-a-boo game (i.e., mother places her hands over eyes, tells the child she can't see, and then she removes her own hands) and this may have restricted the younger child's participation in the interaction. This is because in peek-a-boo games children take on the role of passive participant in which they typically only watch the parent perform the actions (i.e., placing and removing hands over eyes). In this way, younger children may have developed an expectation that in this sort of situation their role is just to watch and wait for the adult to re-engage herself in the situation before showing an object. Further, younger children (i.e., 2-year-old children) may be more bound by these expectations than older children. The present result that 2-year-old children understand the function of eyes then importantly demonstrates that the current design was better suited to the younger children's style of social interaction with others.

In the present design, the children were encouraged to take on an active role in a help-seeking task. Specifically, children were asked to play a give-and-receive type of game. By 2-years of age, children have a rich background of social experiences of requesting help from others in obtaining objects and in giving and showing objects to others (e.g., see Trevarthen, 1979, for a description of the infant's increasingly sophisticated manipulation of objects). In this way, children's expectation may have been that if they were to get the desired object then they had to perform some action. Furthermore, the current design was advantageous in that it provided the child a sense of

personal stake in the task (i.e., children were motivated to pay attention to who could see and who could not see because they may have wished to immediately obtain the desired toy). It may be that because children felt there was a personal incentive they did not succumb to fatigue and boredom. Also, the success of the current design is borne out by the fact that few children (approximately 9%) refused to engage in a give-and-receive type of game. In other words, the majority of children were motivated to participate in the task.

While different from the present task in several ways (e.g., mother's role as experimenter, hiding a toy on a shelf), O'Neill's (1996) study also employed a help-seeking task which 2-year-old children successfully mastered. The results from the present study and O'Neill's, taken together, suggest that 2-year-old children have impressive visual-perceptual abilities. Specifically, these studies indicate that 2-year-olds can attend to someone's informational access to an object in order to determine whether that person has knowledge (e.g., location) about the object of interest. Furthermore, in the present study, it was shown that children did not require another's unobstructed eye gaze to be directed towards an object to consider that the other could have informational access about that object. In other words, when children were asked "Who can get you the toy" the nonblindfolded stranger's eyes were focused upon them and not the toy. These findings highlight impressive visual-perceptual achievements for young children. However, what remains unknown is the earliest age at which young children can understand the role of seeing in human behaviour.

Findings from research studies have demonstrated that 18-month-old children can use eye gaze to reliably determine another's focus of attention. However, the proposal is that 18-month-olds' visual-perceptual abilities do not indicate an understanding of a role of eyes. This is because the 18-month-old child's attention is largely cued to locations by someone's gestures (e.g., head turn, shifts in eye gaze; e.g., Moore, Angelopoulos, & Bennett, 1997; Butterworth & Jarrett, 1991). In other words, in contrast to 24-month-olds, the younger child is reliant upon another's movement cues to locate an object of interest. Also, in a recent study (Moore, Angelopoulos, & Bennett, in press) 18-month-olds were found to apply a novel name (i.e., "Dodo") to the novel object (there were two objects: one located on each side of the child) that was more salient (i.e., the one that was spinning on a turn-table) regardless of the person's attentional focus (i.e., the person sometimes looked to the nonspinning toy when she said "Dodo"). This latter finding suggests that 18-month children do not have a clear understanding that eyes act as a cue to attentional focus. In other words, if they showed such an understanding, they would have correctly applied the novel name to the object of the person's attentional focus.

These findings may indicate that there is a developmental shift between 18 months and 24 months of age in children's understanding of eyes. This proposal differs from Wellman's (1993) theory on the developmental course of an understanding of eyes in young children. He states that such an understanding is in place by 18 months of age. However, Wellman provides a rich interpretation to joint visual attentional acts (i.e., he

proposes that the infant can follow shifts in eye gaze because they understand that the other intended to move their eyes to an object of interest).

The present study did not find evidence of an increase in performance with age, but rather a decrease. The findings indicated that while 24-month-olds performed above chance levels in looking to the nonblindfolded person, 30-month-olds were only at chance levels. This result is not supported by previous studies (Lempers et al., 1977; Povinelli & Eddy, 1996) which have found that 2.5-year-olds have an understanding of eyes as a cue to attentional focus. There were, however, problems with the small sample sizes (e.g., the evidence that children understand the function of eyes at 2.5-year-olds was based upon the results of 12 subjects in one task) were approaching their third birthday. They were old 2-year-olds with a mean of 2-11. These problems may suggest that there is not overwhelming evidence, to-date, of an understanding of eyes in 30-month-olds. Notwithstanding problems found in earlier studies, the apparent decrease in performance with age is most probably due to methodological flaws in the current study.

One methodological flaw in the current study was a fifteen second delay in which children had to wait before they could request a toy from one of the two strangers. We imposed this delay in order to obtain a looking time measure of the child's preference for one stranger over another. However, this delay may have been confusing to the children who immediately responded to the experimenter's request "Who can get you the toy? Show me". This may have been more problematic for the 30-month-olds because they were the only children seen to respond verbally to the experimenter's request. Approximately 38% of the 30 month-olds correctly told the experimenter, for example,

“She’ll give it to me”, or “That one can get the toy for me”. None of the 24 month-olds were seen to communicate verbally. It may be that the older children expected their verbal responses to be immediately acted upon. When the toy was not given to them, they may have re-thought their choice and looked to the other person for assistance. Another factor that may explain and contribute to fairly equal looking times at the nonblindfolded and blindfolded strangers in the 30-month-old group is that the novelty of a blindfold may have been more difficult to overcome in the older children. In the experimental trials, the percentage of looks to the blindfolded person was above 50% in approximately 57% of the 30-month-olds whereas the percentage of looks was above 50% to the blindfolded person in only 30% of the 24-month-olds.

The second methodological flaw was children’s reluctance to touch a stranger’s and to retrieve a toy. It should be noted that in pilot studies in which one of the strangers was the parent, these children appeared willing to touch a stranger’s hand (i.e., not their mother’s). This may be due to the fact that the mother sat beside the stranger which may have made children more comfortable overall with the stranger. Further, another factor in the child’s reluctance to touch a stranger’s hand in the present study was the limited time a child had to get acquainted with the two strangers and the experimenter (the mother sat beside her/his child, to the left of and slightly behind the child). On average, children spent thirty minutes warming (typically this is much less in studies which one experimenter is actively involved with the child but it should be noted that three strangers in the present study all interacted with the child) up to the three experimenters prior to a testing session and another thirty minutes (approximate) completing the tasks. The emphasis on the thirty

minute familiarization period is especially important in light of the studies which found an understanding of the function of eyes as young as 2 1/2 years of age.

In Lempers et al. (1977) study, the experimental session was conducted in the child's home with the mother as the experimenter. Further, the child's best performance was taken in their study meaning that the child was given several practice trials in which he/she could learn how to get it right. In addition, Povinelli and Eddy (1996) conducted their study in a day-care centre familiar to the children who participated in their study. Further, children were familiarized both to the experimental tasks (i.e., they were trained) and to the experimenters over a period of time ($M=3.4$ weeks over which children received on average three to six sessions). This familiarization process may then make the sample of children in both of these studies different from the sample in the present study. In other words, it is more likely that the child who is in a more familiar environment will evidence a behavior that is typical of him or her. In contrast, a laboratory environment may evoke the "strange behaviour of a child in a strange situation with a strange adult" (Bornstein & Lamb, 1992, p. 94). Even though children, on the whole, enjoyed the tasks the presence of three strangers may have impeded their best performance.

If this is so, future studies could address this issue by increasing the comfort level of a child in a laboratory setting. Previous studies (e.g., Pillow, 1989) have successfully employed the use of puppets with young children. In addition, in a warm-up period with children in the present study, it was noted that the majority of children were attracted to puppets in the toy-box. The advantage to using puppets would be that children would encounter only two new people (i.e., the experimenter and the puppet controller).

Further, during the experimental session, the children would not see the puppet controller as she would be hidden behind a box (similar to a Punch and Judy set-up). The children would then only encounter two puppets. Each of these puppets would take on the role of each of the strangers in the present study. Further, a time delay could be removed such that once the child made her choice (e.g., points to or says the name of a stranger) the toy could then be given to her by the nonblindfolded puppet (that is, the puppet could reach to the toy and push it to the child).

Within each age group, the gender groups were seen to perform differently. In the 24 month-old group, girls performed better than boys and in the 30 month-old group boys showed a trend to performing better than the girls. This was a surprising finding as gender is seen to be an insignificant factor in studies on theory of mind (e.g., Wellman & Woolley, 1990, Povinelli & Eddy, 1996, Taylor, 1988, Wimmer et al., 1988). However, studies that do test for sex effects are far fewer than those who claim that they could not due to insufficient statistical power (e.g., O'Neill, 1996) or to those who do not even test for sex effects (e.g., Lee (in press); MacLaren & Olsen, 1993; Lempers et al., 1977; Pratt & Bryant, 1990; Bartsch & Wellman, 1989). The fact that few studies test for sex effects may decrease our understanding of this important variable. Further, researchers in the theory of mind literature may have to re-think their designs in order to include sex as a variable in order that it may be tested (i.e., there is sufficient statistical power).

However, the girls and boys performances in the present study suggests that there may be additional factors which contribute to or interact with gender. Dunn, Brown, Slomkowski, Tesla, and Youngblade (1992), examined the effect of siblings on a child's

understanding of theory of mind. These authors found that children who had older siblings performed better on theory of mind tasks than those who did not. It should be noted that an order of birth variable is not routinely examined by theory of mind researchers and was not considered as a variable in the present study. In this way, an examination of the data can only provide hypotheses for future studies which can then be tested.

In the 24-month-old group, it was found that the majority of second-borns were girls (80%) and they performed significantly better than the first-borns who were largely (65%) boys. A similar pattern of birth order was found in the 30-month-old group. The majority of boys (77%) were second-borns and they tended to perform better than the girls who were largely (78%) first-born. These percentages may tentatively explain the poorer performance of girls at 30-months (i.e., girls in the 24 month-old group were largely second-born whereas the girls in the 30 month-old group were largely first-born). Birth order may then be an important variable which interacts somehow with gender.

In the present study, there was no evidence to suggest that 24-month-old and 30-month-old children understand that seeing leads to knowing. None of the children looked significantly longer to the target person when asked "Who has the toy? Show me". This result may be due to methodological problems, memory load deficits and/or lack of understanding that seeing leads to knowing.

While every effort was made to ensure that the seeing leads to knowing task was age-appropriate, it may have proven too complex for both age groups. The problem may have been that the children did not adequately understand what was required of them.

This problem may have arisen from the fact that the experimenter often directed the child's attention to what she was doing - that is, hiding a toy under a cup. That is, children may not have comprehended the role of the nonblindfolded person during the hiding of the toy under a cup. In this way, they did not pay specific attention to who could see and who could not (even though the experimenter pointed this out to the child). Several parents commented that their children did not understand what was required of them, specifically, that the nonblindfolded stranger's role was to watch the hiding of a toy. In other words, children needed to consider the role that the "seeing" person could play for them.

In the first task, the children's task was much more simple. They simply had to choose between a blindfolded and a nonblindfolded stranger whereas in the second task they had to *remember* who was blindfolded and who was not and then make a choice between two strangers who were now both nonblindfolded. Future studies may address the problem of a memory load by requiring that only one stranger be blindfolded which she wears above her eyes (i.e., act as a cue) when the child is asked "Who has the toy? Show me". It may be that problems in memory deficits may then account more for the poor performances in both age groups rather than the child's lack of attention to and comprehension of the role of each stranger when one is blindfolded and one is not.

O'Neill & Gopnik (1991) propose that memory deficits, specifically deficits in episodic memory and auto-noetic consciousness, may account for a lack of understanding of belief in young children who are under three years of age. A deficit in episodic memory may mean that a young child lacks a sense of her own past. This is because she does not understand that information she receives (e.g., "Who can get the toy for you?") can be

connected to a past event or to a past belief (e.g., “She can see and she knows where the toy is hidden”). This was particularly evident in a follow-up study with eight 36-month-old children who could clearly state who could see and who could not see the experimenter hide a toy. However, all these children failed to use this information later on to find the toy under the correct cup.

Autonoetic consciousness (see also Tulving, 1995) specifically refers to the child’s knowledge that personally experienced events act as a “veridical part of their own past experience” (p. 396). A deficit in autonoetic consciousness means that young children may not consider past events when they make decisions in the here-and-now. It may be that the young child develops the understanding that seeing leads to knowing in a gradual manner similar to her development of simple desire reasoning. For instance, Wellman (1993) proposed that infants (from 9 to 12 months) only understand that their own and another’s desires can be about objects that are in the here-and-now. Around 18- to 24-months, the child deepens her understanding of simple desires in that she can understand that she and another can have desires about objects that are out of sight.

In this way, the child may gradually develop their understanding that seeing leads to knowing. First, their understanding of who knows where a toy is hidden may be limited to contexts that are here-and-now. Later on in the child’s development, possibly in the third year, children’s autonoetic consciousness develops such that they can consider past personal events and beliefs. Similar to a more sophisticated understanding of desire (i.e., ability to infer that desires can be about objects that are not present) children can retain

perceptual information about events that no longer exist which they could use to determine who has knowledge about a particular object.

The proposal that young children's understanding that seeing leads to knowing develops in a gradual fashion and that younger children (under three years of age) can only engage in seeing=knowing with here-and-now perceptual experiences could be explored in future studies. For instance, consider the scenario in which the child is presented with two puppets - one who is blindfolded and one who is not. The experimenter then asks the child to attend to the hiding of a toy in one of three cups. A screen is placed in front of the cups blocking the child's vision such that he/she cannot see the hiding. Further, the experimenter informs the child that only the nonblindfolded puppet can hide a toy. Immediately following the hiding the screen is removed. The experimenter then asks each puppet to find the toy. Both puppets then look into separate cups. The puppet, who wore a blindfold during the hiding, has her blindfold placed above her eyes (i.e., the presence of the blindfold above the eyes is a strong cue to the child of who could not see) and looks into the wrong cup. The nonblindfolded puppet looks into the correct cup. The order of which puppet looks first would be counterbalanced over trials. Following this, the child is asked "Where is the toy?" and a cup is only pushed forward once the child makes her choice. The child would be guided in her choice between the two puppets with the information provided by each of them (i.e., one wears a blindfold on her forehead and the other has no blindfold). Further, a few seconds (rather than minutes in the present study) would elapse between the time the blindfolded puppet removes her blindfold and looks into a cup.

In conclusion, the finding that 2-year-old children understand that eyes act as a cue to attentional focus importantly adds to the literature. This is because previous studies (Lempers et al., 1977; Povinelli & Eddy, 1996) did not find such an understanding until 2.5- and 3-years of age. The general lesson to be learned from the current task is that researchers need to carefully design research studies that tap into the young child's style of social interaction with others (i.e., reduce task complexity with simpler questions, design game-like tasks which encourage children to be active participants). Further, the present results do not support Wellman's position that 2-year-olds possess an experiential and intentional understanding of persons - namely that of simple desires, perceptions, and emotions. A simpler explanation may be that 2-year-olds, through social interactions with their caregivers, have come to understand that others can only give objects when their vision is not obstructed. That is, 2-year-olds may act on a simple rule ("if Mommy's eyes are open and she can see then she can get something for me") which will satisfy their goal. However, there were methodological flaws (i.e., a time delay, children paid more attention to what the experimenter was doing than to which stranger had visual access to the hiding) found within the present study. It is our contention that researchers will need to address these methodological problems as they may have obscured any understanding that seeing leads to knowing in 2-year-olds. An avenue for future studies then will be to clarify the sorts of understandings 2-year-olds have - that is, intentional or rule-based.

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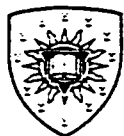
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Appendix A

French Recruitment Letter to Parents



avril 1998

Chers Parents,

Le Laboratoire de Recherche sur le Développement de l'Enfant de l'Université Concordia complète actuellement une série de projets de recherche sur le développement de la compréhension des états mentaux et émotionnels chez le jeune enfant. Cette recherche est subventionnée par le Conseil de Recherches en Sciences Naturelles et en Génie du Canada. La Commission d'Accès à l'Information du Québec nous a autorisées à consulter les listes de naissance de la Régie Régionale de la Santé et des Services Sociaux de la Région de Montréal-Centre. Votre nom apparaît sur une liste qui indique que vous avez un enfant d'un âge approprié pour notre étude.

La présente étude se déroulera dans une petite pièce où vous serez près de votre enfant en tout temps. Dans cette étude, nous allons jouer à un jeu de cache-cache avec votre enfant. Nous avons conçu ce jeu afin de déterminer si les jeunes enfants comprennent que seule la personne qui voit où le jouet est caché peut connaître son emplacement. Un jouet sera caché en dessous d'une tasse et on demandera à votre enfant de trouver le jouet. Deux personnes seront assises face à votre enfant. Une personne pourra voir où l'objet sera caché et l'autre pas. Une de ces personnes donnera des indices visuels à l'enfant quant à l'emplacement de l'objet caché.

Pour la présente étude, nous sommes à la recherche d'enfants âgés de 36-37 mois. Votre participation impliquera une visite d'une durée de 45 minutes à notre centre de recherche situé sur le Campus Loyola de l'Université Concordia, au 7141 rue Sherbrooke Ouest. Suite à sa participation, votre enfant recevra un Certificat de Mérite pour Contribution à la Science de l'Université Concordia. De plus, un sommaire des résultats vous sera posté dès que le projet de recherche sera complété.

Si vous désirez que votre enfant participe à cette étude, ou si vous désirez obtenir des renseignements additionnels, veuillez contacter Mandy (anglais) au 848-2279, Martine (français) au 848-7561 ou Dr. Poulin-Dubois au 848-2219. Nous tenterons de vous contacter par téléphone dans quelques jours afin de répondre à vos questions sur cette recherche.

Nous vous remercions pour votre collaboration,

Diane Poulin-Dubois, Ph.D.

Professeur agrégé

Mandy Steiman, B.A.

Assistante de recherche

Paula Bennett, B.Sc.

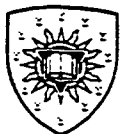
Candidate à la Maîtrise

Martine Habra, B.A.

Assistante de recherche

Appendix B

English Recruitment Letter to Parents



April 1998

Dear Parents,


The Child Development Laboratory at Concordia University is involved in a series of studies looking at how infants understand the thoughts and emotions of other people. This research is funded by the Natural Sciences and Engineering Research Council of Canada. The Commission d'Accès à l'Information du Québec has authorized us to consult birth lists supplied by the Régie Régionale de la Santé et des Services Sociaux de la Région de Montréal-Centre. Your name appears on a birth list which indicates that you have a child of an age appropriate for our study. We would like to invite you and your infant, once again, to participate in a study looking at an important aspect of children's social understanding.


The present study will take place in a small room and you will be in close physical contact to your child at all times. In the study, we will play a hiding game with your child. We designed this game to assess whether young children understand that only the person who sees where a toy is hidden will know its location. A toy will be hidden under one of three cups and your child will be asked to find the toy. Your child will be helped by visual cues that one of two people give about the toy's hidden location. One person will "see" where a toy is hidden and another will not "see" where the toy is hidden.

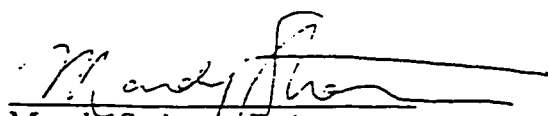
For the purpose of this study, we are looking for young children 36-37 months of age. Participation involves one 45-minute visit to our research centre on the Loyola Campus of Concordia University, located at 7141 Sherbrooke Street West. Appointments can be scheduled at times convenient to you and your child. Upon completion of this study, a report of the results and a certificate of merit for your child will be mailed to you.

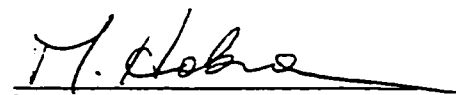
If you are interested in having your child participate in this study, or would like further information, please contact Mandy at 848-2279 (English), Martine at 848-7561 (French) or Dr. Poulin-Dubois at 848-2219. We will try to contact you by telephone after receipt of this letter.

Thank you for your collaboration,


Diane Poulin-Dubois, Ph.D.
Associate Professor


Paula Bennett, B.Sc.
Masters Candidate


Mandy Steiman, B.A.
Research Assistant


Martine Habra, B.A.
Research Assistant

Appendix C

Informed Consent Form - French Version

Formulaire de Consentement Parental

Nom de l'enfant: _____ (prénom et nom)

Date de naissance: _____ (jour/mois/année)

Sexe: _____ Langue(s) parlée(s) à la maison: _____

Adresse: _____

Code Postal: _____

Téléphone: maison: _____ travail: _____

Nom de la mère: _____

Nom du père: _____

Occupation: _____

Occupation: _____

Education: _____

Education: _____

La présente étude a pour but de déterminer si les jeunes enfants peuvent comprendre le comportement humain. Plus spécifiquement, nous cherchons à savoir si les jeunes enfants comprennent que les êtres humains ont des états mentaux tels que des désirs, des connaissances et des émotions, par exemple, et que le comportement humain peut être expliqué par de tels états mentaux. Dans la présente étude, nous essayons de déterminer si les jeunes enfants comprennent qu'une personne doit voir où un jouet est caché pour connaître son emplacement. Plusieurs jouets seront cachés, un à la fois, en dessous d'une tasse, et nous demanderons à votre enfant de trouver le jouet. Nous vous demandons de rester silencieux(se) lors de la session.



Diane Poulin-Dubois, Ph.D.
Professeur Agrégé



Paula Bennett, B.S.c.
Etudiante en Maîtrise

La nature et le but de cette étude m'ont été expliqués de façon satisfaisante et je consens à ce que mon enfant y participe. Je comprends que je peux interrompre ma participation à tout moment sans aucune conséquence négative, et que les chercheuses répondront à toutes les questions qui seront soulevées au cours de la recherche.

Date

Signature du Parent

Appendix D

Informed Consent Form - English Version

Parental Consent Form

Child's Name: _____ (first and last name)

Birthdate: _____ (month/day/year)

Gender: _____ Language(s) spoken at home: _____

Address: _____

Postal Code: _____


Telephone: _____(home) _____(work)

Mother's Name: _____ Father's Name: _____

Occupation: _____ Occupation: _____

Education: _____ Education: _____

In this study, we are examining young children's understanding of people. In particular, we want to determine whether young children understand that other people have mental states (e.g., beliefs, desires, and emotions) and that human behaviours can be explained in terms of such mental states. In this study, we will examine whether children understand that others must see where a toy is placed in order to know where it is hidden. Your child will be presented with various toys and he/she will be asked to request the toy from one of two experimenters. You will be asked to remain silent and neutral during the session.


 Diane Poulin-Dubois, P.h.D.
 Associate Professor


 Paula Bennett, B.S.c.
 Masters Student

The nature and purpose of this study have been satisfactorily explained to me and I agree to allow my child to participate. I understand that we are free to discontinue participation at any time without negative consequences and that the experimenters will gladly answer any questions that might arise during the course of the research.

 Date

 Parent's Signature

Appendix E

Protocol Summary Sheet

Phase II

LEFT (of coder)
Stranger 1
Name: _____

RIGHT (of coder)
Stranger 2
Name: _____

Warm-up Trials:

Record Looking Times to each of the 2 strangers under Left and Right

	Left	Right	Pick Up Which Cup? Left or Right	Target Cup	Correct Cup?
Trial 1:	_____	_____	_____	_____	_____
Trial 2:	_____	_____	_____	_____	_____

Experimental Trials: Big Bird, Cookie Monster, Cow, and Truck

Record Looking Times to each of the 2 strangers under Left and Right

	Left	Right	Pick Up Which Cup? Left or Right	Target Cup	Correct Cup?
Trial 1:	_____	_____	_____	_____	_____
Trial 2:	_____	_____	_____	_____	_____
Trial 3:	_____	_____	_____	_____	_____
Trial 4:	_____	_____	_____	_____	_____

Appendix F

Source Table for Analysis of Variance for Task 1

Table F.1. Source Table for Condition (Target Person versus NonTarget Person), Gender X Age (24 months versus 30 months) For Task 1.

Source of Variation	SS	DF	MS	F	Significance of F
Between Subjects					
Sex	3.38	1	3.38	2.32	.134
Age	1.04	1	1.04	.71	.403
Sex x Age	1.57	1	3.38	1.08	.304
Error	68.42	47	1.46		
Within Subjects					
Person	2.05	1	2.05	2.40	.128
Sex by Person	1.02	1	1.02	1.20	.279
Age by Person	.05	1	.05	.06	.807
Sex by Age by Person	4.10	1	4.10	4.80	.033
Error	40.13	47	.85		

Appendix G

Source Table for Analysis of Variance for Task 2

Table G.1. Source Table for Condition (Target Person versus NonTarget Person).
Gender X Age (24 months versus 30 months) For Task 2.

Source of Variation	SS	DF	MS	F	Significance of F
Between Subjects					
Sex	20.12	1	20.12	5.59	.023
Age	20.05	1	20.05	5.57	.023
Sex x Age	21.02	1	21.02	5.84	.020
Error	154.69	43	3.60		
Within Subjects					
Area*	.88	1	.88	.63	.432
Sex by Area	.20	1	.20	.14	.706
Age by Area	1.02	1	1.02	.73	.397
Sex by Age by Person	.00	1	.00	.00	.987
Error	59.81	43	1.39		

* Area. This refers to the child's mean looking times to either a) the left area (looks made to the cup and stranger to the left of the child); b) the middle area (looks made to the middle cup); and c) the right area (looks made to the cup and stranger to the right of the child).