Infants' Rational Imitation: Does the Model's Reliability Matter?

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ABSTRACT

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The current study examined whether the reliability of an individual's gaze influences infants' decision to imitate her novel actions. Infants were first administered an object search task wherein they observed the experimenter display emotional signals while looking inside an empty container (unreliable condition) or a container with a toy inside (reliable condition). Infants in both conditions were then given the opportunity to imitate the same experimenter, who demonstrated turning on a press-on light using her forehead. Results from Experiment 1 revealed that 18-month-olds were capable of tracking a person's reliability, as their latency to open the container increased from the first to the last trial, only when exposed to the unreliable condition. Analyses of the proportion of infants who later imitated the experimenter's novel action showed no differences between the reliable and unreliable group, with both groups choosing to use their hands rather than their forehead. In Experiment 2, 14-month-olds were also able to track reliability as confirmed by the performance on the object search task. However, while infants in the unreliable group preferred to use their hands to turn on the light, those in the reliable group showed no preference for using either their forehead or hands. Taken together, these findings indicate that 14- month-olds, but not 18-month-olds, appear to be influenced by their previous exposure to a credible or non-credible looker. This suggests a developmental progression in infants' willingness to selectively learn from others, perhaps influenced by different age-dependent motivations.

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The concept of theory of mind refers to children's knowledge about basic mental states, such as desires, beliefs, knowledge, emotions, and intentions. The knowledge of such states is said to subsequently influence children's predictions and explanations of others' behaviors. By the time children are 4- or 5- years-old, they have gained the necessary knowledge and understanding to grasp that others are intentional agents who possess certain beliefs and desires (Wellman, Lopez-Duran, LaBounty, & Hamilton, 2008).

One manifestation of children's theory of mind abilities that has recently received much attention is trust. Research with preschoolers has shown that they are more likely to believe and request information from those proven knowledgeable and trustworthy in the past than those who have not (Clement, Koenig, & Harris, 2004, 2005; Koenig, Clement, Harris, 2004; Harris, 2007; Wellman, Cross, & Watson, 2001). Specifically, 3- and 4-year-olds not only evaluate the reliability of claims made, but associate those with the respective informant, preferring to seek new knowledge from those who have been consistently reliable and confident in their knowledge (Clement et al., 2004; Koenig et al., 2004; Pasquini, Corriveau, Koenig, & Harris, 2007). For example, Pasquini and colleagues (2007) conducted a study where 3-and 4-year-olds watched films that had two different experimenters label four familiar objects and four novel objects. One of the experimenters was always correct or almost always correct (100% or 75% of the time), whereas the other experimenter was always inaccurate or almost always inaccurate (0% or 25% of the time), respectively. Afterwards, children were asked which experimenter was not very good at labeling objects, and which experimenter they would prefer to ask

regarding what a novel object was called. Results showed that both 3- and 4-year-olds performed above chance in identifying the less accurate experimenter and in using this information to guide whom they would ask in the future regarding new information.

Preschool children not only prefer to seek out information from more reliable informants, but consider their behaviour to be the normal or preferred method of action, suggesting that at this age, children engage in selective normative learning. Rakoczy, Warneken, and Tomasello (2008) had both 4- and 5-year-olds watch two puppets engage in labeling and non-verbal actions (i.e., giving objects names and drawing with a pen) one of which did so reliably, the other unreliably. Children were then asked if either of the puppets made a mistake either verbally or physically. Afterwards, both puppets demonstrated to the children how to play a novel game, following which the children had a chance to correct other third party game players who conformed to the rules that either the reliable or unreliable puppet demonstrated to them (thus either played the game correctly or incorrectly). It was found that children preferred to imitate novel game playing from the reliable puppet and protest the behaviour of third parties who followed the unreliable puppet's rules for playing the game. Thus, children at this age did indeed engage in both selective learning and selective imitation, believing that their preferred choice (that of the reliable agent) was the normative one.

Once children have competence at selective learning, they also seem to believe these qualities are unique to adults, preferring to trust them with new knowledge than someone of their own age (Taylor, Cartwright, & Bowden, 1991). However, recent findings suggest that if reliability becomes an issue, preschoolers will choose the more reliable informant, regardless of age. More specifically, if both an adult and same-age

peer informant is reliable, 3- and 4-year-olds prefer novel information given by the adult informant (Jaswal & Neely, 2006). However, when the same-age peer proves to be more reliable, preschoolers will prefer new information given by the peer than by the adult. Thus it appears that preschoolers are able to distinguish between those who are and are not reliable, preferring more reliable sources for learning new information.

It appears that infants as young as 16 months are also able to distinguish between those who are and are not reliable, and differentially treat informants based on their own existing knowledge base. Specifically, infants have been found to look longer at those informants who gave a false label to a familiar object (previously known to infants) than to those informants who gave a true label (Koenig & Echols, 2003). When the false label was given, infants actively tried to repair those incorrect messages by either giving the correct label, pointing, vocalizing, and/or alternating eye gaze between the referent and the experimenter, to see if the experimenter was indeed intending to name the object for which it was providing the incorrect label. This shows that even infants have some expectation that humans will be truthful sources of information.

Support for infants' selective trust also stems from two recent studies that examined the effect of reliability on infants' gaze following and belief attribution. Chow, Poulin-Dubois, and Lewis (2008) showed that infants' previous experience with either a reliable or unreliable looker influenced their subsequent gaze-following to a target object that was placed either in front or behind a barrier. Specifically, they had 14-month-olds first complete a training task in which they watched an experimenter show excitement while looking inside a container that either contained a toy (reliable looker) or was empty (unreliable looker). They then observed the same actor look at a target object that was

either visible to the child in front of a barrier or to a target object behind a barrier, thus hidden from the child's view (Moll & Tomasello, 2004). It was found that infants in the reliable looker condition were more likely to follow the gaze of the actor to the target behind the barrier as compared to infants in the unreliable looker condition. In contrast, no such effect was observed when the target object was visible to the child, confirming that when the object is visible, infants can use their own visual experience to validate what the experimenter is looking at but when the object is not visible, infants appear to be influenced by the past reliability of the looker.

Similar results were obtained from a study that looked at whether infants' selective mistrust influenced their belief attribution to an agent in a nonverbal belief task (Poulin-Dubois & Chow, in press). Infants aged 16 months were first tested in a similar procedure to Chow and colleagues' (2008) search-task with either a reliable looker or unreliable looker. Subsequently, infants were administered a true belief non-verbal task, using a violation of expectancy paradigm, in which they watched the same experimenter hide a toy in one of two locations (Onishi & Baillargeon, 2005). They then witnessed the experimenter search for the toy in a location that was either consistent or inconsistent with her belief about the toy's location. That is, the consistent action would be for the experimenter to search for the toy in the correct location (where it is in fact hidden) whereas the inconsistent action would be for her to search in the incorrect location. It was found that only the infants who were previously in the reliable looker condition looked longer at the inconsistent than at the consistent search behavior whereas those in the unreliable condition looked equally long in both instances. These findings provide evidence that during the second year of life, infants can encode the identity of agents

based on past reliability and establish expectations based on this experience, only attributing beliefs to those who are trustworthy and reliable. Consequently, they may also be more willing to learn novel information about their environment from those they deem trustworthy, a topic that although has been explored with preschoolers, has not previously been explored in infancy research.

One way in which infants learn from others in their social environment is by imitating their overt behaviours. In one of the first studies to look at infants' imitative behaviour, Meltzoff (1988) tested whether infants as young as 14 months would imitate a novel behaviour that they observed. One object that was used for demonstration was a wooden box with a panel on top that would illuminate when touched. Infants watched as the experimenter, during a period of 20 seconds, leaned forward from the waist and touched the top of her forehead to the panel, illuminating the light. After observing the experimenter produce the target action three times, infants were brought in one week later to see if they would demonstrate the novel action. Indeed, those who had seen the demonstration imitated the novel action (8 out of twelve infants); none of the infants who had not seen the demonstration spontaneously performed the head-touch action. It was concluded that infants at 14 months demonstrate deferred imitation, thus having implications for social learning and nonverbal measures of memory and representation.

The finding that infants imitated this irrational, novel action generated a lot of controversy in terms of its interpretations. Specifically, one interpretation suggested that infants imitated the novel action because they were able to identify with the experimenter and make internal representations of her behaviour, so that when they had the same goal as her, they used this stored representation and imitated her behavior (Meltzoff, 1988;

Tomasello, 1999). Tomasello later suggested that infants' ability to map and understand others' intentions allows them to make decisions to imitate the goals of others when they interpret these intentions as rational (e.g., Buttelman, Carpenter, Call, & Tomasello, 2007). The second interpretation focused on infants' understanding of others' actions, stating that because infants at 14 months can understand that an agent acts with the most efficiency and rationality in terms of accomplishing their goals, infants at this age must have inferred that the model's actions had both relevance and some rational basis, since the model had more efficient means available to her (Csibra & Gergely, 2005; Gergely, Bekkerin, and Kiraly, 2002). The latter interpretation suggests that the *pedagogical context*, not some internal representation, is operating to facilitate infants' imitation. The pedagogical context is when a knowledgeable and eager adult and a willing and ignorant infant exchange new and universally shared cultural knowledge about stimuli in the external environment (Fonagy, Gergely, & Target, 2007; Csibra & Gergely, 2005; Csibra & Gergely, 2006; Gergely & Csibra, 2006; Gergely, Egyad, Kiraly, 2007). Specifically, the adult establishes a teaching environment by: 1) using ostensive cues that facilitate communication, such as eye-gaze, turn-taking, and speaking to the infant by name, 2) identifying an outside referent through pointing or gaze-shifting, that 3) results in the transmission of novel and culturally relevant information (Csibra & Gergely, 2005). The assumptions of this theory also state that theory of mind, the ability to attribute mental states to others, is not a necessary precursor to learn from a pedagogical context, but may in fact develop simultaneously or afterward. What is necessary is that infants have sufficient cognitive structures and motivations to recognize a teaching context and want to learn from the situation.

To test the pedagogical context hypothesis, Gergely and colleagues (2002) used a slightly modified procedure to Meltzoff's (1988) head-light touch, where they tested 14-month-olds in two conditions: the standard condition where the experimenter's hands were placed on the table beside the light (hands-free), and a condition where the experimenter pretended to be cold and so was wrapped in a blanket making her hands unavailable (hands-occupied). After the demonstration, infants were given 20 s to explore the light. The majority of infants in the hands-free condition imitated the novel head-light touch one week later (69%) in comparison to a small minority of infants in the hands-occupied condition (21%), even though they all used their hands at one point to successfully turn on the light. Thus, infants in the hands-occupied condition did not preferentially imitate, as the action did not represent any new information (i.e., the model acted rationally, due to situational constraints). However, infants in the hands-free condition must have inferred the action as novel, culturally relevant information, as the majority imitated the novel action, despite their ability to use a more efficient means. This demonstrates that at 14 months, infants have the cognitive underpinnings to learn from a pedagogical context and evaluate the rationality of an action according to the teaching environment provided by the model (e.g., Carpenter & Call, 2007; Gergely & Csibra, 2005).

It appears that enculturated chimpanzees may also have the ability to learn from a pedagogical context and infer the rationality of another agent (Buttelmann, Carpenter, Call, & Tomasello, 2007). In a procedure similar to Gergely and colleagues (2002), wherein a pedagogical context was established (i.e., ostensive cues established, referent acted upon, and relevance of the action manipulated), it was found that across two

demonstration-response trials, enculturated chimpanzees were more likely to imitate the head-touch of the light using their forehead in the hands-free condition (37.5%) than in the hands-occupied condition (18.8%), with this difference being statistically significant for the first trial only. Similar to the 14-month-olds above, while almost all of the chimpanzees turned the light on with their hands first, regardless of condition, those in the hands-free condition were still motivated to imitate the experimenter, despite the fact that they could still turn on the light more efficiently. This suggests that enculturation may make chimpanzees more sensitive to the pedagogical cues of others, wherein they are able to imitate the behaviour of others and understand when it is rational to do so.

Finally, Schweir, Van Maanen, Carpenter, and Tomasello (2006) have since replicated these findings in infants as young as 12-month-olds, using a slightly modified procedure. In their study, infants were presented two conditions: a toy dog entering a house through the chimney because the door was closed (analogous to hands-occupied condition) and a toy dog entering through the chimney even though the door was open (analogous to hands-free condition). Infants were then given the dog and told that the door was open and that it was their turn. They were given 30 s to respond, after which they were shown the demonstration again and given another chance to respond, for a second trial. Similar to Gergely et al. (2002), across trials infants preferred to make the dog enter through the chimney if they were in the door-open condition (81%) as opposed to the door-closed condition (44%). Proportions of trials were used for the analyses, as some infants did not respond in the first trial. Finally while most infants, regardless of condition, tried to put the dog through the door, those in the door-open condition still chose to imitate the experimenter (put the dog through the chimney) even though they

had the ability to use a more efficient means. Taken together, these results show that by about 1 year, infants (and enculturated chimpanzees) can learn from a pedagogical context and infer an action's rational means based on the situational constraints posed to the model, thus mimic an unusual act when they deem it relevant even if a more efficient means is available to them.

Infants do not always learn from a pedagogical context. In a follow-up study of Meltzoff's (1988) original experiment, Kiraly, Csibra and Gergely (2004) replicated the procedure with the exception that the experimenter avoided eye-gaze with the infant. It was found that infants no longer preferentially imitated the model. Similarly, using a different procedure, it was shown that infants at 18 months were more likely to imitate a novel action (i.e., an experimenter turning on a light with her forearm) if she did so with directedness, such as looking at the action while doing it (71%), as opposed to her gazing in a different direction, toward another toy (29%; Behne, Carpenter, van Veen & Tomasello, 2006; Carpenter & Call, 2007; Carpenter, 2006). Taken together, these studies highlight the importance of both ostensive cues and acknowledging a referent in defining a teaching situation wherein infants are willing to learn.

The current study was concerned with the issue of trust in infancy and whether the credibility of an individual's gaze influences infants' decision to learn from and imitate novel actions modeled by that individual. Two experiments were conducted with 14- and 18-month-olds in which they were first trained to either develop trust or mistrust towards a person. This was carried out by following Chow and colleagues (2008) object search procedure, wherein, after observing an experimenter show excitement while gazing at a container's content, infants either found a toy in the container (reliable looker condition)

or looked inside an empty one (unreliable looker condition). Following the reliability training, infants completed an imitation task similar to Meltzoff (1988) and Gergely and colleagues (2002) procedure, where infants observed an experimenter turn on a light with her forehead while her hands were free.

The present experiments were conducted in order to test two main hypotheses. First, it was expected that infants in the unreliable looker condition would develop selective mistrust towards the agent who performed the demonstration by tracking the reliability of her emotional and communicative signals. Thus, it was expected that in the search task, infants in the unreliable condition would eventually take longer, across trials, to open the container and examine its contents, as they gradually would learn that the facial and vocal cues of the experimenter were misleading. Conversely, it was expected that infants in the reliable condition would develop a judgment of reliability towards the agent. Therefore, it was hypothesized that infants' latency to open the containers would not change across trials, and that they would be equally quick to examine the containers' contents across trials.

Second, it was expected that if infants are influenced by selective mistrust when learning from a pedagogical context, then only infants in the reliable condition should pay attention to the experimenter and perceive her as a rational person, whose novel actions are worth imitating. Specifically, infants would know to trust the ostensive cues (eye contact, use of name-calling) of the experimenter and learn from the pedagogical context only if she were reliable in a previous context. Thus, it was expected that in the imitation task, only infants in the reliable looker condition would learn to imitate the novel head-touch. Conversely, infants in the unreliable looker condition were not

expected to imitate the experimenter, but rather use their hands, as they would not trust the experimenter and thus ignore her ostensive cues (e.g., eye contact, name-calling), which have proven to be unreliable in a previous context.

Experiment 1

The purpose of Experiment 1 was to examine whether 18-month-old infants' learning is influenced by the reliability of another's emotional and communicative signals. There is evidence to suggest that this ability has already developed in younger infants (Chow et al., 2008). It was hypothesized that if infants could track an agent's gaze reliability, they would develop trust toward her if her gaze was reliable, and chose to imitate her in an imitation task. Conversely, if infants had experience with an unreliable experimenter, it was hypothesized that they would not develop trust toward the experimenter, therefore choosing not to imitate. Previous studies have shown that 14-month-old infants are able to imitate one's novel demonstration (e.g., Gergely et al., 2002). Thus, it was expected that 18-month olds would also behave similarly, as previous studies have shown that imitation only increases with age and developmental maturation (Neilsen, 2006; Tennie, Call, & Tomasello, 2006).

Method

Participants

A group of sixty infants participated in this study (30 females, 30 males). The mean age for infants was 18.37 months (SD =1.05, range = 16.03 to 20.20 months). Nine additional infants were excluded from the study because of experimental error (n = 2), parental interference (n = 1), and fussiness (n = 6). On the basis of parental report, all infants had a minimum 34-week gestation period in addition to no vision or hearing

impairments. Infants were either recruited from birth records provided by a government health services agency or from birth announcements in a local newspaper.

Materials

Search task. To administer the training task, three opaque cylindrical plastic containers with loose-fitting lids were used. The containers ranged in colour (one blue, one yellow, one orange) but were identical in their dimensions (10 cm diameter, 11 cm height). The order in which the coloured containers were used was counterbalanced across four training trials. Two blocks (one pink, one blue) were used in the warm-up trials and 4 small toys (fish, teddy bear, cat, and lady bug) that made a sound effect when manipulated were used in the training trials in the reliable looker condition (see Figure 1).

Imitation task. A round, circular press-on light (14 cm diameter, 5 cm height) was used. The light would illuminate upon being pressed on.

Design and Procedure

Infants were greeted and brought to a reception room where they were familiarized with the experimenter, while the parent filled out a consent form and a demographic questionnaire. After this familiarization period, both infant and parent were brought into the testing room where both the search and imitation task were administered. Infants were seated in a child seat attached to a table that directly faced the experimenter. Infants were randomly assigned to one of two conditions: an unreliable looker condition ($n = 28$) and a reliable looker condition ($n = 32$). All observations were videotaped.

Search task. This task was a modified version of Repacholi's procedure (1998; see also Chow et al., 2008). It was designed so that infants would develop an expectation of credibility for the experimenter based on watching her demonstrate positive affect

while looking inside an empty container (i.e., unreliable looker condition) or inside a container with a toy inside (i.e., reliable looker condition). Infants completed two warm-up trials and four training trials.

In the warm-up phase, once seated across the experimenter, infants observed the experimenter look inside the yellow container and then say, "What's in here?" Subsequently, the experimenter shook the container, removed its lid, and then titled the container toward the infant so that he or she could see the toy hidden inside. Once closing the lid, the experimenter encouraged the infant to open the container by saying, "Now, it's your turn." This was followed by a 30 second period during which the infant could explore the contents of the container. The exact same procedure was demonstrated during the training trials except that orange and blue containers were used. In addition, an exclamation ("Wow!") accompanied the experimenter's look inside the container, together with a surprised facial expression, expressed by raised eyebrows and an open mouth. Each demonstration lasted approximately 10 s.

Imitation task. This procedure was modified from Gergely et al.'s (2002) task (specifically the hands free condition) and was used to see whether infants' prior knowledge of an experimenter's credibility in the search task would influence their willingness to imitate her behavior in a novel task. Thus, this task was always administered after the search task. Once seated across from the experimenter, infants completed two training trials. The experimenter began by saying "Hi, __(baby's name)," following which she would lean forward from the waist and touch the light with her forehead, thus illuminating the light. As she performed this head-touch, her hands would always be placed flat on the table, on each side of the light. She would then lean forward

from the waist once again to turn off the light. This sequence was repeated two times (head-touch illuminating the light, then head-touch turning off the light, then repeat). Following this display, the experimenter offered the light to the infant, saying "Now, it's your turn." The press-on light was placed directly in front of the infant, which was followed by an exploration period of approximately 30 seconds. After all the experimental trials were completed, both the infant and parent were taken back to the reception area. Infants were given a small toy and certificate of merit for participation, and parents were later mailed a newsletter describing the results of the study after data collection had been completed.

Coding and Reliability

Each participant was videotaped and all tapes were coded by the primary experimenter. The coding scheme for the search task was based on Chow et al.'s (2008) procedure. Two dependent variables were collected, demonstrating whether the infant a) examined the contents of the container by either looking inside or by inserting his or her hands inside the container and b) the latency to examine the contents of the container, in seconds. The coding scheme for the imitation task was based on Gergely et al.'s (2002) procedure. Infants' responses were recorded based on a) which body part they used for their first action and/or second action (either forehead or hands) and b) their latency to touch the light, in seconds. Repeated actions (if an infant used her/his hands or forehead twice) were not recorded. If infants used neither their forehead nor their hands, it was coded as no response.

An independent observer who was blind to the hypotheses coded a random selection of 25% (n = 15) of the infants, based on the videotaped sessions, in order to

assess inter-observer reliability. Using Pearson product-moment correlations, the mean inter-observer reliability was $r = .99$ (range = .81 to 1.00) for the search task and $r = .99$ (range = .84 to 1.00) for the imitation task (including latency).

Results

Search Task

Examination behaviour. To assess whether the infants from both groups paid attention to what the experimenter saw inside the containers during the search task, we compared the number of times infants examined the contents of the container during the training trials (out of 4 trials) in the reliable and unreliable looker conditions. Results indicated that infants from both groups looked equally often inside the containers (reliable looker: $M = 3.97$, $SD = 0.17$; unreliable looker: $M = 3.79$, $SD = 0.57$), $t(58) = 1.73$, n.s., suggesting that they were both paying attention to the experimenter's behavior and were thus able to learn of her reliability.

Latency to examine contents. To determine if infants were able to develop some expectation about the contents of the containers over time, we compared the latency to examine the content on the first and last trial of the training phase using a 2 x 2 mixed model analysis of variance (ANOVA) with condition (reliable, unreliable) as the between subjects factor and trial (first trial, last trial) as a within-subjects variable. In line with our hypothesis, there was a significant interaction between condition and trial, $F(1,58) = 7.92$, $p < .001$, $\eta^2 = .12$. Pairwise comparisons with Bonferroni corrections revealed that infants in the unreliable condition took longer to examine the contents of the container on the last trial ($M = 10.32$, $SD = 1.41$) as compared to the first trial ($M = 6.18$, $SD = 0.82$, $p < .001$), whereas infants in the reliable condition took equally long to examine the

containers' contents (first trial: $M = 3.56$, $SD = 0.77$, last trial: $M = 3.04$, $SD = 1.32$, ns; see Figure 3). This suggests that infants in the unreliable condition became gradually disinterested in the content of the containers as they developed the expectation that the facial and vocal cues of the experimenter were misleading and there was nothing to look at in the containers.

Imitation Task

Infants' first response. We focused primarily on infants' first action after witnessing the model's demonstration, as these acts are considered to be the most indicative of copying effects (Tennie et al., 2006). Figure 4 demonstrates that, as expected, among the children who imitated, infants who previously had experience with a model who acted unreliably used their hands (69%) significantly more often than their foreheads (31%) when first acting on the object, $\chi^2(1, n = 26) = 4.172, p < .05$. The results for the infants who had previous experience with a reliable model were not consistent with our expectations. These infants also used their hands (69%) more often than their foreheads, (31%), $\chi^2(1, n = 29) = 3.85, p < .05$.

A comparison of the proportion of infants who used their hands or forehead across the two groups (reliable vs. unreliable), revealed that there were no significant differences regarding either condition's first attempt at acting on the light, $\chi^2(1, n = 55) = .98$, n.s. It is worth mentioning that some infants in both groups (reliable: $n = 3$, unreliable: $n = 2$) did not succeed in turning on the light through use of either their forehead or hands. These infants were coded as not imitating. Thus, some infants appeared either not interested in the task, or unsure of how to perform this novel action.

Latency to imitate. To examine whether infants' delay in imitation was influenced

by their reliability training, their latency to act was compared as a function of their looker condition and type of action. A two-way ANOVA was run with looker condition (reliable, unreliable) and type of action (forehead, hands) as between-subjects factors. The analysis revealed no significant main effect for looker condition, $F(1,54) = 1.46$, n.s., $\eta^2 = .03$, indicating that infants' previous experience with a reliable or unreliable model did not influence their latency to imitate (reliable: $M = 2.05$, $SD = 1.15$, unreliable: $M = 4.07$, $SD = 1.21$). There was no significant main effect for action, $F(1,54) = 0.10$, n.s., $\eta^2 = .002$, suggesting that infants who used their hands did so as quickly as those who used their forehead (hands: $M = 3.32$, $SD = 0.93$, forehead: $M = 2.79$, $SD = 1.39$). There was also no significant interaction between the two measures, $F(1,54) = 0.12$, n.s., $\eta^2 = .002$, nor did any of the pairwise comparisons with Bonferroni correction reveal any significant findings. This suggests that infants from both conditions took equally long to act on the object, whether they used their forehead or hands, and that the model's previous reliability had no impact on their reaction time to imitate.

Discussion

One of the goals of this study was to examine infants' ability to track the gaze reliability of an agent who displayed either reliable or unreliable cues. By measuring infants' latency to explore the contents of containers which an experimenter previously expressed interest in, it was found that when the experimenter's gaze was unreliable (i.e., expressing joy over an empty container), 18-month-olds took significantly longer to examine the contents of the containers across trials. In comparison, those infants who had experience with someone whose gaze was reliable (i.e., expressing joy over a container with a toy inside) took equally long across trials to examine the containers'

contents. This suggests that infants at this age can track an agent's gaze reliability, based on the credibility of her overt cues and replicates previous results with this task (Repacholi, 1998).

The main goal of this study was to examine whether infants' previous exposure to a reliable or unreliable model influences their tendency to imitate his or her novel actions. It was found that prior knowledge regarding the reliability of a model did not influence whether infants subsequently imitated her novel actions. Specifically, infants did not imitate a head-light touch demonstrated to them, whether the experimenter was reliable or unreliable in a previous context. Instead, infants chose to use the most efficient available means to them, thus using their hands. This suggests that infants at this age were not influenced by their previous knowledge of the experimenter's reliability. Thus the current study did not replicate previous findings demonstrating that infants as young as 12-14-months-old have the capabilities to imitate behaviours that they deem rational (e.g., Gergely et al., 2002; Meltzoff, 1988). A reason for why infants at this age did not imitate may be due to a developmental progression in infants' motivations for imitating another agent's actions (Neilsen, 2006; Tennie, et al., 2006). At this point, a differentiation of imitation from other copying acts should be clarified, where 'imitation' is a term used exclusively for when someone understands the goals of the actor and copies both their specific actions and end result, while 'emulation' is reserved for when a person copies only the end result of the action, not the specific action itself (without necessarily understanding his or her goals; see Neilsen, 2006 for review).

To illustrate this developmental progression, it was found that when a rational reason for performing a novel action was provided, 12-month-olds increased their

likelihood of imitating as opposed to emulating. However, providing a rational reason for a model's behavior was not sufficient for 18-month-olds, who instead were more likely to imitate as opposed to emulate when the experimenter acted in a social manner (e.g., smiled, engaged the child in conversation, maintained eye contact; Neilsen, 2006). While in the current study the experimenter demonstrated eye contact with the infant and engaged the infant by calling his or her name, all other conversation was kept to a minimum and the experimenter remained in neutral affect. Thus, it appears that the level of social motivation may have not been high enough for infants in the current study to imitate the specific actions of the experimenter.

Certain methodological limitations existed in the current experiment that may have also contributed to the results. Specifically, within the procedure for the imitation task, seeing the experimenter turn the light both on and off with her forehead could have confused the infants and possibly made them conclude that using one's forehead might result in an unsuccessful attempt at turning on the light. Therefore they may have been hesitant to use this action. In addition, we noticed that infants were picking up the light and playing with it, rather than letting it rest on the table, thus increasing the likelihood that they would use their hands to reproduce the action. Taken together, these methodological issues may have contributed to the current experiment's results.

Experiment 2

In previous studies reporting about infants' rational imitation, the age at which infants were tested was several months younger than the infants in the first experiment (e.g., Gergely et al. 2002; Meltzoff, 1988; Schweir et al., 2006). Thus, possible reasons for the lack of significant findings between our reliable and unreliable group in terms of

the imitation task (i.e., failure for the groups to exhibit any differences in terms of using their forehead to turn on the light) may have been due to the fact that the rationality of the model may be less important as infants become older (Neilsen, 2006). To see if the infants' older age accounted for this difference, we tested a younger group of infants, whose mean age was approximately 14 months.

In addition to testing younger participants, we modified our procedure somewhat for the imitation task. We thought that perhaps seeing the experimenter turn the light both on and off with her forehead could have confused the infants and possibly make them conclude that using one's forehead could sometimes result in an unsuccessful attempt at turning on the light. Thus it was decided to show infants a demonstration where the experimenter only turned on the light with the forehead. In addition, in order to make sure that the infants saw the light as something to act on, rather than something to manipulate, we secured it to a flat tray, so that it could not be pulled off. Finally, to increase the chances that the infants could learn the novel behaviour, an additional demonstration was added to each trial, increasing it from two to three times. Thus, this second experiment sought to determine whether the results from the previous experiment were due to both the age of the participants as well as to these methodological limitations.

Method

Participants

A group of forty-three infants participated in this study (17 females, 26 males). The mean age for infants was 14.51 months (SD = 0.57, range = 13.33 to 16.46 months). Twelve additional infants were excluded from the study because of experimental error (n = 2), lack of compliance with the task (n = 4), parental interference (n = 1), and fussiness

(n = 5). On the basis of parental report, all infants had a minimum 33-week gestation period in addition to no vision or hearing impairments. Infants were recruited from birth records provided by a government health services agency.

Materials

All stimuli were identical to Experiment 1, with the exception of the imitation task. In the current study, the press-on light was secured to a flat, rectangular tray (45 cm by 33 cm; see Figure 2).

Design and Procedure

The design and procedure were identical to Experiment 1 for the search task. Infants were randomly assigned to one of two conditions: an unreliable looker condition (n = 22) and a reliable looker condition (n = 21). There was a slight modification to the imitation task. Infants still sat across from the experimenter, where they completed three training trials. The experimenter began by saying "Hi, __ (baby's name)," following which she would lean forward from the waist and touch the light with her forehead, thus illuminating the light. She would then bring the tray underneath the table in order to turn it off, so that the infant only saw the head-touch illuminate the light, not turn it off. This sequence was repeated three times (head-touch illuminating the light, bring tray down to turn off, then repeat). Following this demonstration, the experimenter offered the tray to the infant, saying "Now, it's your turn." This was followed by an exploration period of approximately 30 seconds.

Coding and Reliability

Coding for both tasks was conducted in the same manner as Experiment 1. An independent observer coded a random selection of 25% (n = 11) of the infants, based on

the videotaped sessions, in order to assess inter-observer reliability. Using Pearson product-moment correlations, the mean inter-observer reliability was $r = .99$ (range = .91 to 1.00) for the search task and $r = .99$ (range = .99 to 1.00) for the imitation task (including latency).

Results

Search Task

Examination behaviour. To assess whether the infants from each group paid attention to the experimenter's behaviour during the search task, we compared the number of times infants examined the contents of the container during the training trials (out of 4 trials) in the reliable and unreliable looker conditions. Results indicated that infants did not look equally often inside the containers (reliable looker: $M = 3.67$, $SD = 0.58$; unreliable looker: $M = 3.23$, $SD = 0.69$), $t(41) = 2.27$, $p < .05$. This suggests that infants in the unreliable group became increasingly uninterested in the task and perhaps were quick in learning of the experimenter's reliability, resulting in a decrease in their examination of the content of the containers across trials.

Latency to examine contents. To determine if infants were able to develop an expectation about the containers and their contents over time, we compared the latency to examine the containers from the first to the last trial of the training phase using a 2 X 2 mixed model analysis of variance (ANOVA) with looker condition (reliable, unreliable) as the between-subjects factor and trial (first trial, last trial) as a within-subjects factor. Consistent with our hypothesis, it was found that there was a significant interaction between condition and trial, $F(1,41) = 13.97$, $p < .001$, $\eta^2 = .25$. Pairwise comparisons with Bonferonni corrections revealed that infants in the unreliable condition took longer

to examine the contents of the container in the last trial ($M = 16.05$, $SD = 1.90$) as compared to the first trial ($M = 9.01$, $SD = 1.91$ $p < .01$), whereas infants in the reliable condition took equally long to examine the containers' contents (first trial: $M = 10.50$, $SD = 1.95$, fourth trial: $M = 7.08$, $SD = 1.95$, n.s; see Figure 5). This suggests that infants in the unreliable condition came to understand that there was nothing to find in the containers by the last trial, and thus became less motivated to examine its contents.

Imitation Task

Infants' first response. As expected, infants who previously had experience with a model who acted unreliably used their hands (76%) significantly more often than their foreheads, (24%) $\chi^2(1, n = 17) = 4.77, p < .05$. In contrast, those infants who had previous experience with a model who acted reliably showed no preference for using their forehead (54%) or hands (46%) first, $\chi^2(1, n = 13) = .077$, n.s. (see Figure 6).

A comparison of the proportion of infants who used their hands or forehead across the two groups (reliable vs. unreliable), revealed that there were no significant differences regarding infants' first attempt to act on the light, $\chi^2(1, n = 30) = 2.92$, n.s. It is worth mentioning that a large proportion of infants from both groups (reliable: $n = 8$, unreliable: $n = 5$) did not succeed in turning on the light through use of either their forehead or hands. These infants were coded as not imitating. Thus, some infants appeared either not interested in the task, or unsure of how to behave regarding performing this novel action. It was interesting to note that there was a larger proportion of infants doing nothing (38%) in comparison to the older infants from the previous experiment, (9%), $\chi^2(1, n = 109) = 88.79, p > .05$.

Latency to imitate. To examine whether infants' delay to imitate was influenced by

their reliability training, their latency to act was compared as a function of their looker condition and type of action. A two-way ANOVA was run with looker condition (reliable, unreliable) and type of action (forehead, hands) as between-subjects factors. The analysis revealed no significant main effect for looker condition, $F(1,28)=1.10$, n.s., $\eta^2 = .04$, indicating that infants from either condition did not differ in their latency (reliable: $M = 8.99$, $SD = 2.59$, unreliable: $M = 5.16$, $SD = 2.56$). There was also no significant main effect for type of action, $F(1,28)=3.14$, n.s., $\eta^2 = .11$, suggesting that infants who used their hands did so as quickly as those who used their forehead (hands: $M = 3.85$, $SD = 2.21$, forehead: $M = 10.30$, $SD = 2.89$). Finally there was no significant interaction overall between the two measures (i.e., looker condition and type of action), $F(1,28) = 3.35$, n.s., $\eta^2 = .08$. However, pairwise comparisons with Bonferroni corrections revealed that there was a significant difference in the reliable condition's latency to perform a specific action type, $F(1,25) = 6.43$, $p < .05$, $\eta^2 = .21$, but not in the unreliable condition's, $F(1,25)=.002$, n.s., $\eta^2 = .00$. Specifically, only those in the reliable group differed in terms of their latency to act on the light, with those who used their forehead ($M = 15.56$, $SD = 3.66$) taking longer than those who used their hands ($M = 2.43$, $SD = 3.66$)

Discussion

Infants in the current study reacted as expected to the communicative cues provided by the experimenter within the search task. Thus, when the communicative cues of the experimenter were misleading (i.e., the unreliable condition), 14-month-olds took significantly longer to examine the contents of the containers across trials in comparison to those infants who had experience with someone whose communicative cues were

accurate (i.e., the reliable looker condition). Thus, extending results from the previous experiment, this suggests that infants at this age can track an agent's gaze reliability based on the credibility of her overt cues and replicates previous findings with this task (Chow, et al. 2008, Poulin-Dubois & Chow, in press).

More importantly and consistent with our hypothesis, 14-month-olds with prior experience with an unreliable looker did not imitate her novel actions. Instead, these infants preferred to use their hands, significantly more often than their forehead. Clearly, it appears that, although infants were attentive to the model regardless of her past reliability, only the reliable model's ostensive cues acted as an "interpretation switch" directing infants to interpret the model's novel actions as part of a teaching event.

In contrast to the results from the 18-month-olds, 14-month-old infants who had previous exposure to a reliable agent did not show a preference for using their hands or forehead. This can be interpreted as weak support for the current study's original hypothesis, which stated that infants in the reliable condition would be more willing to imitate using their foreheads as the model did. Stated differently, while the current study failed to replicate previous findings demonstrating 14 month-old infants' preference to imitate another's actions when they are deemed rational (e.g., Gergely et al., 2002; Meltzoff, 1988), it did provide partial support suggesting that these infants are equally likely to imitate or not imitate another's rational actions, once exposed to the model's history of reliability. Nonetheless, supporting our hypothesis was the finding that these infants behaved differently from those in the unreliable condition, who clearly chose not to imitate the model.

Reasons for the current study's failure to replicate previous findings may have been because infants in the reliable condition, unsure of whether to use their hands or forehead, opted for neither. Of those who used neither, there were a number of infants who tried to pull the light off the tray (considered neither a forehead or hand touch), suggesting that they thought they were missing some aspect of the game, whose goal could not possibly be to teach to turn on a light with one's forehead. Other explanations for this alternative action of trying to pull the light off from the tray could be due to carry over effects. Infants were always first administered the search task that required them to open containers (i.e., open a container by removing its lid) thus revealing the contents inside. Afterward, the infants were administered the imitation task that had them turn on a light, attached to a tray, with their forehead. It is possible that performing the search task first and therefore gaining experience and exposure to opening a container by removing its lid made infants try to reenact this behaviour in the task immediately after (see Figures 1 and 2 for comparison of materials). Because placing the light on the tray was a methodological change from the 18-month-olds to the 14-month-olds, there is no way to compare the current experiment's results with those from the previous experiment to assess whether infants at both ages would act the same. Therefore, it is considered at best a possible explanation to 14-month-old infants increased lack of imitation.

An interesting finding within this condition was infants' latency to imitate on their first action, where it was found that infants in the reliable looker condition took significantly longer (approximately three times longer) to use their forehead than their hands. One interpretation is that infants were experiencing a conflict: they questioned whether to imitate. It may be that, because the infants saw the experimenter be reliable in

a previous context, they were confused to now see her act in a novel, bizarre way. Thus, they were unsure of how to act, questioned whether to imitate, and took longer to reach that decision. If one were to argue that infants in this condition were questioning whether to imitate, one can make sense of the data. Specifically, there were no differences between the reliable condition and the unreliable condition in terms of using their hands; those who wanted to use their own natural response did so almost right away. However, only those who were going to use their forehead in the reliable condition ($n = 7$) questioned this (and thus, took longer). In contrast, those few who did use their forehead in the unreliable condition ($n = 4$) did so almost right away.

General Discussion

One of the goals of the current study was to test whether infants' learning is influenced by the selective mistrust they have developed towards another person. It was found that 14- and 18-month-old infants who had experience with an unreliable looker were able to track that person's reliability, and develop expectations regarding her behaviour. Specifically, in a search task where infants were required to examine the contents of a container, infants who witnessed an unreliable looker (someone show excitement over an empty container) took significantly longer across trials to examine the contents. In contrast, infants who witnessed a reliable looker (someone show excitement over a container with a toy inside) did not develop this mistrust toward the experimenter, thus their latency to examine the contents of the containers did not change over time. The current study therefore replicates findings that by 14 months of age, infants have the ability to develop selective mistrust towards others who have been unreliable in the past (Chow et al., 2008, Poulin-Dubois & Chow, in press).

The other, more important goal of this study was to examine whether, if infants are capable of selective mistrust, this ability influences their willingness to learn from others. We predicted that infants who had previous exposure to a trustworthy experimenter would trust her pedagogical cues and perceive her as a rational agent, who is worthy of imitating. Conversely, it was predicted that infants who had previous exposure to a non-trustworthy experimenter would not trust her pedagogical cues, thus not perceive her as a rational agent and choose not to imitate her actions. The results from both experiments were mixed. On the one hand, infants in the unreliable condition acted as predicted: both 14- and 18-month-olds in the unreliable condition did not imitate the experimenter. Rather than use their foreheads to turn on a light as the model did, infants preferred to use the more rational, efficient means available to them (i.e., their hands), and did so at a significantly higher proportion than any other action (i.e., forehead, no response).

On the other hand, the results from infants in the reliable condition were not as predicted. In contrast to previous research, neither 14- nor 18-month-olds imitated the model using their forehead. Instead, 18-month-olds used their hands more often and 14-month-olds were equally likely to use either their forehead or hands. Thus, the current study did not replicate previous research that demonstrated rational imitation in infants as young as 12 months (Schweir et al., 2006). It seems that there exist age-related differences in infants' motivation to imitate others that may best explain the lack of significant findings within this condition. Specifically, older infants may be less interested in the rational explanations for performing actions and therefore less likely to imitate based on the apparent "rationality" of the model. In addition, being more

motivated socially, the task itself may have not been reinforcing enough for these infants. Other researchers using this task have only tested infants as old as 14-months and therefore, the 18-month-old infants from Experiment 1 cannot be compared to the results found by other studies, developmentally speaking. In sum, these infants may not have had sufficient motivation to learn from the pedagogical context and demonstrate rational imitation.

In contrast, 14-month-olds from the current study did not prefer to imitate or emulate, as they used both types of action (i.e., forehead or hands) equally often. Infants' willingness to imitate could have been influenced by whether they cognitively understood the task. As mentioned previously, the assumptions of the pedagogical context are that infants have sufficient cognitive structures and motivations to recognize a teaching context. However, those who did appear to understand the task and choose to imitate the light touch (use their forehead) did so after a significantly longer wait period compared to those who used their hands. It may be that these infants were motivated by the apparent logic of the demonstration, as when the experimenter was previously reliable and used her forehead, they did not simply use their hands as the 18-month-olds did. Rather, these infants questioned whether to imitate this bizarre action, perhaps confused given the experimenter's previous reliability.

One of the best possible explanations for the current study's failure to replicate other research on rational imitation is that our study introduced a previous task that was designed to manipulate trust. Because these other studies did not have a previous task that could influence infants' actions, they may have been better able to get a "pure" estimate of infants' ability to learn from a pedagogical context and imitate a

demonstration that was intended to teach them new information. The current study, however, did have a previous manipulation, which was similar in setup: both the search task and the imitation task had objects that were placed one on top of the other (container with lid in the search task, light on tray in the imitation task, see Figures 1 and 2 for comparison) which might have influenced how infants saw these objects as needing to be acted upon. Anecdotal information on how infants responded to the apparatus in the imitation task (i.e., trying to lift it off the tray) suggests this as a plausible explanation. Future studies will have to look at how using a different measure of trust or imitation may influence results. Specifically, the imitation task could use a novel action that has less similar demand characteristics, such as operating an apparatus with one's foot (see Buttelman et al., 2007).

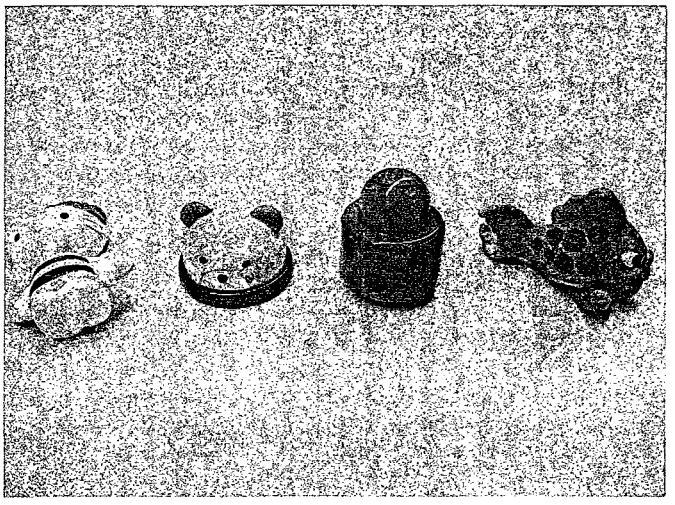
To our knowledge, there have been no previous studies exploring the relationship between infants' trust of others and their subsequent willingness to learn from these models. The current study showed that trust influenced 14-month-olds, but not 18-month-olds, decision in choosing whom to learn from in a novel context. These variable findings can be understood within the context of pedagogical theory. Built into the assumption of the pedagogical theory is that the recipients of new knowledge have to have an epistemic trust of the teacher in order to learn from him or her, in addition to recognizing situations where the teacher is ignorant and thus less capable of delivering relevant information (Csibra & Gergely, 2005; Fonagy et al., 2007; Gergely et al., 2007). Thus it appears that 14-month-old infants did indeed have the cognitive underpinnings and theory of mind precursors to demonstrate some aspects of cultural learning in that they were able to distinguish models based on their reliability, and choose not to learn from an individual

who was untrustworthy in a previous context (Meltzoff, 2002; Csibra & Gergley, 2005). The lack of clear findings within our 18-month-old sample may be due to a developmental progression that appears to exist over the second year of life, with 14-month-olds having different motivations for learning than 18-month-olds. Specifically, younger infants may be more responsive to the rational motivations of others, while older infants may be more responsive to the social motivations of others (Carpenter, 2006; Neilsen, 2006).

Future studies should address whether infants are sensitive to reliability in other domains, such as labeling, and to what extent they can generalize this information across contexts. Studies on children's selective learning have shown that infants are able to take into account others' reliability based on word and object labeling, and prefer to learn from those who have been reliable in other contexts (Rackoczy et al., 2008). This extension would strengthen the argument for infants' mentalistic ability, specifically their ability to demonstrate epistemic trust, a precursor to theory of mind.

Taken together, the results from the present study contribute to ongoing research in the pursuit of early theory of mind capabilities in infancy. In light of the current findings, it appears that while infants at 14 months may not be fully aware of the mental states of others, they do have the necessary precursors that allow them to demonstrate epistemic trust, which influences who they choose to learn from in a novel situation. Future research is needed to further clarify the development of social learning in infancy and whether it is influenced by infants' epistemic trust of others.

Figures



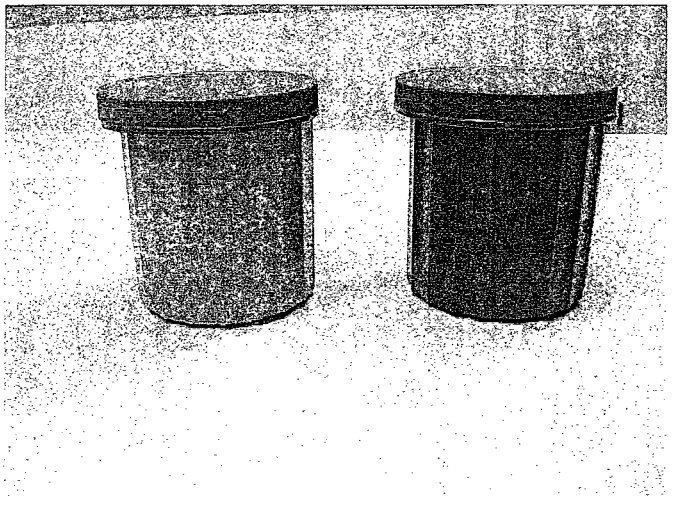


Figure 1. Picture of testing material for Search Task.

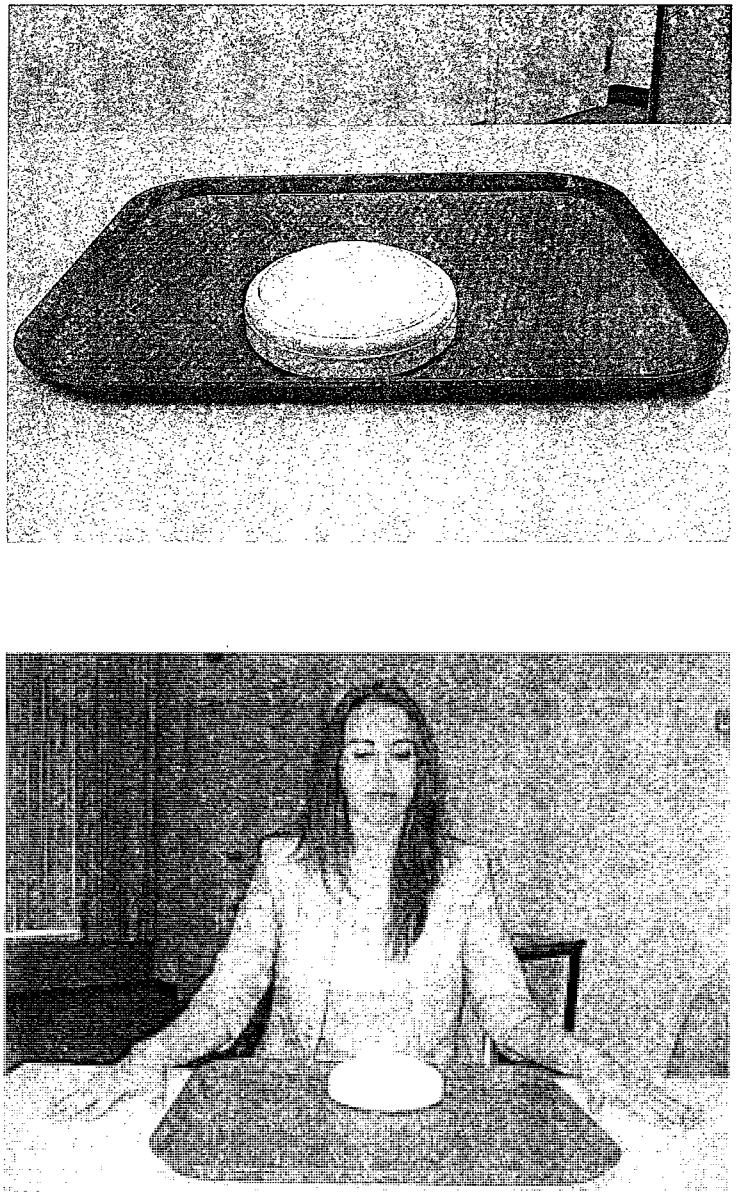


Figure 2. Pictures of testing material and procedure for Imitation Task in Experiment 2.

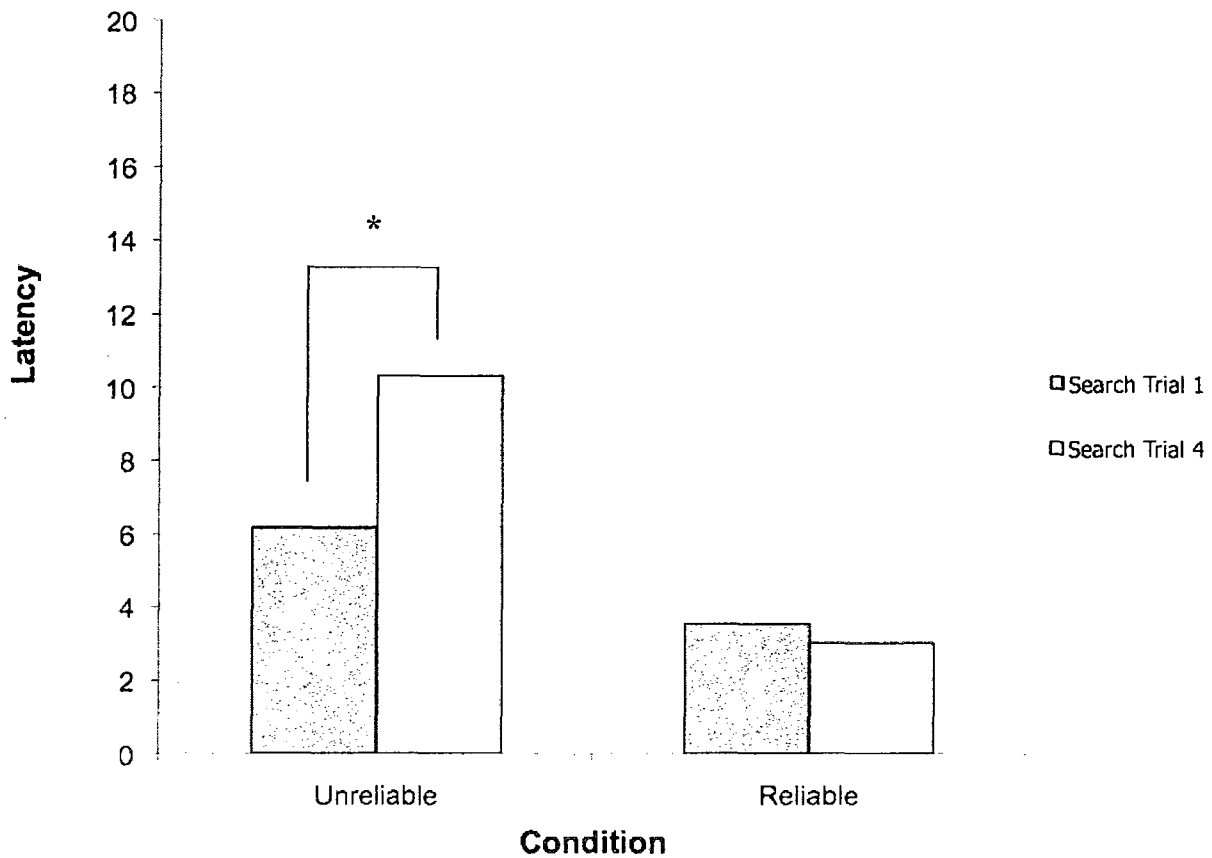


Figure 3. Search latency to examine contents of container in first and last training trials for reliable and unreliable looker conditions in Experiment 1.Lines marked with an asterix differ significantly, $p < .05$.

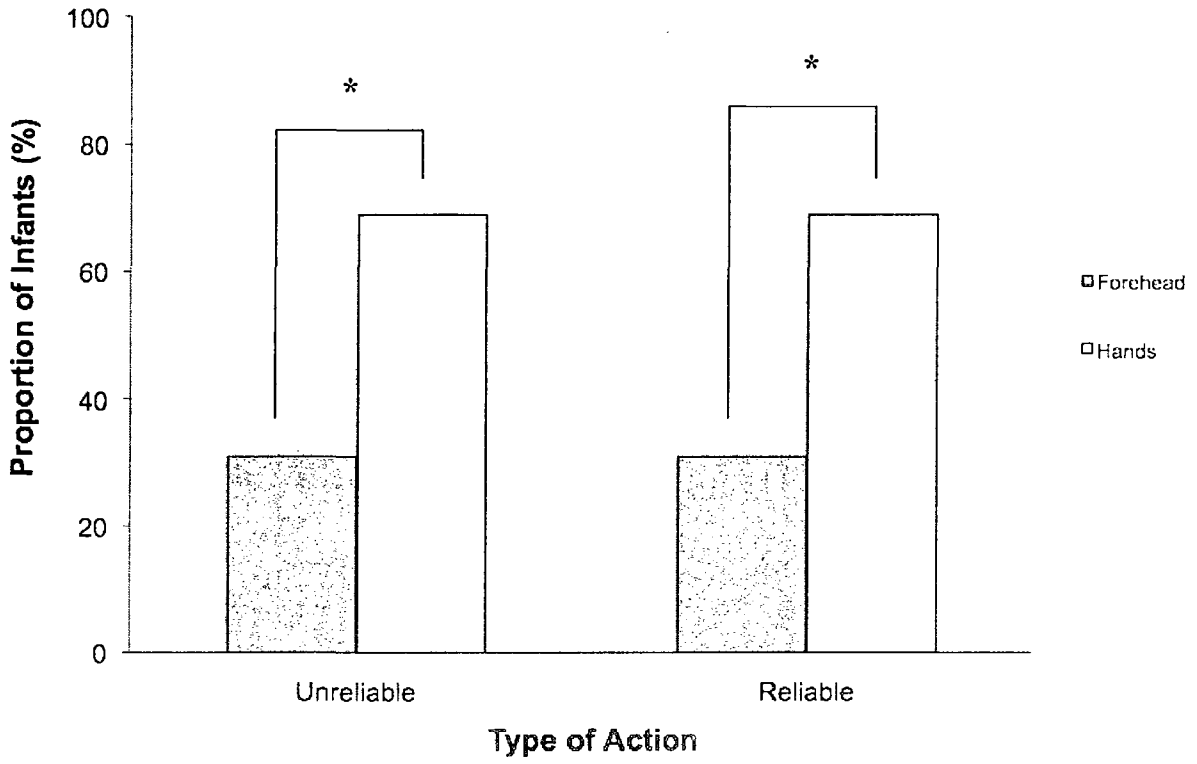


Figure 4. A comparison of the proportion of infants (reliable vs. unreliable) who used either their hands or forehead on their first attempt to act on the light, in Experiment 1. Lines marked with an asterix differ significantly, $p < .05$.

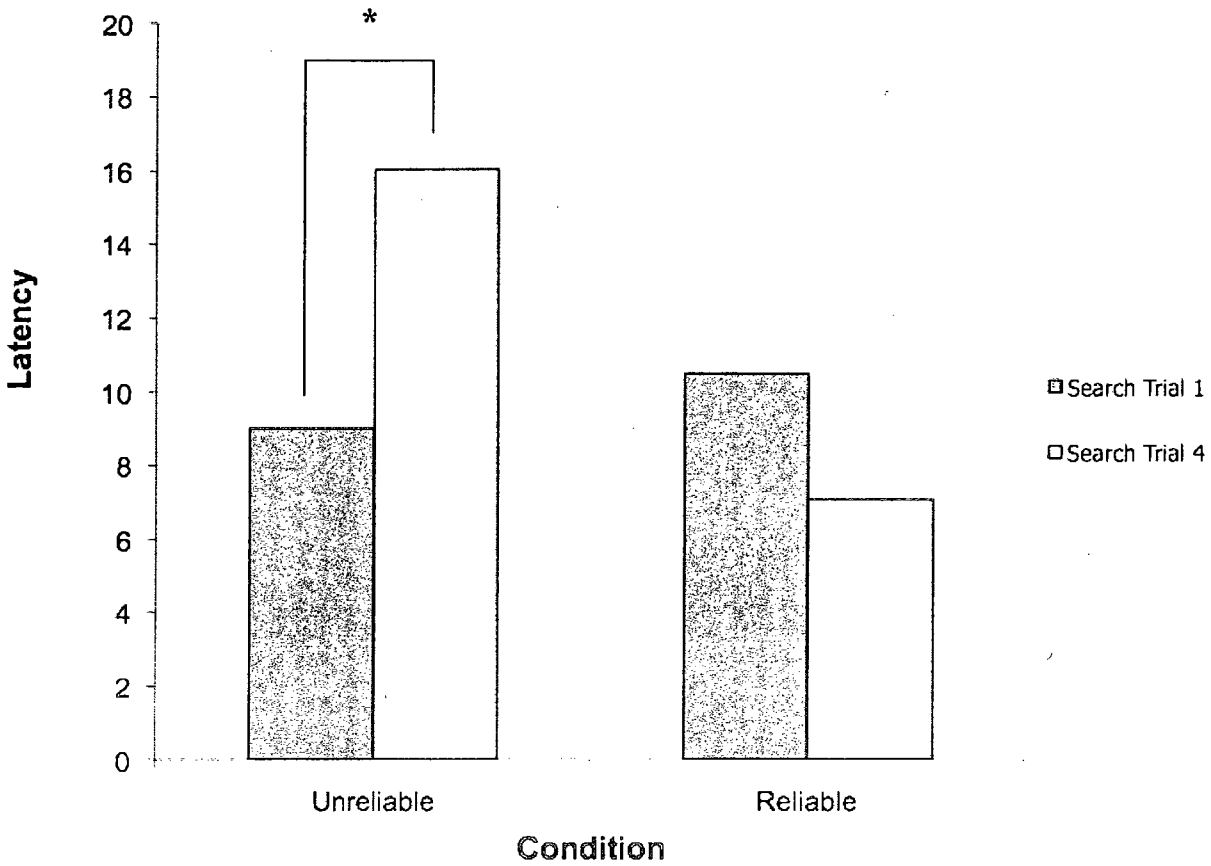


Figure 5. Search latency to examine contents of container in first and last training trials for reliable and unreliable looker conditions in Experiment 2. Lines marked with an asterix differ significantly, $p < .05$.

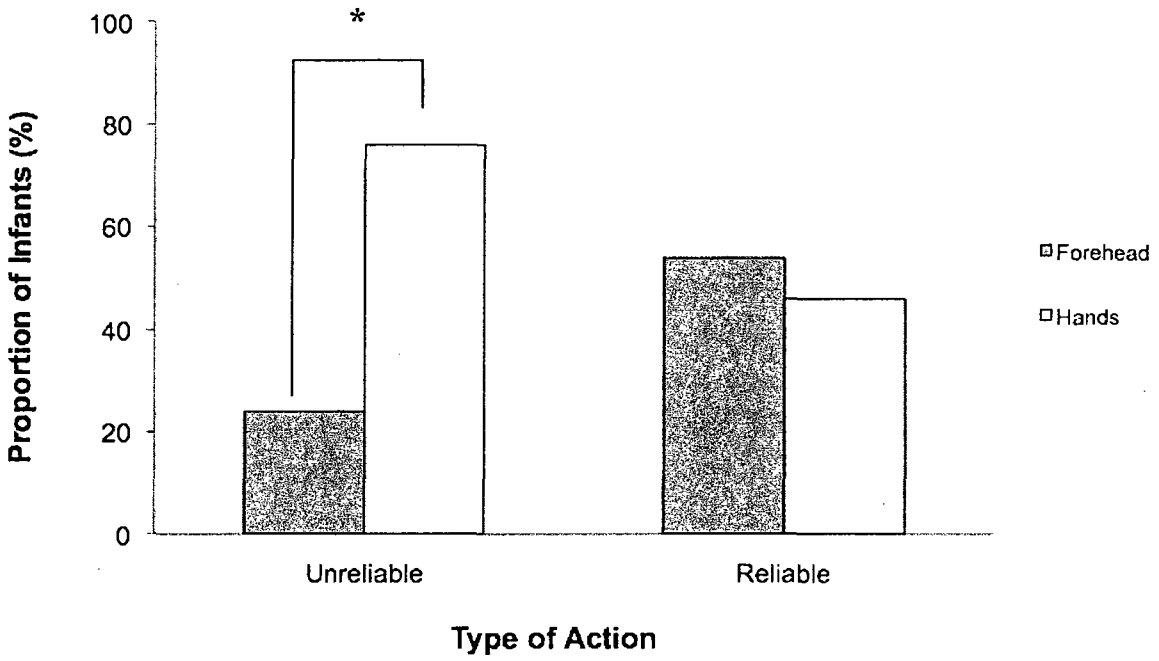


Figure 6. A comparison of the proportion of infants (reliable vs. unreliable) who used either their hands or forehead on their first attempt to act on the light, in Experiment 2. Lines marked with an asterix differ significantly, $p < .05$.

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Appendix A

January 2009

Dear Parents,

The Child Development Laboratory at Concordia University is involved in a study that examines the early development of trust in infancy. As well, we are interested in the way young infants form object categories. This research project is funded by the Social Sciences and Humanities Research Council of Canada. The Commission d'Accès à l'Information du Québec has kindly given us permission to consult birthlists provided by the Régie Régionale de la Santé et des Services Sociaux de la Région de Montréal-Centre. Your name appears on the birthlist of October 2007, which indicates that you have a child of an age appropriate for our study.

The present investigation involves three short and interactive games. In the first game, a female experimenter will show your child colorful containers which will either be empty or containing small toys. The experimenter will look inside each container and say, "Wow!" We will then observe whether your child chooses to explore the containers offered by the experimenter. In the second task, your child will watch as the same experimenter demonstrates how to activate a child night light, after which your child will have the opportunity to imitate her gesture. Of interest is whether their prior learning experience with the containers will influence their ability to imitate the experimenter's gesture. During the final game, the experimenter will give a tray of toys to your child and he/she will have a few minutes to play with them. We are interested in examining how infants will touch and play with the toys. During all tasks, your child will be sitting in a child seat and you will be seated directly behind. We will videotape your child's responses and all tapes will be treated in the strictest of confidentiality.

Overall, your participation will involve approximately one 45-minute visit to our laboratory at the **Loyola Campus of Concordia University, located at 7141 Sherbrooke Street West, in Notre-Dame-De-Grace**. Appointments can be scheduled at a time which is convenient for you and your child, including weekends. Free parking is available on the campus. Upon completion of the study, a Certificate of Merit for Contribution to Science will be given to your child, and **you will be offered a financial compensation of 20$ for participating.** A summary of the results of our study will be mailed to you once it is completed.

For the purposes of this study, we are looking for infants who are **14-16 months of age**, who hear English or French spoken in the home, and who do not have any visual or hearing difficulties. If you are interested in having your child participate in this study, or would like any further information, please contact Alexandra Polonia at (514) 848-2424 ext. 2279, or Dr. Diane Poulin-Dubois at (514) 848-2424 ext. 2219. We will try to contact you by telephone within a few days of receiving this letter.

We are looking forward to speaking with you in the near future.
Sincerely yours,

Diane Poulin-Dubois, Ph.D.
Professor
Department of Psychology

Ivy Brooker, B.A.
M.A. Student
Department of Psychology

Appendix B

Parental Consent Form

This is to state that I agree to allow my child to participate in a research project being conducted by Dr. Diane Poulin-Dubois, in collaboration with student Ivy Brooker of Concordia University.

A. PURPOSE

I have been informed that the purpose of the research is to examine the development of trust during infancy and the way young infants form object categories.

B. PROCEDURES

The present investigation involves three short and interactive games. In the first game, a female experimenter will show your child colorful containers which will either be empty or containing small toys. The experimenter will look inside each container and say, "Wow!" We will then observe whether your child chooses to explore the containers offered by the experimenter. In the second task, your child will watch as the same experimenter demonstrates how to activate a child night light, after which your child will have the opportunity to imitate her gesture. Of interest is whether their prior learning experience with the containers will influence their ability to imitate the experimenter's gesture. During the final game, the experimenter will give a tray of toys to your child and he/she will have a few minutes to play with them. We are interested in examining how infants will touch and play with the toys. The whole session should last approximately 45 minutes. During all tasks, your child will be sitting in a child seat and you will be seated directly behind. We will videotape your child's responses and all tapes will be treated in the strictest of confidentiality.

C. RISKS AND BENEFITS

Your child will be given a certificate of merit at the end of the session as a thank-you for his/her participation. Also, you will be offered 20$ for your participation.

There is one condition which may result in the researchers being required to break the confidentiality of your child's participation. There are no procedures in this investigation that inquire about child maltreatment directly. However, by the laws of Québec and Canada, if the researchers discover information that indicates the possibility of child maltreatment, or that your child is at risk for imminent harm, they are required to disclose this information to the appropriate agencies. If this concern emerges, the lead researcher, Dr. Diane Poulin-Dubois, will discuss the reasons for this concern with you and will advise you of what steps will have to be taken.

D. CONDITIONS OF PARTICIPATION

- I understand that I am free to withdraw my consent and discontinue my participation at any time without negative consequences, and that the experimenter will gladly answer any questions that might arise during the course of the research.
- I understand that my participation in this study is confidential (i.e. the researchers will know, but will not disclose my identity).
- I understand that the data from this study may be published, though no individual scores will be reported.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOUNTARILY AGREE TO HAVE MY CHILD PARTICIPATE IN THIS STUDY.

MY CHILD'S NAME (please print) _____

MY NAME (please print) _____

SIGNATURE _____ DATE _____

WITNESSED BY _____ DATE _____

I would be interested in participating in other studies with my child in the future (yes/ no): _____

If at any time you have questions about your rights as a research participant, you are free to contact Adela Reid, Research Ethics and Compliance Officer, Concordia University, at (514) 848-2424 ext 7481 or by email at areid@alcor.concordia.ca

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i_br@alcor.concordia.ca

Participant # _____ Researcher: _____

Participated in other studies during the same visit:

Name of study	Subject #	Tested by

Appendix C

Participant Information

Infant's first name: _____ Date of Birth: _____

_____

Infant's last name: _____ Gender: _____

Language(s) spoken at home: _____

Mother's first name: _____ Father's first name:

_____

Mother's maiden name: _____ Father's last name: ___

_____

Address: _____ Telephone #: _____

home

_____ _____

work mom

Postal Code: _____ _____

work dad

e-mail: _____

Mother's occupation:_____ Mother's education:

_____

(highest level attained)

Father's occupation: _____Father's education:

_____

(highest level attained)

Mother's marital status: _____Father's marital status: _____

_____

Please answer the following general information questions about your child:

Birth weight: _____ Length of pregnancy: _____weeks

Birth order: _____ (e.g., 1 = 1st child)

Number of children in family: _____

Were there any complications during the pregnancy?_____

_____

Has your child had any major medical problems?_____

_____

Does your child have any hearing or vision problems? _____

_____

Please answer the following general information questions about your family:

Does your family have a pet (or pets)? (yes/no) _____

If yes, please list your pet(s) indicating the kind of pet(s) (e.g., dog, cat, fish) and the number of pet(s):

_____

Participant#:_____ Researcher:_____

_____