Do Infants Generalize Other People's Emotional Dispositions Across Contexts?

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Abstract

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This study explored 15-month-old infants' ability to attribute emotional dispositions to others. Infants (N = 72) participated in three Emotional Eavesdropping trials in which they saw an Experimenter demonstrate an action on an object. Another adult (the Emoter) expressed Anger or Neutral affect toward the Experimenter, in response to her action, and then infants were given access to the object. Trials 2 and 3 followed the same procedure but with different object-action pairs. Infants then participated in three Social-Interaction tasks in which they had an opportunity to give toys to the (now neutral) Emoter. In the eavesdropping trials, infants in the Anger condition were loath to touch the objects and less likely to perform the actions relative to those in the Neutral condition. In the Social-Interaction tasks, infants in the Anger condition were likewise hesitant to touch the toys. The findings suggest that, during the eavesdropping trials, infants began to view the Emoter as "anger prone" and then generalized this disposition to a new social context. Thus, 15-month-old infants already possess some of the social-cognitive skills that provide the foundation for later trait attribution.

Introduction

Overview

Western cultures are rooted in beliefs of individualism and independence, which emphasize personal responsibility (Choi, Nisbett, & Norenzayan, 1999). Thus, we tend to give personal rather than external or situational explanations for other people's behavior. This tendency is often referred to as "trait attribution", a process whereby we attribute another person's behavior to internal and stable psychological characteristics (Liu, Gelman, & Wellman, 2007).

Although this process has been well studied in adults by social psychologists, less is known about the developmental trajectory for making trait attributions. Less than two decades ago, researchers assumed that children were not capable of making trait attributions until age six or seven (Yuill, 1997). Not until recently have studies demonstrated that preschoolers have some ability to make such inferences about others' behavior. Evidence in infants, however, is limited and more difficult to interpret. Thus, it remains unclear whether precursors to this trait attribution capacity develop during or sometime after infancy.

The current study explores the developmental roots of trait attribution, by examining whether 15-month-old infants are able to attribute emotional dispositions to others. We wanted to know if infants can detect the consistencies in another person's emotional behavior and then generalize that information from one context to another. For example, if infants see an adult repeatedly express anger toward another individual, do they view her as an "anger-prone" person? Specifically, would infants generalize the adult's anger to a new situation in which they themselves have an opportunity to interact with the adult? If infants are able to extend this emotional information across contexts, this would suggest that primitive trait-like attributions emerge during infancy.

Trait Attributions in Preschoolers

In recent years, several researchers have demonstrated that preschool-aged children are able to make trait attributions. For instance, Liu and colleagues (2007) investigated both behavior-to-trait inferences and trait-to-behavior predictions in children between the ages of four and seven. They found that even 4-year-olds were able to infer trait labels, such as selfish, nice, and mean, from one behavioral example, such as sharing versus not sharing lunch. In addition, 4-year-olds were able to make trait-consistent behavioral predictions when presented with trait labels, even across multiple time points. For example, children were told that a character was selfish and were then presented with a trait-relevant situation, such as an opportunity to share toys. Children as young as 4 were then able to predict the character's behavior in that situation (e.g., that he would not share the toys).

In another study, 3- and 4-year-olds were assigned to either an accuracy or physical strength condition and were asked to make both trait and behavioral inferences (Fusaro, Corriveau, & Harris, 2011). In the accuracy condition, for example, the children watched one puppet consistently demonstrate accuracy in labeling, whereas another puppet consistently gave the wrong label. The preschoolers were able to give each puppet an appropriate trait label (e.g., accurate versus inaccurate) as well as say that they preferred the accurate to the inaccurate puppet. Children assigned to the physical strength condition showed the same pattern of results, such that the preschoolers correctly labeled the strong and weak puppets, and preferred the strong to the weak puppet. This work provides evidence for at least a basic understanding of traits in relation to one's behavior in preschool-aged children.

In the current study, we were interested in infants' attributions about other people's negative emotions. Interestingly, recent research suggests that young children may show a negativity bias in their trait attributions such that negative behavior is more salient in their judgments and social selections (Boseovski, Chiu, & Marcovitch, 2013; Doebel & Koenig, 2013; Baltazar, Shutts, & Kinzler, 2012). For example, Boseovski et al. (2013) familiarized 3- and 5-year-old children with either a helpful-neutral pair of informants or a harmful-neutral pair. Children were then asked to indicate which character was nicer and were also given a choice as to whom they wanted to accept novel labels or rules from. Not only were children able to identify the nicer character in each condition, but they were also selective in whom they wanted to learn new information from. For example, they thought that the helpful person was nicer than the neutral and they were more likely to accept novel rules/labels from that person. Consistent with a negativity bias, children showed a larger discrepancy in their preferences for whom they wanted to learn new information from when given a choice between the harmful versus the neutral characters than when choosing between the helpful versus neutral characters.

Doebel and Koenig (2013) used a similar paradigm and the results of their study showed the same pattern of results. Preschool-aged children watched vignettes in which a character behaved in either helpful or harmful ways toward a peer. Children were then presented with either the helpful or harmful character, paired with a neutral character. They were then asked to discriminate between the pairs, by indicating which character was nicer. Children were more accurate at identifying the nicer character in the negative/neutral trial than the positive/neutral trial. Thus, as in the previous study, the preschoolers demonstrated a negativity bias in this social situation. Together, these findings provide further evidence of preschoolers' ability to make trait attributions, as well as suggesting that a negativity bias exists very early in childhood. These types of negative biases have likewise been found in adults when engaged in the processes of trait attribution and impression formation (Aloise, 1993; Kanouse, 1984).

Trait Attributions in Infancy

To date, only a few studies have explored infants' ability to make trait attributions about other people, and most have employed looking time as the dependent variable. For example, in a study by Woodward (1998), 6-month-old infants were familiarized with trials in which an adult reached out and grasped one of two objects. After the infants were habituated to this action, the toys' positions were reversed. Infants then saw two test events in which the adult either reached to the old toy/new location or new toy/old location. Infants looked longer at the test event in which the adult reached for the new object. Thus, at an early age, infants are able to use another person's reach and grasp gestures to infer their goal-directed action and attribute a preference for a particular object.

At a young age, infants are also able to make attributions about people's tendency to perform certain actions. In a study by Song, Baillargeon, and Fisher (2005), 13.5-month-old infants watched three familiarization trials in which an Experimenter slid an object back and forth. In the test trials, infants watched the Experimenter place a toy truck in either a short frame, in which the truck could not slide, or a long frame, which allowed the truck to slide back and forth. Infants who saw the adult grasp the truck in the short frame looked longer at the event than those who saw the adult in the 'long frame' event. These results suggest that infants were able to make attributions about the agent's disposition to perform a specific action.

Other studies have looked beyond attributions for preferences or actions, and have assessed infants' ability to make attributions about social characteristics. For example, Hamlin, Wynn, and Bloom (2007) assessed 6- and 10-month-old infants' social preferences and expectations by showing them familiarization trials in which a climber was either aided up a hill by a "helper" or pushed down the hill by a "hinderer". Each of these characters was an animated geometric figure: a square, circle and triangle. In the test trial, the climber approached either the "helper" or the "hinderer". Infants' looking times and character choice (indexed by their reaching behavior) were examined. Both age groups reached toward the "helper" significantly more often than the "hinderer". Interestingly, however, only the 10-month-olds looked longer when the climber approached the "hinderer" than the "helper". Therefore infants as young as 6 months of age show preferences based on social interactions between unknown characters, and by 10 months they are able to form basic expectations about these types of social interactions. This provides evidence for a basic ability in early infancy to make attributions about a person based on their prosocial behavior.

With a slightly older age group, Mascaro and Csibra (2012) examined whether infants make judgments about another type of social behavior - a person's social dominance. In their study, 9- and 12-month-old infants were familiarized with short animations depicting the actions of a dominant and a subordinate agent. The dominant agent collected objects while the subordinate agent remained still and let it succeed. Infants were then shown a test video that was either consistent (dominant prevailed in collecting objects) or inconsistent (subordinate prevailed in collecting objects) with the familiarization information. Although 12-month-olds showed looking patterns suggesting that they expected the dominant agent to succeed again in the test trial, the 9-month-old infants did not. This study suggests that, by the end of the first year of life, infants are able to make attributions about social dominance, and therefore basic social traits.

Further evidence that older infants are able to make attributions about complex social behavior comes from a study by Chow, Poulin-Dubois, and Lewis (2008). In the "reliable" condition, 14-month-old infants watched an experimenter express joy as she looked into a container that held a toy. The "unreliable" condition was the same except that there was no toy in the container, so her joy expression was misleading. After several familiarization trials of this kind, infants in the unreliable looker condition were less likely to follow the adult's gaze to an object hidden behind a barrier in the test trial. This suggests that infants who were familiarized with the unreliable looker did not expect her gaze to lead to an interesting outcome. In contrast, infants in the reliable looker condition followed the experimenter's gaze, expecting there to be a toy again because she was someone they could rely on for an interesting outcome. These results indicate that just after the first year, infants are able to make attributions about other people's reliability.

In all of these attribution studies with infants, there are alternative, more surface-level explanations that should be mentioned and explored. It may be that instead of making stable, internal (i.e., psychological) attributions about other people, infants are simply making generalizations about people's overt behavior within a given situation. For example, in the "helper" versus "hinderer" study by Hamlin, Wynn, and Bloom (2007), one interpretation could be that infants expect the experimenter's helping or hindering behavior to remain constant in that specific experimental context, but not beyond. Even if infants are only making behavioral generalizations, this is an important first step toward later, mature trait attribution. Furthermore, if infants make these generalizations across situations or over time, this would provide stronger support for the existence of some primitive capacity for making trait-like attributions.

Emotion attribution in Infancy

Given the variety of social attributions that infants appear to make before the age of two, it is possible that infants are also capable of making attributions about other people's emotional propensities. Preliminary evidence for this comes from Repacholi and colleagues' work on "emotional eavesdropping" (Repacholi & Meltzoff, 2007; Repacholi, Meltzoff, & Olsen, 2008). In the basic eavesdropping paradigm, an Experimenter demonstrates an action on an object two times. Then, an unfamiliar adult (the Emoter) enters the room and watches a third demonstration of the action. When the action is completed, the Emoter expresses either anger or neutral affect toward the Experimenter. Infants are then given an opportunity to interact with the object and the Emoter (now neutral) watches the infant. The next two trials follow an identical procedure, using the same emotion but different object-action pairs. Eighteen-month-olds who have previously been exposed to the angry Emoter take longer to touch the objects and are loath to imitate the actions on those objects relative to infants in the Neutral condition. These findings were recently replicated with 15-month-olds (Repacholi, Meltzoff, Rowe, & Spiewak Toub, in press). In these studies, infants were never the target of the Emoter's anger; instead, their object-directed actions were influenced by the emotional expression displayed in a third party interaction. Infants apparently assumed that the Emoter would get angry at them as well, if they played with the objects.

A more recent eavesdropping study included a fourth trial in which the Emoter did not express anger because she did not see the Experimenter performing a new action on a new object

(Repacholi, Meltzoff, & Hennings, under review). During the Experimenter's new action demonstration the Emoter was either out of the room or had her back turned. However, as in the three regular trials, the Emoter was physically present and watched the infant during the response period, when the infant had access to the object. In this fourth trial, 15-month-old infants continued to show a longer latency to touch the object and were less likely to perform the action relative to those in the Neutral condition. Most important, however, they were just as inhibited in their play with the object in this 4^{th} trial as those infants who had been exposed to anger in this trial. Thus, infants appeared to keep track of the Emoter's anger over the first three trials and generalized it to the 4^{th} trial. Despite the absence of anger in the 4th trial, infants still expected that the Emoter would express anger if they played with this new object.

One interpretation of these findings is that infants viewed the Emoter as an "anger-prone" person. After multiple trials in which the Emoter expressed anger, infants may have come to view her as someone who regularly expresses negativity, or in other words, is characteristically angry. Of course, this generalization occurred within the same situation (i.e., an emotional eavesdropping trial), and it remains to be determined whether infants would generalize the Emoter's affect to a new situation. If infants are able to make this type of generalization, then this would imply that they view the Emoter's anger to be stable across situations, which is a crucial component of mature trait attribution.

Generalizations Across Contexts in Infancy

Although infants' ability to generalize emotions to new situations is a new area of study, there is past research demonstrating infants' ability to generalize actions across physical locations (Barnat, Klein & Meltzoff, 1996; Klein & Meltzoff, 1999). For example, in Klein and

Meltzoff's deferred-imitation study (1999), 12-month-old infants were shown various demonstrations of actions on objects in either a normal testing room, a room with bright polka dotted wall covering, or their natural home setting. After various time delays, all infants were tested in the same standard testing room, where they were then given the objects for the first time. Compared to infants in the control condition, who did not see the action demonstrations, infants in all experimental conditions were significantly more likely to imitate the demonstrated action in the test phase, regardless of context change. This mirrored the findings of the original context change study in which the only change was the polka dot room to the testing room (Barnat et al., 1997). These results provide evidence for infants' ability to generalize information to new situations, including from home to a completely different location.

In contrast to the deferred imitation findings, there is evidence that infants have trouble generalizing goal states across new contexts. In a study by Sommerville and Crane (2009), 10-month-old infants participated in "prior information trials", in which they watched an actor reach for and pick up one of two toys. The toy that the actor picked was labeled the target/preferred toy. Then, in either the same room or a different room, infants participated in a habituation paradigm. The toys were in the same location as before, but now supported on either a blue or yellow cloth. Infants watched the same actor consistently grasp the cloth that held the target/preferred toy. Once the infants were habituated, the position of the toys was reversed so that the target toy and non-target toy were on opposite cloths. In the test trials, infants alternated between seeing the adult grasping a cloth in three new goal trials (old cloth/new toy) and three new means trials (new cloth/old toy). Infants who remained in the same room looked more to the new goal events. Apparently, this event violated their expectations about the actor's goal. Based on the prior information trials, they expected her to reach for the target toy even though it was now on a different cloth. In contrast, infants who had switched rooms looked more to the new means events. These infants appeared to discount the prior information that they had received about the actor's toy preference. Instead, they expected the actor to reach toward the same cloth as in the habituation trials. Thus, they looked longer when the actor grasped a new cloth (even though it supported the target toy). In other words, the room change disrupted infants' ability to recognize the actor's true goal of grasping the target toy rather than the cloth itself.

As a follow-up to their social dominance research, Mascaro and Csibra (2012) conducted a second experiment in which 12- and 15-month-old infants watched a new kind of familiarization trial in which two agents competed to stay in a small area. In this animated video, the dominant agent arrived in the space where the subordinate was already located, and repeatedly pushed the subordinate agent away. The test trials were the same as their original study, in which the two agents collected objects and either the dominant took the last object (consistent) or the subordinate took the last one (inconsistent). Thus, the familiarization and test trials involved different social situations or contexts. They found that 15-month olds, but not 12-month-olds, were able to apply their expectations from the familiarization trials, which occurred in one situation, to the test trial, which occurred in a different situation.

The current study

The research reviewed so far suggests that by 15 months of age, infants are able to make basic generalizations about people's emotions, when the situation remains the same (Repacholi et al., under review). Although 15-month olds can generalize information about a character's social dominance to a new situation (Mascaro and Csibra, 2012), it is unclear whether infants' emotion attributions also show this type of stability. Specifically, do infants expect a person's emotional disposition in one situation to remain the same in a new situation? This was the primary aim of the current study.

In order to explore this research question, we used the "emotional eavesdropping" paradigm (Repacholi & Meltzoff, 2007). This paradigm allowed us to use multiple behavioral measures to more precisely determine what infants might understand about other people's emotional expressions. In previous eavesdropping studies (Repacholi et al., under review), it was demonstrated that 15-month-old infants generalize the Emoter's affect to a new eavesdropping trial. Here, however, we are asking whether infants at the same age would generalize the Emoter's anger to a new social situation – one in which the infant is invited to interact with the now neutral Emoter by giving her toys. For example, would infants in the anger condition be less likely to give toys to the Emoter than those in the neutral condition, even though the Emoter is no longer expressing anger?

In recent years, evidence has accumulated to suggest that, by about 14-15 months of age, infants are capable of giving objects to unfamiliar adults in basic sharing and helping tasks, even when there is no apparent benefit to the infant (Schmidt & Sommerville, 2011; Warneken & Tomasello, 2007). This research has also indicated that there is not a great deal of consistency in infants' giving behaviors. For instance, an infant might give toys to an adult in a helping task but not in a sharing task or vice versa. Consequently, in the current study, we employed both types of tasks to examine infants' giving behavior with the Emoter.

It was expected that infants who had previously seen the Emoter express anger would be less likely to give toys to her compared to infants who had seen the Emoter express neutral affect. If infants view the Emoter as an anger-prone person, they may be wary of her and see her as an undesirable social partner, and thus not want to interact with her at all. It was also a possibility that infants in the Anger condition would be hesitant to touch the toys in these giving tasks, relative to infants in the Neutral condition. Infants may continue to be concerned that the Emoter will express anger toward them if they touch these new toys, as was the case in the eavesdropping trials.

Methods

Participants

The final sample consisted of 72 (36 male) 15-month-old infants (*M* = 15.08 months; *SD* = 5.01 days; range = 14.73-15.32 months). Participants were recruited from the University of Washington infant studies participant pool. The ethnic composition of the sample was 73.5% Caucasian, 1.5% American Indian or Alaska Native, 1.5% Asian, 1.5% African American, and 22% mixed race. The majority of families were middle-upper class, two-parent households, with both parents college-educated. Fifty-three percent of infants had no siblings, 35% had one sibling, and 13% had two or more siblings. All infants were full-term (37-43 weeks) with normal birth weight (2.5-4.5 kg) and had no known physical, sensory, or mental handicap. An additional 19 infants were excluded from the final sample because of procedural error (*n* = 8), fussiness/inattention (*n* = 9), or parental interference (*n* = 2).

Design

Infants were randomly assigned to one of two conditions (*n* = 36 in each): Anger or Neutral. Equal numbers of boys and girls were assigned to each condition. Infants participated in three Emotion Imitation trials, each involving a different test object. Objects were counterbalanced within and between conditions. All infants subsequently participated in the three Social-Interaction tasks: bugs, car, and rattle. These tasks were presented in a fixed-order to ensure that individual differences in children's performance could not be attributed to task order.

Materials

Emotional Eavesdropping test objects. Three test objects were used in the eavesdropping trials. These objects were replicas of those used by Repacholi et al. (under review) in their eavesdropping studies with 15-month-old infants. One object was a black box (16.5 cm x 15 cm x 5.5 cm) with a recessed rectangular button (3.0 cm x 2.2 cm) on the top surface and a wooden stick (10 cm x 1.7 cm x 1.0 cm). The box was supported by a base that tilted 30 degrees off the table, so that the recessed button was facing the infant. The wooden stick was presented along with the box. The target action was to use the stick to press the recessed button, creating a "buzzing" sound. The second object was a dumbbell, which consisted of two 2.5 cm wooden cubes, each with a 7.5 cm white plastic tube extending from it. One of the tubes was solid and smaller in diameter than the other hollow piece of tubing. The solid piece of tube fit inside the other hollow piece, snug enough so that some force was required to pull the two tubes apart. The target action was to pull the dumbbell apart by grasping each of the wooden cubes and pulling them outward. When the tubes were pulled apart the dumbbell made a "popping" noise. The third object was a plastic cup (10 cm tall and 9.5 cm wide) and a loop of plastic beads (21 cm long). The target action was to pick up the beads and drop them into the cup. A noise was heard when the beads hit the bottom of the cup.

Social-Interaction test objects. Three types of manufactured toys were used in the Social-Interaction tasks. The first were three plastic bugs from the "Lamaze Bug Stacker". These plastic bugs were magnetic so that they were able to stack on top of each other. Each of the three was a different color and type of bug. The second toy was a "B. Wheeee-Is" soft toy car. The car was blue with white and yellow flowers and a smiling face on the front. The four wheels rolled in both directions. The third toy was the rattle from the "Sassy Illumination Station". This rattle had a circular handle and a rotating wheel with various shapes and parts you could spin and shake. The small ball, attached to the rattle, lit up when rolled.

Emotional stimuli in the eavesdropping trials. In the Anger condition, the Emoter's facial expression was based on Ekman and Friesen's (1975) description of this emotion. Her eyebrows were lowered and drawn together, her eyes were narrowed and squinted, and her cheeks were elevated. When she was not speaking, her lips were pressed tightly together. Her vocalizations matched her angry expression in tone and content. She used relevant emotion words to help produce a consistent and convincing anger expression and vocalization. This strategy has been used in previous social referencing (e.g., Mumme, Fernald, & Herrera, 1996) and eavesdropping (e.g., Repacholi & Meltzoff, 2007) studies. The focus of the current study was infants' responses to emotional rather than linguistic information so we chose emotion words that 15-month-olds would not typically understand. These words do not appear on any language scales as words comprehended at this age. We expected that infants would respond solely to the Emoter's angry facial expression and tone of voice. Even so, we cannot completely rule out the possibility that individual infants understood some of the emotion words.

Different verbal scripts were used for each of the three eavesdropping trials, but they were designed to be similar in syllable length and structure. An example of an anger dialogue between the Emoter and Experimenter is as follows:

Emoter (in angry tone): “That’s aggravating! That’s so annoying!”

Experimenter (in neutral tone): “Oh, I thought it was really interesting.”

Emoter (in angry tone): “Well, that’s just your opinion! It’s aggravating!”

In the Neutral condition, the Emoter’s facial expression was pleasant with a “neutral face”. The Emoter’s mouth was relaxed, her forehead smooth, and she displayed minimal facial movement. Her vocalizations were “matter of fact” and relatively uniform in tone of voice while still indicating that she was interested in the Experimenter’s actions. The scripts for the Neutral condition were similar in syllable length and structure to the anger scripts. The words were likewise assumed to be beyond 15-month-old infants’ comprehension. Neutral words did not fit with the structure of the angry scripts, so slightly positive words were used instead. An example of a neutral script is as follows:

Emoter (in neutral tone): “That’s entertaining. That’s so enticing.”

Experimenter (in neutral tone): “Oh, I thought it might have been too distracting.”

Emoter (in neutral tone): “Well, you could be right. But it is entertaining.”

Temperament questionnaire. Infant temperament was assessed by parental report using the Early Childhood Behavior Questionnaire (ECBQ; Putnam, Garstein, & Rothbart, 2006). Out of the 18 subscales within the ECBQ, this study included only the eight that were most relevant to infant behavior in the eavesdropping trials and the Social-Interaction tasks. Parents filled out this shortened version of the ECBQ online prior to coming into the lab. One parent did not fill out the questionnaire and was therefore excluded from the temperament analysis. Parents rated 86 statements on a 7-point scale (1 = never to 7 = always). Items were grouped into eight subscales: fear, frustration, impulsivity, inhibitory control, positive anticipation, sadness, shyness, and sociability. Infants received a score for each subscale ranging from one to seven. Definitions for each subscale are as follows (Putnam, Garstein, & Rothbart, 2006, p. 399).

Fear: Negative affect, including unease, worry, or nervousness related to anticipated pain or distress and/or potentially threatening situations; startle to sudden events.

Frustration: Negative affect related to interruption of ongoing tasks or goal blocking.

Impulsivity: Speed of response initiation.

Inhibitory Control: The capacity to stop, moderate, or refrain from a behavior under instruction.

Positive Anticipation: Excitement about expected pleasurable activities.

Sadness: Tearfulness or lowered mood related to exposure to personal suffering, disappointment, object loss, loss of approval, or response to other's suffering.

Shyness: Slow or inhibited approach and/or discomfort in social situations involving novelty or uncertainty.

Sociability: Seeking and taking pleasure in interactions with others.

Equipment

Three digital video cameras were used to record the experiment. One video camera recorded the infant (head, torso, hands) and part of the table surface in front of the infant. This video record was used to code infants' instrumental behavior. A second video camera recorded a close-up view of the infants' faces for coding their facial expressions and looking behavior. The third camera recorded a wide-angle view of the Experimenter and the Emoter. This camera was used to examine whether the Emoter's expressions were recognizable to naïve coders and to ensure that the Emoter remained neutral during the response period for the eavesdropping trials along with the Social-Interaction tasks.

Procedure

The experiment took place in a laboratory room and all infants sat in their parent's lap, across the table from a female Experimenter. Infants remained seated in this position throughout the testing session. Parents were instructed to (a) remain silent and neutral; (b) avert their gaze if their infant looked toward them; and (c) avoid any kind of interaction with their infant (e.g., touching their back to comfort). Participants were dropped from the sample if the parent failed to follow these instructions. Only two infants were dropped for this reason.

Throughout the testing procedure, the Experimenter maintained a pleasant demeanor. The session began with a short warm-up to familiarize infants with the Experimenter and set-up of the laboratory room. In the warm-up, the Experimenter presented the infants with three different toys: a little man, dinosaur, and a box with a block inside. For each of these objects, the experimenter placed it in front of the infant on the table, simultaneously saying, "Here's a _____". She encouraged the infant to pick it up or look at it and made comments about various features (e.g., ”The little man is wearing a hat on his head”). Infants were allowed to play with the toy for several seconds before the Experimenter requested it back and then placed the next toy on the table.

Emotional eavesdropping trials. In each of the eavesdropping trials, the Experimenter initially demonstrated the target action twice on the test object. After each demonstration, the test object was placed under the table and out of the infant's view in preparation for the next demonstration. The Experimenter did not express any specific emotion before, during, or after performing the target action on the object. Instead, she maintained a neutral, pleasant expression throughout the demonstration.

Immediately after the second demonstration, an unfamiliar adult female (the Emoter) entered the room. As she walked in, she said "Hi Theresa. I'm going to sit here and read a magazine." The Experimenter introduced the Emoter to the infant in a neutral voice by saying, "That's Kelly. Kelly is going to sit and read a magazine." The Emoter sat in a chair to the left of the Experimenter, at the corner of the table, and held up a magazine, pretending to read it. The Experimenter then elicited the Experimenter's attention, saying "Kelly, look at this" and demonstrated the target action a third and final time. Immediately upon the completion of the third demonstration, the Emoter expressed either anger or neutral affect toward the Experimenter. The Experimenter consistently replied with neutral affect and then the Emoter expressed further anger or neutral affect. In both conditions, the Emoter became silent and adopted a neutral facial expression at the end of her interaction with the Experimenter. She then quickly stood up and sat back down, as if adjusting her seating posture, in order to get the infant's attention. Once she was re-seated, the silent Emoter looked toward the infant with a neutral facial expression. She did not make direct eye contact with the infant, because pilot work had indicated that this sometimes upset infants. Instead, the Emoter directed her gaze toward the table surface in front of the infant, which gave the impression that she was looking at what the infant was doing with the object with pleasant interest.

Once the Emoter's gaze was directed toward the infant, the Experimenter placed the test object on the table, directly in front of the infant and said "Here" in a neutral tone of voice. The infant had 20 s in which to play with the object. This 20-s response period was timed from when the object was placed on the table. During the response period, the Experimenter looked down at her watch and maintained a neutral expression. The Emoter continued to look toward the infant with a neutral expression. At the end of the response period, the Experimenter asked the infant "Can I have that?" and retrieved the object. She placed the object on the table in front of her. The Emoter then said "I'm going to go now, Theresa". In response, the Experimenter said "Kelly's going bye-bye" and made a waving gesture with her hand as she watched the Emoter leave. As the door shut behind the Emoter, the Experimenter said to the infant, "Kelly went bye-bye" and made a waving gesture once more. The procedure for the second and third eavesdropping trials were identical except that the Experimenter did not re-introduce the Emoter as she entered and the Emoter did not announce her departure. In addition, each trial had a different object-action pairing and the verbal scripts were different (see Appendix A).

After the Emoter left the room at the end of the third eavesdropping trial, the Experimenter showed infants an hourglass rattle. For 10 s, the Experimenter held the rattle and turned it around, as she talked about its features. She maintained a neutral expression and pleasant tone of voice. After 10 s had elapsed, the Experimenter put the rattle away and the Emoter re-entered the room. The Experimenter watched the Emoter enter and said, "Here's

Kelly. Kelly's going to sit at the table." The Emoter sat in her usual position, to the left of the Experimenter.

Helping (bug) task. This task was modified from Warneken and Tomasello's out-of-reach helping tasks (2007). In one version of this task, an Experimenter "accidentally" drops clothespins on the floor. He then reaches down toward the ground with his hand, indicating that he wants the infant to help by giving them back to him. Although this is an ecologically valid task, the set up of our testing room required the use of a table-top helping task. Thus, we used a modified version of Warneken and Tomasello's out-of-reach ball task. In another out-of-reaching helping task, the Experimenter collects paper balls and places them in a container. However, the adult cannot reach three balls that are on the infant's side of the table. The Experimenter reaches toward the balls with tongs and indicates that he wants the infant to help them retrieve the paper balls. We chose not to use the paper balls task, because of concerns about a) the balls rolling off or being thrown off the table and b) infants simply handing over the paper balls because they were perceived to be boring/unattractive objects. We therefore devised an out-of-reach bug task which incorporated elements of the clothespin and the paper ball tasks.

Once the Emoter was seated, the Experimenter brought out three magnetic toy bugs, called the Emoter's attention ("Kelly"), and placed the bugs in a row in front of the Emoter. The Emoter watched this action with a neutral expression and then stacked each bug on top of the other, counting out loud (one to three), as she stacked the bugs. The Experimenter watched the Emoter with a neutral, interested expression. At the end of the stacking, the Experimenter placed a clear plastic barrier between the stack of bugs and the infant. The barrier was out of the infant's reach. She then placed a fourth bug in front of the barrier (i.e., on the infant's side) and said "Kelly" again. The bug was within the infant's reach, but out of reach of the Emoter. The

Emoter immediately reached her hand around the barrier and made a pinching gesture indicating that she could not reach the bug. With a neutral expression and tone of voice, she said "Oh, my bug. I can't get it," as she made further pinching gestures. The Emoter alternated her gaze between the bug and the infant. She left her hand out until the infant gave her the bug or until 7 s had elapsed. The time limit of 7 s was set for each bug trial based on pilot data suggesting that this was the average amount of time that infants remained interested in the task. If the infant did not give the Emoter the bug within the 7-s time frame, the Experimenter retrieved the bug and stacked it on the Emoter's side of the barrier. This procedure was repeated for the two other bugs.

Reciprocate (car) task. The goal of this task was to see if the infant would roll a toy car back to the Emoter after the Emoter had rolled the car toward the infant. In this task, there was an initial opportunity for the infant to spontaneously roll the car back before any direct requests were made to do so by the Emoter. Infants subsequently received an indirect request for the car and then a more direct verbal request.

To begin this task, the Experimenter cleared away the materials from the bug task and looked toward the Emoter with a neutral but interested expression. The Emoter presented a toy car and said "I have a car". She then said, "I'm going to roll the car to you" and simultaneously rolled the car to the infant. The infant had 10 s to play with the car. If the infant did not spontaneously roll it back to the Emoter during that time, the Emoter then cupped her hands on the table and said (with a neutral expression and tone of voice) "Now it's your turn". If the infant did not give the Emoter the car within 2 s, the Emoter then said, "Can you push the car to me?" If the infant did not roll the car back within another 5 s, the Emoter removed her hands and the Experimenter retrieved it. The trial ended whenever the infant rolled the car to the

Emoter or the Experimenter. If infants did not ever roll the car to an adult, then the trial was terminated after 17 s had elapsed. Again, this time limit was selected based on pilot testing.

Giving (rattle) task. This task involved a number of direct requests for the infant to give an object to the Emoter. Unlike the reciprocate car task, it was the Experimenter who gave the object to the infant. This task also required more "approach", in that the infant had to put the object in the Emoter's hand, as opposed to rolling it to the Emoter from across the table.

In this last Social-Interaction task, the Experimenter placed a rattle on the table in front of the infant, saying "Here." The infant had 10 s in which to play with the toy. After the 10 s had elapsed, the Emoter put her hand out, palm side up on the table and said "Can I have it?" and after another 3 s, "Can I have it please?" She alternated her gaze between the rattle and the infant while maintaining a neutral expression (facial and vocal). She left her hand out for 5 s and then removed it. She then immediately put her hand back out and repeated her request. She left her hand out for a total of 8 s and then removed it. Thus, the response period for this trial was 26 seconds and this time was selected based on extensive pilot testing. If at any point the infant gave the rattle to the Emoter or the Experimenter, the trial ended and no more requests were made. If the infant did not give the rattle within the time limit, the Experimenter retrieved it. At the end of this task, the Experimenter announced that the Emoter was leaving ("Kelly's going bye-bye") as she made a waving gesture and watched her leave. After the Emoter left the room, the Experimenter said to the infant, "Kelly went bye-bye" and made a waving gesture again. She then announced the end of the testing session and gave the infant one of the toys to play with.

Scoring

Manipulation check (not yet completed). In order to check that the Emoter's affect followed the procedural requirements of the study, her facial expression during both the emotional expression periods and the response periods in the eavesdropping trials will be coded. Blind coders will use a 5-point scale (-2: very negative to +2: very positive) to assign an overall rating for the hedonic tone of the Emoter's facial expression. These facial ratings will be performed without sound. The coders will also indicate which discrete facial emotion was predominant: happiness, interest, neutral, surprise, sadness, anger, disgust, or fear. Two other naïve coders will rate (from -2 to +2) the Emoter's vocalizations for their hedonic tone during the emotional expression period. For this coding, the audio files will be low-pass filtered at 475 Hz, rendering them verbally unintelligible but maintaining their hedonic tone. The Emoter's affect will also be checked during each of the three social interaction tasks by another pair of blind coders. Because the Emoter's vocalizations did not involve any emotion words in these tasks, the Emoter's affect will be coded based on the combination of facial and vocal cues. The hedonic tone of Emoter's overall affect will be coded using the same 5-point scale and predominant emotion will also be identified.

Infant behavior in the Emotional Eavesdropping trials. Infant's object-directed behavior (see Table 1) was coded from videos that were edited to only include the three 20-s response periods, thereby ensuring that coders were naïve to infants' experimental condition. Touching behavior was coded using a dichotomous (yes/no) measure for each trial and a total touch score (0-3) was calculated for each infant. An infant was coded as touching an object if one or more fingers were placed on the object at any point during the response period. Imitation of the modeled target action was also coded dichotomously (yes/no) using Meltzoff's (1988) scoring criteria. The buzzer was scored as a yes if the infant used the stick to push the button and the buzzing sound was heard. A yes was scored for the dumbbell if the infant completely pulled it apart. The beads were scored as a yes if the string of beads was lowered halfway or more into the cup. If infants did not touch the object, they were excluded from the imitation coding for that trial.

To further assess the effects of the Emoter's emotional display on infant's object-directed behavior, latency to first touch of the object and duration of object contact were examined. Latency to touch was timed from the moment the object was placed in front of the infant to the time of first touch. If the infant did not touch the object, the latency was coded as 20 s. The duration of object contact was timed from the first touch of the object and included any moment in which the infant was touching the object during the remainder of the response period. Infants who did not touch the object were excluded from the duration coding for that trial.

Infant affect in the Emotional Eavesdropping trials. Infant's affect (indexed by facial expression) was coded during each of the expression and response periods. The expression period began when the Emoter started to express either anger or neutral affect toward the Experimenter, and ended just before the Experimenter gave the infant the object. The response period included the 20 seconds in which the infant had the object. Naïve coders examined emotional expressions from the close-up recording of the infants' faces without sound, to ensure that they were unaware of the experimental condition. The facial expressions were rated on a 3-point scale for both positive and negative hedonic tone (from Hirshberg & Svejda, 1990). For the positive scale, a score of 2 represented a broad smile or laughter; a score of 1 indicated a slight smile, and a score of 0 was given in the absence of any positive affect. For the negative scale, a score of 2 indicated a cry-face/crying, big frowns, grimaces, or scowls; a score of 1 represented mild frowning/furrowing of the brows or slight warinesss/worried expression; a score of 0 was given when there were no signs of any negative affect. The highest score was taken for each infant for both the expression and response period.

Helping (bugs) task. The primary dependent variables were whether or not infants touched the bugs, latency to touch, whether they gave the bugs to the Emoter, and latency to give (see Table 2). Touch was coded as a dichotomous (yes/no) measure for each bug trial based on whether or not the infant touched the bug at any point during the 7-s window. A total touching score (0-3) was calculated for each infant. Latency to touch the bug was timed from the moment the Experimenter's fingers were no longer in contact with the bug after she placed it on the table. If an infant did not touch the bug, the latency for that trial was coded as 7 s. For each of the three trials, infants who touched the bug were given a score of 1 for helping if they placed the bug in the Emoter's hand, held the bug out towards the Emoter, or pushed the bug in the direction of the Emoter. If infants did not try to give the bug to the Emoter, they received a helping score of 0 for that trial. Among infants who gave the bugs, latency to give was coded from the time of the first touch to the time of give for each trial. Specifically, this was the time from which the infant first made contact with the toy to the moment at which the infant clearly began to move their hand toward the Emoter in order to give the bug to her.

Secondary variables were also included to further examine infants' interaction with the bugs (Table 2). Each infant was given a score that reflected the maximum type of touch in each trial: 1 for partial hand, 2 for whole hand, and 3 for two hands. Based on Hertenstein and Campos' (2004) "percentage of whole-hand contact" variable (p. 602), type of touch was included to assess the quality and confidence of infants' touch. As a further indication of infants' confidence in their interaction with the bugs, playing was coded dichotomously (yes/no) for each trial in which the infant touched the bug. A yes was scored for playing if the infant turned or twisted the bug with their hands, slid it around on the table, or shook it up and down.

Reciprocate (car) task. Touching, latency to touch, sharing of the car, and latency to share were coded as the primary dependent variables (see Table 2). Infants were given a dichotomous (yes/no) score for touching the car. They were given a yes if they touched the car at any point during the 17-s time period. Latency to touch the car was timed from the moment the Emoter's fingers were no longer in contact with the car after she rolled it toward the infant. Infants who did not touch the car received a latency score of 17 s. Infants who touched the car were given a dichotomous (yes/no) score for whether or not they gave the car to the Emoter. A yes was scored for giving if the infant rolled the car to the Emoter, handed the car to the Emoter, or held the car out toward the Emoter. For the infants who gave the car, latency to give was coded from the time of the first touch to the time the infant began to give the car to the Emoter.

As in the bug task, secondary variables included type of touch and play (Table 2). These variables were only coded for infants who touched the car. Maximum type of hand contact was coded using the same criteria as that described for the bug task. Infants were given a dichotomous (yes/no) score for play. An infant was coded as playing if they rolled the back and forth in front of them, turned or twisted it with their hands, or shook it up and down.

Giving (rattle) task. As in the previous Social-Interaction tasks, touching, latency to touch, giving the object, and latency to give were the primary dependent variables (see Table 2). A dichotomous (yes/no) score was used to code whether infants touched the rattle. Infants were given a yes if they touched the rattle at any point during the 26-s window. Latency to touch the rattle was timed from the moment the Experimenter's fingers were no longer in contact with the rattle after she placed it on the table in front of the infant. Infants who did not touch the rattle were given a latency score of 26 s. Among the infants who touched the rattle, dichotomous (yes/no) scores were also used to code whether or not infants gave the rattle to the Emoter. Giving was coded as yes if the infant placed the rattle in the Emoter's hands, held the rattle out toward the Emoter, or pushed it toward the Emoter on the table. Among infants who gave the rattle to the Emoter, latency to give was coded from the time of the first touch to the time the infant began to give.

The same secondary dependent variables were coded for this task as in the previous Social-Interaction tasks (Table 2). These variables were only coded for infants who touched the rattle. Infants received a score reflecting the maximum type of hand contact, using the same criteria as that employed in the other two tasks. These infants were also given a dichotomous (yes/no) play score. An infant was given a yes for playing if they turned or twisted the rattle in their hands, slid it around on the table, or shook the rattle up and down.

Reliability

For each of the dependent variables, second coders rated 33% of the data. Excellent inter-rater reliabilities were obtained in the eavesdropping trials: object touch $K = .88$; latency to touch $r = 1.00$; duration of touch $r = .99$; object imitation $K = 1.00$; positive affect/emotional interchange $r = .92$; positive affect/response period $r = .94$; negative affect/emotional interchange $r = .83$; negative affect/response period $r = .93$. In the Social-Interaction tasks, reliabilities were likewise very high: object touch $K = .97\text{-}1.00$; type of touch $r = .85\text{-}.97$; latency to touch $K = .99\text{-}1.00$; object play $K = .80\text{-}1.00$; object give all Ks = 1.00; and latency to give $r = .97\text{-}1.00$

Table 1

Dependent Variables Coded in the Emotional Eavesdropping Trials

Dependent Variable	*Definition*
Touch	Whether or not infant touched the object within 20 s
Latency to Touch	Time of first touch, from start of trial
Duration of touch	Total time infant spent touching object
Target action	Whether or not infant imitated the target action within 20 s
Emotional expression	Rating for positive, neutral, or negative emotional affect

Table 2

Dependent Variables Coded in the Social-Interaction Tasks

Dependent Variable	*Definition*
Touch	Whether or not infant touched toy within time frame
Latency to touch	Time of first touch, from start of trial
Type of hand contact	Whether infant used partial, one, or two hands to touch toy
Play	Whether infant actively manipulated toy
Giving	Whether infant gave or attempted to give Emoter toy
Latency to give	Time of giving toy to Emoter, from time of first touch

Results

Manipulation Check

These will be reported as soon as they are coded and the reliabilities are complete.

Emotional Eavesdropping Trials

Object touch. Cochran's Q tests were conducted separately for each condition to determine whether there were trial effects for infant object touching. There were no significant trial effects. In addition, a preliminary analysis of variance (ANOVA) did not reveal any significant gender effects. Infants' total touch scores (0-1) were analyzed with a one-way ANOVA, revealing a significant condition effect, $F(1, 70) = 12.76$, $p = .001$, $\eta^2_p = .15$. Infants in the Anger condition were less likely to touch the objects ($M = 2.36$, $SD = 1.07$) than were infants in the Neutral condition ($M = 3.00$, $SD = .00$). Nonparametric analysis with a Mann-Whitney test replicated this significant condition effect, $U = 450.00$, $p < .001$.

Latency to touch the object. Preliminary analyses indicated that there were no significant trial or gender effects for latency to touch the object. Because there was a significant difference between the two groups in their total touch scores, latency to touch was analyzed only for those trials in which infants touched the object. Four infants (all in the Anger condition) were completely excluded from the analysis because they failed to touch the object on any of the trials. The results of this ANOVA indicated a significant condition effect, $F(1, 66) = 11.19$, $p = .001$, $\eta^2_p = .15$. Infants in the Anger condition took longer to touch the objects ($M = 2.15$, $SD = 2.51$) than did infants in the Neutral condition ($M = .72$, $SD = .57$).

Duration of object contact. Duration of object contact was not independent from the latency to touch measure because the response period was timed from the moment the object was presented to infants. Moreover, there was a significant group difference in latency to touch the objects. Consequently, a proportion score was used to analyze duration of object contact, rather than the raw score. This proportion score took into account the amount of time remaining in the response period, once infants had touched the object. Duration of touch proportion scores were calculated for each trial. Preliminary analyses indicated that the amount of time infants spent in contact with the object did not differ significantly by trial or gender. Thus, a mean proportion score was calculated for each infant, based only on the trials in which they touched the object.

These mean proportion scores were analyzed using a one-way ANOVA, and the condition effect was significant, $F(1, 66)= 6.71$, $p = .01$, $\eta^2_p = .09$. Infants in the Anger condition spent less time touching the object ($M = .83$, $SD = .22$) than did infants in the Neutral condition ($M = .93$, $SD = .07$).

Imitation of the target acts. Given that there was a significant difference between the conditions in whether or not infants touched the objects, an imitation proportion score was calculated for each infant. This proportion score only included the trials in which the infant touched the object. For example, if an infant touched two of the three objects within the 20 s response period, and imitated the target action on only one object, that infant's imitation proportion score would by .50. Preliminary analyses revealed no significant trial or gender effects for imitating the target action. Infants' proportion imitation scores were then analyzed using a one-way ANOVA. About 89% of all the trials were included in the analysis. There was a significant condition effect, $F(1, 66) = 9.41$, $p = .003$, $\eta^2_p = .13$, such that infants in the Anger condition were less likely to imitate the target action ($M = .48$, $SD = .40$) than were infants in the Neutral condition ($M = .73$, $SD = .26$).

A subsidiary analysis was also conducted to take into account condition differences in latency to touch the object. This analysis only included the trials in which infants touched the object within the first 5 s and thus had 15 s in which to imitate after the first touch of the object. Therefore trials in which an infant did not touch the object within the first 5 s were dropped. This subsidiary analysis included 85% of the total trials. A proportion score was calculated for each infant based on the number of trials in which they imitated the target action. If, for example, an infant only touched two of the objects within the first 5 s, and imitated with one of the two objects, the proportion score would be .50. A total of eight infants were excluded because their latency to touch was longer than 5 seconds in all three trials. Results of this ANOVA were consistent with the previous analysis. Thus, there was a significant condition effect, $F(1, 62) = 4.14$, $p < .05$, $\eta^2_p = .06$, and no gender effects.

Infant facial expressions. Preliminary analyses indicated that there were no significant trial effects for infant positive and negative affect. Infant mean positive and negative affect in the expression period were then separately analyzed using 2 (condition) × 2 (gender) ANOVAs. These analyses revealed no significant effects (see Table 3). The same analyses were undertaken for infant mean positive and negative affect in the response period. Once again, there were no significant effects (see Table 3).

Table 3

Infant Facial Expression During Eavesdropping Trials as a Function of Condition

	Experimental Condition			
	Anger (n = 36)		Neutral (n = 36)	
Variable	*M*	*SD*	*M*	*SD*
Positive affect in expression period	.28	.43	.46	.54
Negative affect in expression period	.28	.33	.27	.40
Positive affect in response period	1.01	.59	1.10	.66
Negative affect in response period	.17	.31	.28	.32

Note. Affect ratings based on a scale from 0-2

Helping (Bug) Task

Touch. Cochran's Q tests were conducted separately for each condition to determine whether there were trial effects for touching the bug (see Table 4). A Mann Whitney test was also used to examine gender effects on bug touching. These preliminary analyses indicated that there were no trial or gender effects. Infants' bug touching score (0-3) was then analyzed using a one-way ANOVA. Infants in the Anger condition (*M* = 1.75, *SD* = 1.36) were less likely to touch the bugs than infants in the Neutral condition (*M* = 2.39, *SD* = 1.08), $F(1, 70) = 4.88$, $p = .03$, $\eta^2_p = .07$. A Mann-Whitney U likewise indicated a significant condition effect, $U = 472.00$, $p = .02$.

Table 4
Bug Task: Infant Touching as a Function of Trial and Experimental Condition

	Experimental Condition					
	Anger (*n* = 36)			Neutral (*n* = 36)		
Variable	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
Proportion touching bug	.53	.58	.64	.75	.86	.78

Latency to touch. Preliminary analyses, based on all infants, indicated no significant gender effects on latency to touch. However, there was a significant trial effect, $F(2, 70) = 8.95$, $p < .001$, $\eta^2_p = .11$. Infants were slower to touch the bugs in the first trial (*M* = 3.76 s, *SD* = 2.63) than the second trial (*M* = 2.97 s, *SD* = 2.74), and fastest in the third trial (*M* = 2.94 s, *SD* = 2.83).

Given that the two conditions had significant differences in their total touch scores, latency to touch was analyzed only for the trials in which infants touched the bug. Sixteen infants (12 in Anger, 4 in Neutral) were excluded because they failed to touch a bug in any of the three trials. Among the 69% of trials included in this analysis, a new mean latency to touch score was calculated for each infant. There were no significant condition or gender effects in this analysis (see Table 5).

Type of hand contact. Among infants who touched the bugs, further analyses were run to analyze infants' type of hand contact. Preliminary analyses revealed no gender effects. Thus, a 2 (condition) × 3 (trial) repeated measures ANOVA was conducted, including only those infants who touched in all three trials. Forty-three infants (17 in anger; 26 in neutral) touched all three bugs and were therefore included in this analysis. There was a significant trial effect, $F(2, 82) = 6.04$, $p = .004$, $\eta^2_p = .13$. Infants had more hand contact with the bug in the first trial ($M = 2.72$, $SD = .50$) than in the second trial ($M = 2.60$, $SD = .54$) and more in the second trial than the third ($M = 2.49$, $SD = .59$). This ANOVA also yielded a significant condition effect, $F(1, 41) = 11.59$, $p = .001$, $\eta^2_p = .22$. Infants in the Anger condition had less hand contact with the bugs ($M = 2.33$, $SD = .41$) than infants in the Neutral condition ($M = 2.78$, $SD = .42$).

Because the previous ANOVA only included the infants who touched all three bugs, a subsidiary analysis was conducted to include a larger number of subjects. Using a series of one-way ANOVAs, hand type scores were analyzed for each trial, thereby only excluding infants who did not touch the bug on a particular trial. In the first trial, infants in the Anger condition had a significantly lower hand type score ($M = 2.53$, $SD = .51$) than infants in the Neutral condition ($M = 2.85$, $SD = .46$), $F(1, 44) = 5.13$, $p = .03$, $\eta^2_p = .10$. There was no significant condition effect in the second trial. In the third trial, infants in the Anger condition once again had significantly less hand contact ($M = 2.17$, $SD = .65$) than infants in the Neutral condition ($M = 2.68$, $SD = .48$), $F(1, 49) = 10.23$, $p = .002$, $\eta^2_p = .17$. Individual Mann-Whitney tests for each trial mirrored the condition effects for the first and third trial, $U = 168.00$, $p = .01$; $U = 188.00$, $p = .004$.

Play. Each infant was given an average play score based on the trials in which they touched the bug. Preliminary analyses using Cochran's Q indicated that there were no trial effects for playing with the bug. Individual Mann-Whitney tests as well as a 2 (condition) × 2 (gender) ANOVA indicated no significant condition or gender effects (see Table 5).

Helping. Only trials in which the infants touched the bug were included in the analysis of giving the bug to the Emoter. A Cochran Q test indicated no significant trial effects for giving to the Emoter.[1] A helping proportion score was calculated for each infant based on the trials in which they touched the bug. For example, if an infant touched in two trials and gave the Emoter the bug in one trial, they would have a helping proportion score of .50. This helping score was used to analyze condition and gender effects. Separate Mann-Whitney tests and a 2 (condition) × 2 (gender) ANOVA revealed no significant effects of condition or gender (see Table 5).

Latency to help. Individual one-way ANOVAS were run for each trial to analyze group differences in latency to give the bugs (based only on those infants who touched the bug in that trial). In the first trial, there was a significant condition effect, $F(1, 16) = 5.06$, $p = .04$, $\eta^2_p = .24$, such that infants in the Anger condition were faster to give the Emoter the first bug ($M = 1.44$, $SD = 1.44$) than infants in the Neutral condition ($M = 3.00$, $SD = 1.49$). There were no significant differences among groups in the second and third trials (see Table 5).

[1] When all infants were included in the analysis there was a significant trial effect, $Q(2) = 7.43$, $p = .02$. Infants were increasingly more likely to give the Emoter the bug as the trials progressed.

Table 5

Helping Task: Infant Behavior as a Function of Experimental Condition

	Experimental Condition			
	Anger (n = 24)		Neutral (n = 32)	
Variable	*M*	*SD*	*M*	*SD*
Latency to touch	1.78 s	1.20	1.52 s	1.35
Play score	.26	.39	.44	.44
Give (proportion)	.52	.45	.35	.45
Latency to give trial 2	1.68 s [a]	1.30	1.55 s [a]	1.55
Latency to give trial 3	1.29 s [b]	1.09	2.11 s [a]	2.00

Note. Latency to touch, Play, and Give scores only include trials in which the infant touched the bug. Latency to give scores only include trials in which the infant gave the bug.
[a] n = 12. [b] n = 14.

Reciprocate (Car) Task

Touch. Preliminary Chi-Square analyses for each condition indicated that there were no significant gender effects for touching the car. A Chi-Square analysis revealed no significant condition effect, with the majority of infants touching the car (Anger – 92%; Neutral – 97%).

Latency to touch. Excluding the four infants (three in Anger) who did not touch the car, a 2 (condition) × 2 (gender) ANOVA was conducted for latency to touch. There were significant main effects for condition, $F(1, 64) = 13.00$, $p = .001$, $\eta^2_p = .17$; and gender, $F(1, 64) = 7.79$, $p = .007$, $\eta^2_p = .11$. However, there was also a condition × gender interaction, $F(1, 64) = 7.09$, $p = .01$, $\eta^2_p = .10$. Girls in the Anger condition took significantly longer to touch the car ($M = 4.47$, $SD = 4.95$) than did girls in the Neutral condition ($M = .53$, $SD = .67$), $F(1, 32) = 10.59$, $p = .003$, $\eta^2_p = .26$. However, there was no significant difference between boys in the Anger condition ($M = 1.04$, $SD = 1.72$) and boys in the Neutral condition ($M = .44$, $SD = .65$).

Type of hand contact. Excluding the infants who did not touch the car, a 2 (condition) × 2 (gender) ANOVA indicated a significant condition main effect, $F(1, 64) = 4.08$, $p < .05$, $\eta^2_p = .06$, along with a significant condition × gender interaction, $F(1, 64) = 4.52$, $p = .04$, $\eta^2_p = .07$. Infants in the Anger condition had less hand contact with the car ($M = 2.18$, $SD = .85$) than infants in the Neutral condition ($M = 2.54$, $SD = .70$). However, this condition effect was only significant for girls, $F(1, 32) = 9.92$, $p = .004$, $\eta^2_p = .24$. Girls in the Anger condition had less hand contact with the car ($M = 2.00$, $SD = .89$) than girls in the Neutral condition ($M = 2.76$, $SD = .44$). In contrast, boys in the Anger condition ($M = 2.35$, $SD = .79$) and boys in the Neutral condition ($M = 2.33$, $SD = .84$) did not differ in their hand contact scores. Separate Mann-Whitney tests for the girls and boys revealed a similar gender effect, such that the condition effect for type of hand contact was only significant for girls, $U = 71.00$, $p = .02$.

Play. Preliminary Chi-Square analyses were conducted separately for each condition and revealed no significant effect of gender for playing with the car. Including only the infants who touched the car, a Chi-Square test indicated that infants in the Anger condition (42%) were less likely to play with this toy than were infants in the Neutral condition (74%), $\chi^2(1, N = 68) = 7.12$, $p = .008$.

Give. Preliminary Chi-Square analyses indicated that there were no significant gender effects for giving the car to the Emoter. Among infants who touched the car, a Chi-Square test revealed that infants in the Anger condition (64%) were more likely to give the car to the Emoter than were infants in the Neutral condition (34%), $\chi^2(1, N = 68) = 5.86$, $p = .02$.

Latency to give. Preliminary analyses using a 2 (condition) × 2 (gender) ANOVA revealed no condition or gender effects for latency to give the car (see Table 6).

Giving (Rattle) Task

Touch. Preliminary Chi-Square analyses indicated no significant gender effects for touching the rattle. A Fisher's exact test indicated that there was no significant difference between the two conditions in terms of the number of infants who touched the rattle. All infants in the Neutral condition and 89% of those in the Anger condition touched the toy.

Latency to touch. A 2 (condition) × 2 (gender) ANOVA was conducted (excluding the four infants who did not touch the rattle) to examine latency to touch the rattle. Infants in the Anger condition took longer to touch the rattle (M = 2.72 s, SD = 3.97) than did infants in the Neutral condition (M = .88 s, SD = .94), $F(1, 64) = 7.34$, $p = .009$, $\eta^2_p = .10$. There were no gender effects.

Type of hand contact. A 2 (condition) × 2 (gender) ANOVA was conducted with infants' hand contact scores, excluding infants who did not touch the rattle. There was a significant condition × gender interaction, $F(1, 64) = 6.27$, $p = .02$, $\eta^2_p = .09$. Follow-up analyses revealed a significant condition effect only among the girls, $F(1, 32) = 10.81$, $p = .002$, $\eta^2_p = .25$. Girls in the Anger condition (M = 2.44, SD = .73) had lower hand contact scores than did those in the Neutral condition (M = 3.00, SD = .00). Among infants in the Neutral condition, girls had significantly more hand contact with the rattle than did boys (M = 2.61, SD = .50), $F(1, 34) = 10.82$, $p = .002$, $\eta^2_p = .24$. In the Anger condition, hand type did not differ significantly between girls and boys (M = 2.69, SD = .60). Mann-Whitney tests were conducted for each gender and mirrored the previous condition × gender effect. The condition effect for type of hand contact with the rattle was only significant among the girls, $U = 81.00$, $p = .03$.

Play. Preliminary Chi-Square analyses (conducted for each condition) indicated that there were no gender differences in playing with the rattle. Among infants who touched the rattle, there was a significant main effect of condition, Fisher's exact test $p = .005$. Infants in the Anger condition (72%) were less likely to play with the rattle than were infants in the Neutral condition (97%).

Give. Preliminary Chi-Square analyses once again indicated no significant gender effects for giving the rattle to the Emoter. A separate Chi-Square test also revealed that there was no significant condition effect in the number of infants who gave the rattle (Anger – 78%; Neutral – 72%).

Latency to Give. A 2(condition) × 2 (gender) ANOVA revealed a significant gender effect for latency to give the rattle, $F(1, 47) = 4.46$, $p = .04$, $\eta^2_p = .09$. Of the infants who gave the rattle, girls were faster to give the rattle ($M = 9.41$, $SD = 4.30$) than were boys ($M = 12.48$, $SD = 6.43$). There were no significant condition effects (see Table 6).

Table 6

Reciprocate and Giving Task: Latency to Give as a Function of Experimental Condition

	Experimental Condition			
	Anger		Neutra	
Variable	*M*	*SD*	*M*	*SD*
Latency to give car	4.65 s [a]	4.75	5.12 s [b]	3.81
Latency to give rattle	9.74 s [c]	5.78	12.05 s [d]	5.31

Note. Latency to give only includes infants who gave the car or rattle to the Emoter.
[a] $n = 21$. [b] $n = 12$. [c] $n = 25$. [d] $n = 26$.

Continuity in infant behavior

In addition to analyzing the eavesdropping trials and Social-Interaction tasks separately, we also wanted to explore whether there was continuity/stability in infants behavior between the two contexts. For example, if a child was inhibited in the eavesdropping, were they also likely to be inhibited in the social interaction tasks? Therefore the following analyses were run to examine whether infant behavior was correlated across the two parts of the study.

Correlational analyses were conducted between infants' behavior in the eavesdropping trials and in the Social-Interaction tasks. Specifically, touch, latency to touch, duration of touch, and total imitation score in the eavesdropping trials were examined along with touch, latency to touch, and giving the toys in the Social-Interaction tasks. The latency to touch, duration of touch, imitation, and give scores only included trials in which the infants touched the object or toy. Given the condition effects for infant behavior in both types of tasks, correlations were run separately for infants in the Anger and Neutral conditions.

Neutral condition. Within the Neutral condition (Table 7), the longer infants' took to touch the eavesdropping objects, the less likely they were to touch the bugs and the slower they were to touch the bugs. In addition, infants who took longer to touch the objects in the eavesdropping trials were less likely to touch the car and took longer to touch the rattle.

Table 7

Correlations Between Behavior in the Emotional Eavesdropping Trials and Social Tasks among Infants in the Neutral Condition

	Eavesdropping Trials	
Variable	Mean latency to touch objects	Mean duration of touch
Total bugs touched	-.38*	.20
Mean latency to touch bugs[a]	.41*	-.32
Touching car	-.84***	.44**
Latency to touch rattle	.85***	-.52**

Note. $n = 36$ unless otherwise noted.
[a] $n = 32$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Anger condition. Among infants in the Anger condition (Table 8), the more eavesdropping objects they touched, the more likely they were to touch the bugs. Infants who touched more objects in the eavesdropping trials were also faster to touch the car and the rattle in the Social-Interaction tasks. As in the Neutral condition, the longer infants took to touch the eavesdropping objects, the less likely they were to touch the bugs. Infants who took longer to touch the objects were also slower to touch the car. Those in the Anger condition who imitated more in the eavesdropping trials touched more bugs and were faster to touch the car in the social tasks.

Table 8
Correlations Between Behavior in the Emotional Eavesdropping Trials and Social Tasks among Infants in the Anger Condition

	Eavesdropping Trials		
Variable	Total objects touched	Mean latency to touch objects	Mean imitation score
Total bugs touched	.63***	-.48** [a]	.41* [a]
Latency to touch car	-.70*** [b]	.50** [c]	-.41* [c]
Latency to touch rattle	-.60*** [a]	.32 [d]	-.30 [d]

Note. $n = 36$ unless otherwise noted.
[a] $n = 32$. [b] $n = 33$. [c] $n = 30$. [d] $n = 29$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Infant gender. Given that there was a significant gender effect for latency to touch the car, separate analyses were run by gender within each condition to examine the link with infants' behavior in the eavesdropping trials (Table 9). Among girls in the Anger condition, those who took longer to touch the car also tended to have lower touch scores and longer latencies to touch in the eavesdropping trials. In addition, girls in the Anger condition who had lower imitation scores tended to take longer to touch the car.

Table 9

Correlations Between Behavior in the Eavesdropping Trials and Latency to Touch the Car among Girls in the Anger Condition

	Eavesdropping Behavior		
Variable	Total objects touched	Mean latency to touch objects	Mean imitation score
Latency to touch car	-.75**	.58* [a]	-.58* [a]

Note. $n = 16$ unless otherwise noted.
[a] $n = 13$
* $p < .05$. ** $p < .01$. *** $p < .001$.

Individual Differences

Aside from exploring group differences in the two parts of the study (eavesdropping and social interaction) and the continuity between the two, we wanted to also examine individual differences in infants' behavior. Temperament data provided by the infants' parents allowed us to look at the role of temperament and whether this explains any of the variability in infant behavior in each condition.

Preliminary analyses indicated no significant differences in temperament as a function of condition or gender (see Table 10). Within each condition, correlational analyses were conducted between the temperament scores and infant behavior in the eavesdropping trials as well as the Social-Interaction tasks. Specifically, touch, latency to touch, duration of touch, and imitation in the eavesdropping were included in this analysis because significant condition effects were found for those variables. In the Social-Interaction tasks, touch, latency to touch, and give were included in the analysis because they were the primary dependent variables. All latency to touch, duration of touch, imitation, and give scores included only trials in which the object or toy was touched. In order to reduce the number of analyses, only the temperament subscales that were most theoretically relevant to the eavesdropping trials and Social-Interaction tasks were examined (i.e., fear, impulsivity, inhibition, positive anticipation, shyness, sociability).

Table 10

Temperament: Descriptive Statistics as a Function of Experimental Condition

	Experimental Condition					
	Anger (*n* = 36)			Neutral (*n* = 35)		
Variable	*M*	*SD*	*Range*	*M*	*SD*	*Range*
Fear	1.91	.64	2.16	1.94	.55	2.05
Impulsivity	4.71	.87	3.70	4.99	.73	3.10
Inhibitory Control	3.55	1.01	3.82	3.71	1.12	4.22
Positive Anticipation	4.23	1.04	5.00	4.28	1.11	4.60
Shyness	3.07	.83	3.75	2.91	.74	2.87
Sociability	5.55	1.04	4.00	5.75	.96	3.67

Neutral condition. Significant correlations between the temperament subscales and infant behavior variables are listed in Table 11. In the eavesdropping trials, there was only one significant correlation - infants who had higher Fear scores were slower to touch the objects.

Infants with higher Impulsivity scores touched more bugs and were faster to touch the bugs. Infants with higher Fear scores were also faster to touch the bugs, which is the opposite of what was found in the eavesdropping trials for latency to touch the objects.

In the car task, infants with high Impulsivity scores were faster to touch the toy and those with higher Positive Anticipation scores were less likely to give the car to the Emoter.

Infant Fear was negatively correlated with latency to touch the rattle. Thus, as in the bug task, fearful infants were faster to touch the toy. Once again, infants with high Positive Anticipation scores were found to be less likely to give the toy to the Emoter in the rattle task.

Table 11
Correlations Between Temperament and Infant Behavior among Infants in the Neutral Condition

	Temperament		
Variable	Impulsivity	Fear	Positive Anticipation
Mean latency to touch objects	.03	.49**	-.13
Total bugs touched	.55**	.28	.10
Mean latency to touch bugs[a]	-.49**	-.36*	-.19
Latency to touch the car[b]	-.34*	-.12	-.14
Giving car to Emoter[b]	-.34	.04	-.38*
Latency to touch rattle	-.05	-.43*	.02
Giving rattle to Emoter	-.03	.06	-.34*

Note. $n = 35$ unless otherwise noted.
[a] $n = 31$. [b] $n = 34$.
* $p < .05$. ** $p < .01$.

Anger condition. Among infants in the Anger condition, infants who had higher Shyness scores were less likely to give the bugs to the Emoter, $r(22) = -.64$, $p = .001$. There were no other significant correlations within this condition.

Infant gender. Infants' temperament scores were also analyzed separately for each gender within the two conditions, but only for those behavioral variables in which gender effects were present.

In the Neutral condition, boys who had higher Impulsivity scores were faster to touch the car, $r(16) = -.57$, $p = .01$, whereas for girls, higher scores on Shyness predicted faster touch of the car, $r(14) = -.56$, $p = .02$.

In the Anger condition, girls with higher scores on Inhibitory Control were faster to touch the car $r(14) = -.54$, $p = .03$. There were no significant correlations between temperament and behavior for boys in the Anger condition.

Discussion

Using the original Emotional Eavesdropping paradigm (Repacholi & Meltzoff, 2007), the current study explored infants' behavior in response to a live, emotional interaction between two adults. After witnessing the Emoter express anger toward the Experimenter in response to her actions on objects, infants not only inhibited their object-directed behavior in the eavesdropping trials, but also in the new Social-Interaction tasks. The results suggest that infants are able to generalize an adult's anger to an entirely new situation. This is the first study to examine whether infants' generalize emotional dispositions to other people, and provides evidence that infants are able to make primitive, trait-like attributions about other people's emotions. After seeing an adult express anger a number of times in one situation (i.e., the eavesdropping trials), infants behaved as if the adult was "anger-prone" and that she was likely to express anger across very different kinds of situations.

Emotional Eavesdropping Trials

Consistent with previous eavesdropping studies (e.g. Repacholi & Meltzoff, 2007; Repacholi et al., 2008), infants who saw the Emoter express anger toward the Experimenter inhibited their object-directed behavior relative to those infants in the Neutral condition. Specifically, infants in the Anger condition were less likely to touch, slower to touch, and spent less time touching the objects than infants in the Neutral condition. In addition, these infants were less likely to imitate the Experimenter's actions. Taken together, these findings suggest that infants' exploratory behavior was negatively impacted after witnessing one person expressing anger toward another person. As argued by Repacholi and colleagues, infants' behavior suggests that they expect the Emoter to get angry at them if they play with the objects.

One lean, alternative explanation is that infants "caught" the Emoter's negative affect (i.e., a contagion account). In this case, the infants' own negative affect would inhibit their object exploration, rather than infants' expectation that the Emoter would get angry at them if they played with the objects. This contagion account is unlikely, however, given the results of the infant affect coding that was conducted during the emotional expression and response periods. In this study, consistent with previous research, there were no significant differences between the Neutral and Anger conditions with regard to infants' facial expression. Indeed, there were very few negative expressions among the infants overall. Therefore, the more plausible explanation is that infants identified the object as the source of the Emoter's anger, and inhibited their object play so as to avoid eliciting anger from the Emoter.

The argument against a contagion explanation is further supported by a previous eavesdropping study that included conditions in which the Emoter did not watch the infant during the response period (Repacholi, Meltzoff, Rowe & Spiewak Toub, in press). In that study, 15-month-old infants eagerly touched the objects and imitated the target actions when the previously angry Emoter had her back turned and was unable to see what infants were doing with the object. This finding suggests that the infants were not fearful because of the mere presence of the Emoter. Instead, infants were able to determine when they themselves might be the target of another person's anger and then regulating their behavior accordingly.

Social-Interaction Tasks

Compared to infants who previously saw the Emoter express neutral affect, infants in the

Anger condition also inhibited their toy-directed behavior in the subsequent Social-Interaction trials. In general, these infants showed a decrease in their toy exploration in this new social situation, even though the Emoter maintained a neutrally pleasant disposition. Specifically, in each of the Social-Interaction tasks, infants in the Anger condition showed significant differences in their touching, hand contact, and/or play with the toys compared to infants in the Neutral condition. In addition, in the one task initiated by the Emoter, infants in the Anger condition showed differential patterns of giving, suggesting intimidation.

Helping (bug) task. Despite the short break between the eavesdropping trials and the first Social-Interaction task, and the absence of anger, infants in the Anger condition were wary about touching and playing with the bugs. Not only did fewer infants in the Anger condition touch the bugs, but those who did touch them had less hand contact with the bugs than did infants in the Neutral condition. Thus, infants in the Anger condition behaved as if they were concerned that the Emoter would express anger toward them if they touched these new objects.

The fact that there were no differences in giving the bugs between the two conditions is likely due to the low rates of giving overall. For example, in a study by Warneken and Tomasello (2007), 68% of 14-month-old infants helped an Experimenter by giving an out-of-reach object in at least one out of three trials, whereas in the current study only 35-52% of infants helped the Emoter at least once. The low rate of giving in the current helping task may have been due to the fact that the Emoter's need for help was not clear to the infants. In Warneken and Tomasello's study, the experimenter was standing and reached down over a barrier to try to reach a far-away toy on the floor, whereas in the current study the Emoter feigned being unable to reach a toy that was just across the table and had been placed there by the Experimenter. In addition, the stacking of the bugs may not have seemed like a task that really warranted help, whereas the task of picking up a marker that was accidentally dropped may be more realistic and necessitate more helping from the infant. Lastly, in the current task, infants only had 7 seconds in which to give each bug to the Emoter. This is in contrast to Warnken and Tomasello's study, in which infants were given 30 seconds to help the Emoter retrieve an out of reach object. Thus, the low rates of helping across both conditions were probably due to the ambiguity of the task, as well as the short time frame that infants had in which to help the Emoter get the bugs.

Reciprocate (car) task. In the second Social-Interaction task, almost all infants in both conditions touched the car after the Experimenter rolled it to them. However, there was a gender x condition interaction in infants' latency to touch and type of hand contact with the car. Girls in the Anger condition took longer to touch the car and had less hand contact with the car than did girls in the Neutral condition. There was no condition effect among the boys, possibly because of the strong gender-typed preference for vehicles at this age (Alexander, 2003; van de Beek, van Goozen, Buitelaar, & Cohen-Kettenis, 2009).

Interestingly, regardless of gender, infants in the Anger condition were less likely to play with the car than infants in the Neutral condition. This particular finding is consistent with the idea that infants who saw the Emoter previously express anger were wary about interacting with the car, presumably because they were concerned that the Emoter might get angry at them for doing so.

This interpretation is further supported by the fact that infants in the Anger condition were more likely to give the car to the Emoter. Indeed, infants who saw the Emoter express anger may have only touched the car in order to give it to the Emoter. It is possible that they were intimidated by her presence, even in this new, more pleasant situation. In contrast, infants in the Neutral condition were more interactive with the car, and less likely to give the car to the Emoter, perhaps because they did not feel pressured into complying with her request. These infants were enjoying their exploration of the car toy (as indexed by their higher play scores), and if given more time to lose interest in it, may have eventually given the toy back.

Also of interest is that unlike the other Social-Interaction tasks, the Reciprocate task was the only one in which the Emoter gave the toy to the infant, rather than the Experimenter. In addition, compared to the bug task, the Emoter's request was more direct in the car task. Specifically, the Emoter eventually made a direct verbal request for the car, whereas in the bug task, the infant had to infer that the Emoter wanted the bugs from her reaching and subtle verbal cues. The effort and directness on the part of the Emoter to interact with the infant in the car task may have increased the level of intimidation for infants in the Anger condition and increased their compliance with the object request. Interestingly, in the Helping task, infants in the Anger condition were also more likely to give the bugs to the Emoter than those in the Neutral condition, but this difference did not reach significance. It is possible that there would have been a significant difference between conditions in the Helping (Bug) Task if the request had been as direct as it was in the Car Task.

Sharing (rattle) task. Even in the third Social-Interaction task, well into the new social situation, infants in the Anger condition continued to be inhibited in their toy-directed behavior. Specifically, these infants were less likely to touch the rattle than infants in the Neutral condition. Furthermore, among the infants who touched the rattle, those in the Anger condition were slower to touch and less likely to play with the toy than those who had previously seen the Emoter express neutral affect. Among those who touched the rattle, close to three-quarters of the infants in each condition subsequently gave it to the Emoter the rattle. Thus, in this task, the rates of giving in both conditions were in line with those reported by Warneken and Tomasello (2007). The directness of the Emoter's request might partly account for why the groups did not differ from each other. In this task, when the Emoter verbally requested the rattle, her hand was outstretched (palm-up) and was very close to the infant, such that the non-verbal cue was obvious and hard to ignore. Thus, even infants in the Neutral condition may have eventually given the toy because of the very explicit, direct nature of the request. Moreover, because the response period was very long in this task (26 seconds to comply with the request versus 7 seconds in the Bug task and 17 seconds in the Car task), infants might have given the rattle because of boredom.

It is also worthwhile considering whether infants in the two conditions gave for different reasons: those in the Anger condition might have given the toy out of intimidation, whereas infants in the Neutral condition might have given the rattle because they lost interest in the toy. This interpretation is supported by the finding that infants in the Anger condition were less likely to play with the rattle than the infants in the Neutral condition. Specifically, infants in the Neutral condition were interacting with the toy rather than just giving it to the Emoter whereas the infants in Anger took longer to touch and likely just touched the rattle in order to give it to the Emoter, thereby complying with her request.

As further support for the intimidation hypothesis, in each of the Social Interaction tasks, infants in the Anger condition were faster to give the toys to the Emoter compared to infants in the Neutral condition. This pattern of results, though not always statistically significant, is consistent with the idea that infants in the Anger condition may have been giving toys to the Emoter due to intimidation. By quickly complying with the Emoter's request, infants in the Anger condition may have been trying to prevent her from expressing anger again.

Continuity Between Tasks

In sum, infants do appear to generalize infants' anger to a new context, even one in which the Emoter has a neutral-pleasant expression and invites the infant to interact with her. This indicates stability in infants' view of the Emoter as an angry person, such that they are forming trait-like attributions about her emotional behavior. The correlation between infants' behavior in the Eavesdropping trials and the Social-Interaction tasks offer further support for this conclusion. The results showed clear continuity in the behavior of individual infants' (rather than two groups of infants) from the Eavesdropping trials to the Social-Interaction tasks. In each condition, infants' object-directed behavior in the Eavesdropping trials was significantly correlated with their toy-directed behavior in the Social-Interaction tasks. For example, infants who were more inhibited in their play with the objects in the Eavesdropping trials were also more inhibited in their play with the toys in the Social-Interaction tasks. Therefore, although the context and tasks changed, infants' instrumental behavior remained constant throughout.

Individual Differences

Further support for the influence of the Emoter's affect on infant behavior in the Social-Interaction tasks comes from the temperament data that the infants' parents provided. Among infants in the Anger condition, there was only one significant correlation between temperament and infant behavior in the Social-Interaction tasks. Thus, in general, individual differences in infants' behavior in the Social-Interactions tasks in the Anger condition cannot be attributed to temperament. Rather, infants' inhibition in the Social Interaction tasks was related to the Emoter's emotional expression in the eavesdropping trials. In contrast, among infants in the Neutral condition, variability in the infants' behaviors in the Social Interaction tasks was related to individual differences in temperament, especially with regard to impulsivity. In the Neutral condition, impulsive infants touched more bugs, were faster to touch the bugs and were also faster to touch the car. For infants in the Anger condition, these temperament characteristics may have been overridden by the Emoter's previous anger expressions.

General Conclusions

Taken together, this research suggests that infants are able to generalize another person's affect across very different contexts. These findings expand on previous research by Repacholi et al. (under review), which found that infants are able to generalize an emotional disposition to a new eavesdropping trial. In the current study, not only did the Emoter switch to having a pleasant demeanor, but the infant was presented with new objects and new tasks that required varying degrees of social interaction on the part of the Emoter. Thus, infants' ability to generalize in this very different social situation provides evidence for infants' ability to make primitive trait-like attributions about other people's emotions. Specifically, infants were able to use the Emoter's previous affective behavior to predict her future emotional response, which suggests that they viewed her as an "anger-prone" person, who was likely to express anger in all kinds of situations.

One alternative explanation is that infants used the Emoter's affect to make a more global negative evaluation about her. Instead of viewing her as anger prone, they may have assumed that she was "not nice" or "bad" overall, based on her negative affect in the previous eavesdropping trials. However, if infants were forming this more general negative evaluation, one would expect infants to not give her any objects at all. The fact that infants gave toys to the Emoter at a higher rate than those in the Neutral condition (for one task) suggests that infants did not want to upset her or elicit more anger, which supports the idea that infants specifically viewed the Emoter as anger prone. Additionally, there was a trend in each of the tasks, albeit non-significant, for infants in the Anger condition to give the Emoter the toy more quickly than infants in the Neutral condition. Together, these findings suggest that infants were intimidated into giving the objects – they thought that she was an angry person, who was likely to express anger again.

This research adds to the small extant literature suggesting that infants are able to make attributions based on another person's previous actions, preferences, and social behaviors (e.g., Song et al., 2005; Hamlin et al., 2007). Mascaro and Csibra (2012) demonstrated that infants expect a character's social dominance to remain stable across situations, and the current study suggests that infants also expect adults' emotional dispositions to remain stable across contexts. The current findings indicate a more mature level of complexity in infants' socio-emotional understanding, such that they are beginning to make trait-like attributions about other people's emotions.

These results are especially interesting given the ecological validity of the study. In addition, there are three important features of this study that made it unique and differentiated it methodologically from other related infant research. Firstly, infants in the current study watched live actions and emotions, rather than pre-recorded vignettes. Additionally, the live interactions in this study involved two people, rather than animated shapes or puppets, thereby creating a more realistic scenario. Lastly, multiple dependent variables were measured, including infant affect, imitative behavior, and social behavior. Other studies have primarily employed looking time (a single dependent variable) in the context of a violation of expectation procedure and this type of data can be difficult to interpret. For example, there are often difficulties in distinguishing whether infants are looking at a stimuli based on novelty or preference, or a combination of the two (Houston-Price & Nakai, 2004; Oakes, 2010). In contrast, by employing a multi-measure approach, we were able to obtain a more meaningful assessment of how infants' were responding to, and using, the emotional information provided in the eavesdropping trials.

Future Directions

There are several directions that future research could take to further explore the idea that infants are making trait-like attributions about other people's emotions. For instance, one could create Social-Interaction tasks that are more effortful on the part of the infant, and require the infant to actually walk or crawl towards the Emoter in order to help. It is possible that condition differences would emerge in a helping task in which the need for assistance from the infant was clearer and the infant had to exert more effort to do so. It would also be interesting to include a Social-Interaction task in which the infant has to choose whether to give or share a toy with the Emoter or another unfamiliar person. If infants were more likely to give the toy to the unfamiliar person, this would provide further evidence for their concern over the Emoter's previous anger.

In order to better understand whether infants view the Emoter's anger as a stable trait, a study could examine whether infants continue to show differential behavior with an increase in time delays between the Emotional Eavesdropping trials and Social-Interaction tasks. Additionally, it would be interesting to add a condition where another actor takes the place of the Emoter in a fourth eavesdropping trial, in which there was no anger directed at the Experimenter. The results of such a study would shed light on whether the infants attribute anger only to the Emoter, or generalize the anger to other people in that position as well. These kinds of studies would offer deeper insights into infants' ability to make more stable attributions about the Emoter's personality characteristics based on her previous emotional expressions.

In conclusion, after witnessing an adult repeatedly expressing anger toward another adult, 15-month-old infants inhibited their toy-directed behavior and showed evidence of intimidation in the new social context. These findings suggest that infants are beginning to understand emotional dispositions as stable and trait-like, such that an adult who has a history of expressing anger is an "anger-prone" person - that is, the person is likely to express anger in the future. Thus the results of the current study add to the growing literature on infants' ability to make primitive trait attributions, and offer new insights into the lasting effects of negative emotions on infants' exploratory behavior.

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Appendix A

Neutral Scripts

Trial 1
Emoter: “That’s entertaining. That’s so enticing.”
Experimenter: “Oh, I thought it might have been too distracting.”
Emoter: “Well, you could be right, but it is entertaining.”

Trial 2
Emoter: “That’s encouraging. That’s so engaging.”
Experimenter: “Oh, I had no idea you’d feel that way.”
Emoter: “I do feel that way, but it is encouraging.”

Trial 3
Emoter: “That’s stimulating. That’s very striking.”
Experimenter: “Oh, I didn’t think you’d really notice it.”
Emoter: “Well, not to worry, but it is stimulating.”

Anger Scripts

Trial 1
Emoter: “That’s aggravating! That’s so annoying!”
Experimenter: “Oh, I thought it was really interesting.”
Emoter: “Well, that’s just your opinion! It’s aggravating!”

Trial 2
Emoter: “That’s infuriating! That’s so irritating!”
Experimenter: “Oh, I’m sorry you feel that way about it.”
Emoter: “Well, you should be sorry! It’s infuriating!”

Trial 3

Emoter: “That’s so frustrating! That’s really distracting!”
Experimenter: “Oh, I didn’t realize you’d care so much.”
Emoter: “Well, you’re wrong about that! It’s very frustrating!”