Transfer of Social Learning Across Contexts: Exploring Infants' Attribution of Trait-Like Emotions to Adults

Article *in* Infancy · March 2016

DOI: 10.1111/infa.12136

Betty Repacholi
University of Washington Seattle

Andrew N Meltzoff
University of Washington Seattle

Ashley L. Ruba
University of Washington Seattle

THE OFFICIAL JOURNAL OF THE
INTERNATIONAL CONGRESS
OF INFANT STUDIES

Infancy, 1–22, 2016

ISSN: 1525-0008 print / 1532-7078 online
DOI: 10.1111/infa.12136

WILEY Blackwell

Transfer of Social Learning Across Contexts: Exploring Infants' Attribution of Trait-Like Emotions to Adults

Betty M. Repacholi, Andrew N. Meltzoff, Theresa M. Hennings, and Ashley L. Ruba
Department of Psychology and Institute for Learning and Brain Sciences (I-LABS)
University of Washington

We explored whether 15-month-olds expect another person's emotional disposition to be stable across social situations. In three observation trials, infants watched two adults interact. Half the infants saw one of the adults ("Emoter") respond negatively to the other adult's actions (Anger group); half saw the Emoter respond neutrally to the same actions (Neutral group). After a change in social context, infants participated in novel tasks with the (now-neutral) Emoter. Infants in the Anger group were significantly more likely to relinquish desirable toys to the Emoter. We hypothesize that, in the initial observation trials, infants learned that the Emoter was "anger-prone" and expected her to get angry again in a new social situation. Consequently, infants readily gave the Emoter what she wanted. These findings reveal three key features of infants' affective cognition: (1) infants track adults' emotional history across encounters; (2) infants learn from observing how people interact with *others* and use this to form expectations about how these people will treat *them*; and (3) more speculatively, infants use appeasement to cope with social threat. We hypothesize that infants form "trait-like" attributions about people's emotional dispositions and use this to formulate adaptive responses to adults in novel social contexts.

Infants are highly adept social learners. They rapidly acquire new cultural routines and instrumental skills by observing the behavior of other people. Two key forms of preverbal social learning are imitation and social referencing. By the second year of life, infants readily imitate novel actions on objects that they see performed by infant peers (e.g., Hanna & Meltzoff, 1993) and adults. Infants also engage in social referencing, whereby they observe another person's emotional reaction to an object, and then use that emotional information to regulate their own object-directed actions (e.g., Klinnert, Emde, Butterfield, & Campos, 1986).

Correspondence should be sent to Betty M. Repacholi, Department of Psychology, University of Washington, UW Box 351525, Seattle, WA 98195-7988. E-mail: bettyr@u.washington.edu

Social learning in infancy is not restricted to *dyadic* contexts in which information is directly communicated to infants. It can also occur when the infant overhears and/or sees two *other* people interact. There are three interrelated phenomena reported in the literature. First, 15-month-old infants can learn the emotional consequences of performing an action simply by observing a social interaction between two other people—termed "emotional eavesdropping" (Repacholi & Meltzoff, 2007; Repacholi, Meltzoff, Rowe, & Toub, 2014; Repacholi, Meltzoff, Toub, & Ruba, 2016). Second, 12- to 14-month-old infants respond in socially anxious ways toward strangers after watching their mother's anxious emotional reaction (de Rosnay, Cooper, Tsigaras, & Murray, 2006)—termed "indirect social referencing." Finally, in language acquisition, 18-month-olds can acquire new words by overhearing others' conversations (Floor & Akhtar, 2006; Gampe, Liebal, & Tomasello, 2012).

In sum, we know that in addition to learning through direct dyadic interactions, infants also learn from observing third-party interactions when they themselves are not part of the action. However, little is known about infants' *generalization* from one type of social learning situation to another. Can infants transfer what they learn from observing third-party interactions to their own subsequent personal interactions? This is a crucial aspect of social cognition that operates in adults—we learn from watching how people interact with *others* and use this to form expectations about how these people may treat *us*. Adults also expect there to be some stability in how people act across social contexts—as discussed in the impression formation and trait attribution literature within social psychology (e.g., Jones & Harris, 1967; Ross & Nisbett, 1991). What is known about infants?

Several bodies of literature address infant generalization across contexts. Work on deferred imitation indicates that infants between 9- and 12-months of age can observe what a person does with an object in one room, and then imitate that action in a new context even after a delay (Klein & Meltzoff, 1999; Learmonth, Lamberth, & Rovee-Collier, 2004). Although young infants can make generalizations about how to act on an object, the findings are more mixed when assessing the stability of an agent's dispositions across contexts. It has been reported that 10-month-old infants generalize an agent's social preferences across a change in context (Hamlin, Wynn, & Bloom, 2007) but not their object preferences (Sommerville & Crane, 2009).

The findings are more consistent in older infants. Mascaro and Csibra (2012) familiarized 12- and 15-month-old infants with videos of geometric figures that seemed to compete to stay in an enclosed area. In the video, the "dominant" agent arrived in the space where the "subordinate" was already located and pushed the subordinate agent away. In the generalization phase, infants saw scenes in which the two agents gathered objects. In the consistent scene, the dominant agent took the last object, whereas in the inconsistent scene, the subordinate took it. The 15-month-old infants looked longer at the inconsistent scene; but 12-month-olds did not. Thus, the older infants seemed to identify who was dominant in a conflict over space and generalized that to a conflict about objects. Infants are also able to make cross-context generalizations about people's reliability as a source of information. In one study, 14-month-old infants watched an adult express joy as she looked inside a box that either contained a toy (reliable group) or was empty (unreliable group) (Chow, Poulin-Dubois, & Lewis, 2008). Infants in the unreliable group were subsequently less likely to follow that adult's gaze to an object hidden behind a barrier. These and other studies (e.g., Hamlin, Wynn, Bloom, & Mahajan, 2011) suggest that infants can generalize certain types of social information across contexts in the second year of life.

However, there is a significant gap in the literature concerning *emotion generalizations* in infancy, despite the centrality of emotional information in adult person perception.[1] Adults use people's emotional reactions to predict that person's future behavior and these predictions often influence how we ourselves interact with that person (Ambady & Rosenthal, 1992; Hareli & Hess, 2010). Whether infants can use emotional information in this way has not been systematically studied, although it is an ecologically valid part of infants' lives—they often observe the interaction of others and are then approached by one of the interactants.[2] What do infants expect about that person's interaction with them? This was the focus of the current experiment.

BACKGROUND AND NOVELTY OF THE CURRENT STUDY

We examined whether, after observing an adult express anger toward another person in three encounters, 15-month-old infants keep track of the adult's emotional behaviors and generalize to a *novel social situation* in which they themselves interact with the adult, who now has a calm demeanor. Do infants learn from "eavesdropping" on third-party interactions and form expectations about how the previously angry adult will interact with them? We also examined how infants cope with their own encounter with this "anger-prone" adult? This is of interest both to social developmental theory (generalization across contexts, origins of dispositions) and also to child clinical psychology (hostile attributional bias—Dodge, 2006).

The research paradigm used in the current work is the "emotional eavesdropping" paradigm (Repacholi & Meltzoff, 2007) in which infants learn about an adult's propensity for anger. In a series of trials, infants watch as an adult (the Emoter) responds with anger (or neutral affect) to another adult's (the Agent) actions on objects. After each trial, infants are then given an opportunity to play with the object as the now-neutral Emoter watches. It has been discovered that 15- and 18-month-old infants in the Anger group are hesitant to touch the objects and perform the demonstrated actions despite the fact that the Emoter is now displaying a neutral facial expression (Repacholi, Meltzoff, & Olsen, 2008; Repacholi et al., 2014). However, if the previously angry Emoter is unable to see what the infant is doing (e.g., the Emoter has her back turned or eyes closed), infants will eagerly play with the objects. The theoretical interpretation is that after watching the Emoter express anger in response to the Agent's actions, infants expect the Emoter to become angry, but *only* if she *sees* them playing with the objects. Importantly, the eavesdropping effect is thus not reducible to simple emotional contagion or the infant "catching" the Emoter's anger. The Emoter displays the same anger in these test conditions, yet infants expect the previously angry Emoter to become angry in some situations but not under other situational constraints (e.g., Repacholi et al., 2008, 2014, 2016).

[1]There is evidence of generalization of emotional facial expressions in the infant face processing literature. By around 7 months of age, infants can categorize photographs of facial expressions—generalizing emotional expressions across multiple models and intensities (Grossman, 2010; Quinn et al., 2011).

[2]As noted earlier, de Rosnay et al. (2006) explored infants' responses to a person who had been the *source* of their mother's social anxiety. The current experiment is related but distinct: It examines how infants respond to an unfamiliar person who *expresses* an emotion toward another individual.

The novel aspect of the current study is the inclusion of a series of personal engagement tasks *following* the emotional eavesdropping trials, which has not been previously tested.[3] We examined whether infants used the emotional information provided in the initial Eavesdropping phase to make a prediction about the Emoter's affect in a subsequent novel social situation—one in which the now-neutral Emoter makes a bid to socially engage with the infant. In this Personal Engagement phase, infants were given a series of attractive toys and the Emoter indicated verbally and through manual gestures that she wanted each of the toys. Thus, the two phases of the experiment were distinct. In the Eavesdropping phase, infants were bystanders, simply observing the Emoter's interaction with the Agent. In the Personal Engagement phase, the now-neutral Emoter directly engaged with the infant and requested toys from the infant.

Two aspects of infants' behavior were measured in the Personal Engagement phase: (1) exploration of the toys and (2) willingness to relinquish the toys to the Emoter. The extant literature supports at least two alternative predictions. On the one hand, infants might be unlikely to give the previously angry adult the toys. Hamlin et al. (2011) reported that 19- to 24-month-olds prefer to give treats to a prosocial rather than an antisocial puppet. On the other hand, when confronted with an anger-prone, live adult, infants might be motivated to take action to avoid antagonizing that person—infants might use "appeasement" in this situation. Appeasement refers to "the process by which persons placate or pacify others in situations of potential or actual conflict" (Keltner, Young, & Buswell, 1997; p. 360). Appeasement gestures in response to threat displays have been documented in nonhuman primates (e.g., de Waal, 1982) and have also been studied in adult humans (e.g., Keltner et al., 1997). To date, appeasement has received scant attention in the developmental literature. As part of a larger observational study, Caplan, Vespo, Pederson, and Hay (1991) remarked that, at the end of a conflict over a toy, 12-month-olds sometimes offer or give the toy to the antagonist and that these appeasement gestures increase in prevalence during the second year of life. The current work is the first test of infant "appeasement" behavior in an experimental situation.

METHOD

Participants

The participants were 72 (36 male) 15-month-old infants, tested within a narrow age band (M = 15.08 months, SD = 5.01 days, range = 14.73–15.32 months). All were recruited from a university infant database. The racial 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. Sixty-nine (95.83%) of the parents identified their child's ethnicity as "Not Hispanic or Latino", and the remainder chose not to provide this information. Infants were from middle- to upper-class families. 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).

[3]Note that, in a related study, Repacholi et al., (2016) examined whether infants generalize an adult's emotion from one eavesdropping trial to another eavesdropping trial (i.e., emotion generalization within the *same* social context).

Design

Equal numbers of boys and girls were randomly assigned to each of the two experimental groups ($N = 36$ per group): Anger and Neutral. In the Eavesdropping phase, infants completed three emotional eavesdropping trials (Phase 1). Infants subsequently participated in the Personal Engagement phase, which was based on three tasks (Phase 2). The study design is depicted in Figure 1.

Stimuli: eavesdropping phase

The stimuli had three components: (1) the physical test objects, (2) the dynamic actions demonstrated by the Agent, and (3) the Emoter's facial and vocal expressions.

Test objects and actions

The test objects were modeled after Hanna and Meltzoff (1993) and were used in previous eavesdropping studies with 15-month-old infants (e.g., Repacholi et al., 2014, 2016). Each trial involved a different object–action pair. The six possible testing orders for the three objects were counterbalanced. One object was a box with a recessed button on the top and a stick. The demonstrated (or target) act was to press the button with the stick, creating a buzzing sound. The second object was a string of beads presented alongside a cup. The target act was to pick up the beads at one end and drop them into the cup, producing a rattling sound as they hit the bottom. The third stimulus was a dumb-bell object, consisting of two cubes with a tube attached to each

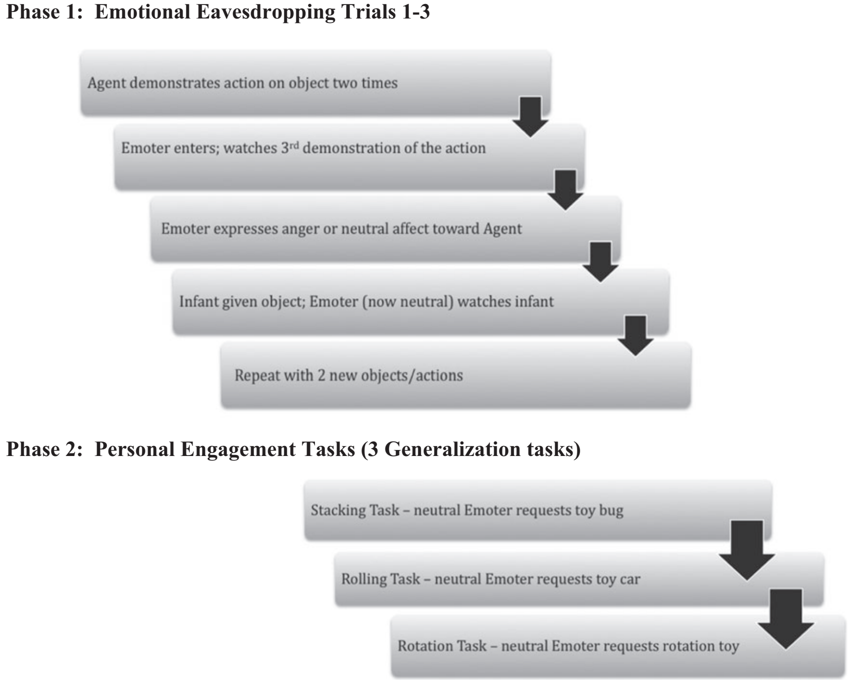

Figure 1 Study Design.

cube. One tube fit inside the other. The target act was to grasp the cubes and pull outward, which caused the object to come apart with a popping sound.

Emotional expressions

In the Anger group, the Emoter responded with anger whenever she observed the Agent performing the target acts on the test objects. The Agent's facial and vocal expressions were always neutral when interacting with the Emoter. The Emoter's facial expression was based on Ekman and Friesen's (1975) description of anger. Her tone of voice was angry, and her words were congruent, but the emotion words were selected to be too difficult for 15-month-olds to understand (Fenson et al., 1993). Thus, it was assumed that infants would respond to the Emoter's angry tone of voice, in combination with her angry facial expression. An example of the three-step Anger interchange is as follows: (1) Emoter (angry tone of voice)—"That's aggravating! That's so annoying!" (2) Agent (neutral voice)—"Oh, I thought it was really interesting." (3) Emoter (angry voice)—"Well, that's just your opinion! It's aggravating!" Different verbal scripts were employed in each trial, but all were similar in their structure and syllable length (see Repacholi et al., 2008, for the complete set of scripts).

In the Neutral group, the Emoter expressed neutral affect in response to the Agent's actions. The Emoter's mouth was relaxed, her forehead was smooth, there was minimal facial movement, and she spoke in a matter of fact manner. The three-step Neutral scripts were similar to the Anger scripts in terms of structure and number of syllables, for example (1) Emoter (neutral voice)—"That's entertaining. That's so enticing." (2) Agent (neutral voice) — "Oh, I thought it might have been too distracting." (3) Emoter (neutral voice) — "Well, you could be right. But it is entertaining."[4] Different scripts were used in each trial.

Stimuli: personal engagement phase

There were three engagement tasks and each used different, brightly colored toys that were designed to be appealing to infants. The tasks were presented in a fixed-order (Stacking, Rolling, Rotating) to ensure that individual differences in task performance could not be attributed to task order (see Carlson & Moses, 2001, p. 1035). In the *Stacking Task*, six different types of magnetic bugs from the "Lamaze Bug Stacker" were employed. The *Rolling Task* employed a "B. Wheeee-Is" toy car, decorated with flowers and a smiling face. The "Sassy Illumination Station" was used in the *Rotating Task*. This toy had a wheel that infants could rotate or shake plus a small ball that lit up when rotated.

Video recording

Three digital video cameras recorded the experiment. One camera provided a video record for coding infants' instrumental behavior. Another camera recorded a close-up

[4]It is difficult to identify fully neutral words that have the number of syllables and fit the syntactic structure of the angry scripts, and thus words with a more positive meaning were used. Crucially, however, these words were also selected to be beyond the comprehension of a typical 15-month-old infant ("enticing," "distracting," and "entertaining,"), and a neutral tone of voice was used in the script.

view of infants' faces for coding their facial expressions and visual attention. The third camera focussed on the Agent and the Emoter. This video was used to examine whether the Emoter's expressions were recognizable to naïve coders and to ensure that she was neutral during the response periods for the eavesdropping trials and during the engagement tasks.

Procedure

The experiment took place in a laboratory room, and all infants sat in their parent's lap, across the table from the Agent. Throughout the testing procedure, the Agent maintained a pleasant demeanor. Parents were instructed to: (1) remain silent and neutral; (2) avert their gaze if their infant looked toward them; and (3) avoid any kind of interaction with their infant. Infants were dropped from the sample if these instructions were not followed. Each infant participated in the Eavesdropping phase then the Personal Engagement phase.

Eavesdropping phase

The three eavesdropping trials closely matched the procedure used in Repacholi et al., 2008. In Trial 1, a female Agent demonstrated an action on an object, two times. An unfamiliar female (the Emoter) subsequently entered the room and sat to the Agent's left. She watched the Agent demonstrate the action a third time, and then expressed one of two emotions. In the Anger group, the Emoter expressed anger toward the Agent in response to her action on the object. In the Neutral group, the Emoter's facial expression and tone of voice were neutral.

After the emotional interchange, the Emoter looked toward the infant with a neutral-attentive face and did not say anything more. The Agent placed the object in front of the infant and said "Here" in a neutral tone of voice. A 20-sec response period followed, during which the Agent looked down at her lap and maintained a neutral facial expression. The Agent retrieved the object after 20 sec, and the Emoter then exited the room. The next two trials followed an identical procedure, but with novel object–action pairs and new emotion scripts each time.

The purpose of the eavesdropping trials was to provide infants with information about the Emoter's propensity for anger and to test infants' ability to use this information to regulate their behavior in the same context in which the emotion was expressed.

Personal engagement phase

After the Emoter left the room at the end of the Eavesdropping phase, a small break was taken: The Agent showed infants a toy rattle and talked about its features while maintaining a pleasant demeanor and tone of voice. After 10 sec, the Agent put the toy away and the Emoter re-entered the room. As before, the Emoter sat to the left of the Agent. Throughout this phase, the Emoter faced the infant and was neutral in her facial and vocal expressions. The Agent was also neutral, and during the response period for each task, she looked down at her lap. The purpose of the Personal Engagement phase was to test whether infants would generalize their impression of the Emoter, formed during the eavesdropping trials, to a new social situation.

The three engagement tasks were modified versions of prosocial tasks that have been used with 12- to 15-month-old infants (e.g., Sommerville, Schmidt, Yun, & Burns, 2013; Warneken & Tomasello, 2007). In all of them, infants were required to give the Emoter a toy that she wanted. At this young age, infants do not consistently comply with people's requests to give toys (e.g., Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011). Thus, we gave infants multiple opportunities to do so, as described below.

Rotating task

The Agent placed the toy in front of the infant, saying "Here." After 10 sec had elapsed, the Emoter engaged in a direct interaction with the infant. She put out her hand (palm side up) in front of the infant, and said "Can I have it?" and after 2 sec, "Can I have it please?" She alternated her gaze between the toy and the infant. She left her hand out for another 5 sec, and then briefly removed it before repeating the hand gesture and verbal requests. She left her hand out for another 5 sec. If at any point the infant relinquished the toy, the trial ended.

Rolling task

The Emoter again directly engaged the infant. She placed a toy car on the table and said, "I have a car." She then said "I'm going to roll the car to you" and proceeded to do so. Infants then had 10 sec to play with the car. After this play period, the Emoter cupped her hands on the table as if to catch the car and said "Now it's your turn." If the infant did not relinquish the car within 2 sec, the Emoter then directly requested the toy ("Can you push the car to me?"). If the infant did not relinquish the car within 5 sec of this request, the trial ended.

Stacking task

The Agent placed three bugs on the table. The Emoter then stacked the bugs. The Agent subsequently put a clear plastic barrier in front of the bug stack and placed a fourth bug on the infant's side of the barrier. The Emoter reached around the barrier and made a grasping gesture, indicating that she wanted the bug. She then directly engaged the infant: With a neutral face and tone of voice, she said "Oh, my bug. I can't get it," as she made further grasping gestures. The Emoter alternated her gaze between the bug and the infant. She left her hand out until the infant relinquished the bug or until 7 sec elapsed. If the infant relinquished the bug, the Emoter stacked it on her side of the barrier; otherwise the Agent retrieved it and the trial ended. This procedure was repeated with the other two bugs.

Scoring definitions and reliability

Eavesdropping phase

There were four broad categories of behavior scored in this phase of the experiment: (1) Emoter's facial displays, (2) infant instrumental behavior, (3) infant affect, and (4) infant visual attention. All of the scoring was conducted by independent coders who were blind to experimental group, study procedures, and hypotheses. Each dependent measure had high intercoder agreement, as described below.

Emoter facial displays. A manipulation check was conducted to determine that the Emoter's facial displays were administered correctly. Coders used 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 during each of the emotional interchange and response periods. These facial ratings were conducted without sound so that the Emoter's words (e.g., "aggravating") would not bias the coders. The coders also indicated which discrete facial emotion was predominant.

Infant instrumental behavior. Four types of object-directed behaviors were scored during each of the 20-sec response periods. This scoring was based on edited videotapes that contained no record of the Emoter's interactions with the Agent. Infants' *touching* behavior was coded in each trial using a dichotomous (yes/no) measure to indicate whether they touched the object at any time during the response period. *Latency to touch* in each trial was timed from the moment the object was placed in front of the infant to the time of the first touch. No latency score was assigned for trials in which the infant did not touch the toy. For trials in which the object was touched, the *duration of object contact* was timed from the first touch of the object and included any moment when the infant was touching the object during the remainder of the response period. In trials in which the toy was touched, *imitation of the modeled target act* was coded dichotomously (yes/no) in each trial using Meltzoff's (1988) scoring criteria.

Infant affect. Infant affect was scored from the camera focused on infants' faces and contained no visual record of the adult emotional displays. The sound was disabled during scoring to keep the coder naïve to the content of the emotional interchange. Consistent with the social referencing literature (e.g., Hirshberg & Svejda, 1990; Mumme & Fernald, 2003), separate three-point scales were used to rate the maximum positive and negative affect displayed by the infant in each trial during the emotional interchange between the Emoter and the Agent and the subsequent response period. For the positive affect scale: 0 = absence of positive affect; 1 = slight smile (slightly upturned mouth, no cheek elevation); and 2 = a broad smile (usually with mouth open and/or cheeks elevated) or a laughing face. For the negative affect scale: 0 = absence of negative affect; 1 = either a frown/brow furrowing or corners of the mouth pulled back in a grimace, disgust-like nose wrinkle, pout, or sneer; and 2 = either: (1) a frown/furrowed brow accompanied by any of the other facial movements that qualified for a score of 1; (2) the infant avoided the Emoter by leaning away from her plus one of the facial movements that met the criteria for a score of 1; or (3) a cry face. This coding scheme was adapted from Hertenstein and Campos (2004).

In addition to scoring hedonic tone, infant fearful facial expressions were coded as present or absent during the same time periods. To be coded as "present", infants were required to display raised eyebrows (either drawn together or straightened); a widening of the eyes; and a horizontal lip stretch (lips not parted) or horizontal cry mouth (lips parted) (Izard, 1979; Sullivan & Lewis, 2003).

Infant visual attention. Infants' looks to the Agent's demonstrations of the target actions were coded from video records in which the Emoter's face was not visible and the sound was turned off. Thus, coders were not aware of the emotion being displayed. In each trial, the coder recorded the onset and offset of each look toward the action demonstration. The durations of infants' looks were summed, and a proportion score calculated for each trial to take into account any slight differences in demonstration length. Infant looks toward the Emoter during the response period were also recorded, and the durations of these individual looks were then summed for each of the response periods.

Intercoder agreement for eavesdropping phase

Scoring agreement, based on 33% of the sample, was high: object touch $K = .88$; latency to touch $r = 1.00$; duration of touch $r = .99$; imitation $K = 1.00$; positive affect-emotional interchange $r = .92$; negative affect-emotional interchange $r = .83$; positive affect-response period $r = .94$; negative affect-response period $r = .93$; attention to demonstration, $r = .93$; and attention to Emoter-response period, $r = .96$. There was 100% agreement for the presence/absence of infant fear expressions during the emotional interchange and the response period. Agreement for Emoter facial hedonic tone was high, $r = .92$, and Kappa for the predominant emotion classification was .88.

Engagement phase

There were six broad categories of behavior scored in this phase of the experiment, each with high intercoder agreement, as described below.

Emoter affect. A manipulation check was conducted to establish that the Emoter was neutral during all of the personal engagement tasks. Because the Emoter did not use emotion words in these tasks, the sound track was not turned off during this coding. Coders were instructed to rate the Emoter's combined facial and vocal expression. Hedonic tone and discrete emotion were scored as described in the Eavesdropping phase.

Infant toy exploration. Three dependent measures were scored in each task to determine whether the Emoter's prior affect influenced infants' exploration of the toys. *Toy touching* was scored using a dichotomous (yes/no) measure. *Latency to touch* (in seconds) was timed from when the toy was presented to the infant to the moment when the infant first made contact with the toy. No latency score was assigned if the infant did not touch the toy. Active *play* with the toy was coded dichotomously (yes/no) for each task in which infants touched the toy. A "yes" was scored if infants turned, spinned, twisted, shook, rolled, or slid the toy.

Infant relinquishment of toys. Two dependent measures were scored in each task to determine whether the Emoter's prior affect influenced infants' willingness to relinquish the toy. *Toy relinquish* was coded in each task using a dichotomous (yes/no) measure for each task in which the infant touched the toy. A "yes" was scored if infants placed the toy in the Emoter's hand, held the toy out toward the Emoter, or if they pushed/rolled it toward the Emoter. *Latency to relinquish* was coded for each task in which the infant touched the toy. Latencies were timed from when the toy was presented to the infant to the moment when the infant began to relinquish the toy to the Emoter.

Infant affect. The maximum positive and negative affect displayed by the infant, along with the presence/absence of a fearful facial expression, was coded during the response period for each task, as described previously.

Infant attention. In each task, the coder recorded the onset and offset of each look toward the Emoter's face during the response period. The durations of infants' looks were summed, and a proportion score calculated for each task.

Infant avoidance. In each task, coders recorded the presence/absence of infant behaviors that could indicate a desire to distance oneself from, or avoid interacting with, the Emoter: (1) leaning away from the Emoter; (2) turning face and/or body away from the Emoter; (3) pushing the Emoter's hand away; and (4) trying to get off the parent's lap.

Intercoder agreement for personal engagement phase

Scoring agreement across tasks was high: object touch, $K = .98$; latency to touch, $r = .99$; object play, $K = .93$; toy relinquish, $K = 1.00$; latency to relinquish, $r = .99$; attention to Emoter's face, $r = .95$; infant positive affect, $r = .88$; and infant negative affect, $r = .90$. There was 100% agreement for infant fear expressions and avoidance behaviors. Agreement for the Emoter's affect was also high: hedonic tone, $r = 1.00$, and predominant emotion, $K = .90$.

Data reduction for personal engagement phase

Preliminary analyses indicated that there were trial effects in the Stacking Task, therefore only Trial 1 was used, which made the Stacking Task comparable to the other two tasks in which there was only one trial. Furthermore, given that the engagement tasks were similar in terms of providing infants with an opportunity to explore an attractive toy and give it to the Emoter, each dependent measure was collapsed across the three tasks (using the mean level of responding across the three tasks). The pattern of results for the main dependent measures was the same whether the tasks were analyzed individually or collapsed.

RESULTS

Manipulation checks

The manipulation checks verified that the Emoter displayed the desired emotional expressions as called for by the experimental design. As called for, during the emotional interchange in the Eavesdropping phase, the Emoter was significantly more negative in her facial expression in the Anger group ($M = -1.23$, $SD = .31$) than in the Neutral group ($M = .07$, $SD = .21$), $t(58.65) = 20.50$, $p < .001$. Indeed, 100% of the Emoter's emotional displays were correctly classified as "anger" for predominant emotion in the Anger group. The majority (93%) of the Emoter's facial displays were classified as "neutral" in the Neutral group, and the remainder were identified as "interest." Also consistent with the experimental design, the Emoter's facial expressions during 100% of the eavesdropping response periods were identified as neutral for hedonic tone. Similarly, 100% of the Emoter's expressions were assigned a score of 0 (i.e., neutral) for hedonic tone during each of the personal engagement tasks.

Eavesdropping phase: main analyses

Two-tailed tests were employed throughout, and, for the main analyses, a Bonferroni correction for multiple tests ($p < .0125$) was employed to maintain family-wise alpha at .05.

Object touch

A total touch score (0–3) was calculated for each infant based on the number of objects touched across the three trials (see Table 1). As expected, a *t*-test, corrected for unequal variances, indicated that infants in the Anger group touched fewer objects than did infants in the Neutral group, $t(35) = 3.57$, $p = .001$, $d = .85$. Nonparametric analysis also produced a significant result, Mann–Whitney *U test* = 450.00, $p < .001$.

Latency to touch

Also as expected, infants in the Anger group took significantly longer to touch the objects than did infants in the Neutral group, $t(33.82) = 3.17$, $p = .003$, $d = .79$ (Table 1).

Duration of object touch

A duration of touch score was calculated that took into account the amount of time remaining in the response period once infants had first touched the object. A mean proportion of time spent touching the objects was calculated for each infant (Table 1). The results showed that infants spent less time touching the objects in the Anger vs. Neutral group, $t(37.05) = 2.47$, $p = .02$, but this was not statistically significant once the Bonferroni correction was applied.

Imitation of the target acts

Because there was a significant group effect for the latency-to-touch measure, an imitation proportion score was calculated for each infant, based on the trials in which infants had at least a 10-sec window after touching the object in which to imitate. This time frame was chosen because previous studies have shown that infants typically imitate

TABLE 1
Eavesdropping Phase: Infant Instrumental Behavior as a Function of Experimental Group

	Experimental group			
	Anger (N = 36)		*Neutral (N = 36)*	
Variable	*M*	*SD*	*M*	*SD*
Total touch score (0–3)	2.36	1.07	3.00	0.00
Latency to touch (in seconds)	2.15	2.51	.72	.57
Duration of touch (proportion)	.83	.22	.93	.07
Imitation score (proportion)	.49	.39	.73	.26

within this length of time (e.g., Meltzoff, 1985, 1988) and because it maximized the number of trials that could be included in the analysis. The proportion score was calculated as follows. If the infant was delayed in touching the object for more than 10 sec, that trial was dropped, because there was not the required 10-sec response period, and the infant's imitation score was the proportion of the two remaining trials. For example, if the infant produced the target action in one of the two trials, the score would be .50.

As expected, analysis of these proportion scores (Table 1) revealed that infants in the Anger group were less likely to imitate the target actions than were infants in the Neutral group, $t(52.86) = 2.94$, $p = .005$, $d = .71$. Nonparametric analysis also produced a significant result, Mann–Whitney U test = 367.00, $p = .008$.

Eavesdropping phase: secondary analyses

Infant affect

Infants' facial expressions were analyzed to explore whether they "caught" the Emoter's affect during the Eavesdropping phase of the experiment (Table 2). Infant mean positive and negative affect scores during the emotional interchange between the Emoter and the Agent were analyzed with MANOVA. As expected, this analysis did not reveal any significant multivariate [Pillai's trace = .04, $F(2,69) = 1.31$, $p = .28$] or univariate effects [positive affect $F(1,70) = 2.57$, $p = .11$; negative affect $F(1, 70) = .01$, $p = .92$]. The same analysis was undertaken for infant affect scores in the response period (Table 2). There was no significant multivariate effect, Pillai's trace = .03, $F(2\ 69) = 1.22$, $p = .30$. The univariate effects for positive affect [$F(1,70) = .39$, $p = .53$] and negative affect [$F(1,70) = 2.19$, $p = .14$] were also nonsignificant. Consistent with previous eavesdropping studies, infants showed very low levels of negative affect overall. Moreover, there were no instances of fearful facial expressions during either the emotional interchanges or the response periods.

Infant attention

There was no significant difference between the Anger ($M = .88$, $SD = .05$) and the Neutral ($M = .89$, $SD = .04$) groups in the proportion of time that infants attended to

TABLE 2
Eavesdropping Phase: Infant Affect as a Function of Experimental Group

	Experimental group			
	Anger (N = 36)		*Neutral (N = 36)*	
Variable	*M*	*SD*	*M*	*SD*
Emotional interchange				
Positive affect score	.28	.43	.46	.54
Negative affect score	.28	.33	.27	.40
Response period				
Positive affect score	1.01	.59	1.10	.66
Negative affect score	.17	.31	.28	.32

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

the Agent's demonstrations of the target actions, $t(62.88) = 1.01$, $p = .32$. Thus, infants' hesitancy to play with the objects in the Anger group was not the result of inattention—they were just as likely to have seen what to do with the objects as those infants in the Neutral group.

Infants' attention (in seconds) to the Emoter during the 20-sec response periods was also examined. There was no significant difference between the Anger ($M = 3.75$, $SD = 2.49$) and the Neutral group ($M = 2.91$, $SD = 1.23$), $t(51.03) = 1.82$, $p = .08$. Thus, it was not the case that infants in the Anger group spent so much time monitoring the Emoter during the response period that they did not have sufficient time to play with the object.

Engagement phase: main analyses

Two-tailed tests were employed, and a Bonferroni correction ($p < .01$) was employed for the main analyses to maintain family-wise alpha at .05.

Touch score

A total touch score (0–3) was calculated for each infant, reflecting the number of toys touched across the three tasks (see Table 3). The results showed that infants in the Anger group were less likely to touch the toys than were those in the Neutral group, $t(58.44) = 2.40$, $p = .02$, but this was not statistically significant once the Bonferroni correction was applied. A nonparametric analysis revealed the same finding, Mann–Whitney U test = 476.00, $p = .02$.

Latency to touch

Because the tasks differed in the length of the response period, the latency-to-touch scores were converted to standard z-scores. A mean latency z-score was then created for each infant (Table 3). Analysis of these scores indicated that infants in the Anger group took significantly longer to touch the toys than did infants in the Neutral group, $t(38.18) = 3.43$, $p = .001$, $d = .83$.

Play score

A play proportion score was calculated for each infant, based on the tasks in which they touched the toy (Table 3). Infants in the Anger group were significantly less likely

TABLE 3
Personal Engagement Phase: Infant Behavior as a Function of Group

	Experimental group			
	Anger (N = 36)		*Neutral (N = 36)*	
Variable	*M*	*SD*	*M*	*SD*
Total touch score (0–3)	2.33	.83	2.72	.51
Latency to touch (z-score)	.58	1.38	−.26	.40
Play score (proportion)	.46	.34	.77	.28
Relinquish score (proportion)	.69	.35	.46	.35
Latency to relinquish (z-score)	−.17	.79	.21	.72

to play with the toys than were those in the Neutral group, $t(68) = 4.20$, $p < .001$, $d = .99$ The same significant result was obtained using a nonparametric analysis, Mann–Whitney U test= 307.00, $p < .001$.

Relinquish score

A relinquish proportion score was created for each infant, using the tasks in which they touched the toy (Table 3). Analysis of these scores revealed that infants in the Anger group were more likely to relinquish the toys than were those in the Neutral group, $t(68) = 2.76$, $p = .007$, $d = .66$. The same significant result was obtained using a nonparametric analysis, Mann–Whitney U test= 386.00, $p = .007$.

Latency to relinquish

The latency-to-relinquish scores were converted into z-scores for each task, and a mean z-score was calculated for each infant (Table 3). Infants in the Anger group were faster to relinquish the toys than were those in the Neutral group, $t(68) = 2.11$, $p = .039$, but this difference was not statistically significant once the Bonferroni correction was applied.

Engagement phase: secondary analyses

Infant affect

As expected, the infants themselves displayed very little negative affect during the engagement tasks, and negative affect scores did not vary as a function of group, $M_{\text{Anger}} = .05$, $SD = .18$; $M_{\text{Neutral}} = .10$, $SD = .21$, $t(68.67) = 1.21$, $p = .23$. Infants' positive affect scores likewise did not differ across the two groups, $M_{\text{Anger}} = .73$, $SD = .58$; $M_{\text{Neutral}} = .75$, $SD = .66$, $t(70) = .13$, $p = .90$. Consistent with these findings, no fearful facial expressions were noted during these tasks.

Infant attention

The mean proportion scores for infants' looks to the Emoter's face were analyzed. There was no significant difference between the groups, $M_{\text{Anger}} = .21$, $SD = .13$; $M_{\text{Neutral}} = .20$, $SD = .10$; $t(70) = .13$, $p = .90$. Thus, it was not the case that infants in the Anger group were so preoccupied with monitoring the Emoter that they then failed to explore the toys.

Infant avoidance of the Emoter

In general, "avoidance" or "distancing" behaviors were rare, and equally so, in both groups (*leaning away from the Emoter*: 3 instances in 108 response periods for the Anger group and 4 in 108 for the Neutral group; *pushing the Emoter's hand away*: 1/108 for Anger and 3/108 for Neutral; *trying to get off the parent's lap*: 0/108 for Anger and 1/108 for Neutral). Infants turned their face and/or body away from the Emoter in about 12% of the response periods, and there was no difference between the Anger (13/108) and Neutral (14/108) groups in this regard.

Correlational analyses

Because infants in the Neutral group were more likely to play with the toys than were those in the Anger group, it was possible that there was less toy relinquishment in the former group only because they were too busy exploring the toys to notice or respond to the Emoter's requests. Although this explanation cannot be completely ruled out, it seems unlikely given that there was no significant correlation between infant toy play and relinquishment in the overall sample, $r(72) = -.07$, $p = .56$, or in the groups taken individually (Anger group, $r(36) = .30$, $p = .07$; Neutral group, $r(36) = -.27$, $p = .11$).

For completeness, additional correlational analyses were conducted to explore potential links between infants' behavior in the Eavesdropping and the Engagement phases. Due to their exploratory nature, these analyses are presented in the Data S1.

DISCUSSION

The findings demonstrate that 15-month-old infants generalize emotional information derived from watching a third-party interaction to their own subsequent dyadic interaction with that person. After observing an adult express anger toward another individual during the eavesdropping trials, infants behaved as if they expected that the adult would become angry again in a new social situation. These findings address social developmental theory and have implications for child clinical psychology.

In the first phase of the study, infants were bystanders, eavesdropping on an emotional interchange between two adults and learning about the regularities in the adults' behavior. Infants' behavior in the response period replicated the findings from previous eavesdropping studies (e.g., Repacholi & Meltzoff, 2007). Specifically, infants who saw the Emoter express anger toward the Agent were hesitant to play with the objects relative to infants in the Neutral group. As argued by Repacholi et al. (2008, pp. 571–573), infants behaved as if they predicted that the Emoter would become angry if she saw them play with the objects.

One lean, alternative explanation is that infants "caught" the Emoter's negative affect. In this case, the infants' *own negative affect* would inhibit their play, rather than infants' prediction that the Emoter would become angry if they played with the objects. We do not favor this particular lean interpretation for two reasons.

First, the contagion account is unlikely given the results of the detailed infant affect coding that was reported for both the emotional interchange and for the response period. In the current study, consistent with previous research (e.g., Repacholi et al., 2008), there were no significant differences between the Neutral and Anger groups with regard to infants' facial expression. Indeed, there were very few negative infant expressions overall, although they would be expected if it was a matter of emotional contagion.

The argument against a simple contagion explanation is also bolstered by findings in another eavesdropping study. Repacholi et al. (2014) reported that 15-month-old infants eagerly played with the object if the previously angry Emoter had her back turned during the response period and was unable to see what they were doing with the object. If general emotional contagion is playing an important role, infants should be hesitant to play with the objects, even when the Emoter cannot see their actions;

and this was not the case. This finding suggests that the infants were not fearful because of the mere presence of the Emoter or because they had been upset after observing her angry display. Instead, Repacholi et al. (2014) hypothesized that infants were able to determine when they themselves might become the target of another person's anger and then regulated their behavior accordingly. We similarly suggest that infants in the current study acted so as to avoid eliciting further Emoter anger.

Generalization across social context: personal engagement phase

The novel aspect of the current study was the inclusion of the personal engagement tasks, following the eavesdropping trials, to test generalization. Throughout these new tasks, the Emoter maintained a neutral demeanor. Moreover, infants had not previously observed either the Emoter or the Agent within the context of these novel tasks. Would infants generalize the Emoter's prior anger and behave as if she was an anger-prone person in this new social situation?

As expected, there were significant differences in the behavior of infants in the Anger vs. Neutral groups in the engagement tasks, *even though all infants were treated identically in this phase of the experiment*. The only procedural difference between the groups was with regard to the Emoter's *emotional history*—in all other respects, this phase of the experiment was identical across the two groups. Yet infants in the Anger group were inhibited in their exploration of the toys in the engagement tasks relative to infants in the Neutral group. The behavior of infants in the Anger group was thus consistent with the hypothesis that they were concerned that the Emoter would express anger if the infants played with the toys. Infants' behavior is noteworthy, given that the new test stimuli in this phase of the experiment were attractive, colorful toys.

A lean interpretation, akin to contagion, might be that infants were fearful of the Emoter in the first phase of the study, and that this was carried over to the engagement tasks, thereby dampening infants' exploration of the new toys. This is possible, but we argue that it is unlikely given that there were no significant differences between the Anger and Neutral groups in terms of infants' negative facial expressions—either in the Eavesdropping or in the Engagement phase. Moreover, coders reported zero instances of infant fearful facial expressions. In addition, if infants were fearful of the Emoter, one might expect them to be highly vigilant. Yet infants in the Anger group were no more likely to watch the Emoter during these engagement tasks than were those in the Neutral group.

We propose that infants used the emotional information in the Eavesdropping phase to make a prediction about the Emoter's affective reactions in the Personal Engagement phase. More specifically, infants kept track of the Emoter's affect over the three eavesdropping trials and detected a consistency in her emotional responses to the three different object–action pairings (akin to infants extracting "category" information based on multiple exemplars). Then, in the engagement tasks, infants expected that the Emoter would again become angry if they played with the new toys. It is intriguing to speculate that infants attributed an underlying disposition to the Emoter—she was construed as an "anger-prone" person and this attribution would then predict how to respond to her in a variety of new contexts outside of the original one.

That infants behaved in this way is relevant to social developmental theory especially because the context had changed. First, the test stimuli were completely different (i.e., colorful, attractive manufactured toys); second, the Agent's actions were different from what she had performed in the earlier phase; third, the Emoter did not ever indicate that she was angered or otherwise upset by people playing with these toys; and fourth, unlike the Eavesdropping phase, the Emoter now actively engaged with the infants and adopted a neutral demeanor. Despite these contextual changes, infants behaved as if they were anticipating an angry response from the Emoter.

It is also relevant to theory that the personal engagement tasks placed new social demands on infants. Unlike the Eavesdropping phase, in which infants simply *observed* the Emoter's interaction with the Agent, infants were now faced with a situation in which they would have to *personally engage* with the Emoter. Faced with this situation, infants in the Anger group were more likely to relinquish the toys to the Emoter than were those in the Neutral group.

How can we explain this particular effect? A lean interpretation is that infants evaluated the eavesdropping stimuli as being "negatively valenced", and then generalized this to the novel toys in the engagement tasks. Thus, infants may have been eager to cast them aside by giving them to the Emoter. This seems unlikely, however, given that infants' toy play and relinquish scores in the Anger group were not significantly and negatively correlated. In other words, it was not the case that infants with low play scores were more likely to give the toys to the Emoter. It is also noteworthy that in the Eavesdropping phase, even though infants in the Anger group were hesitant to play with the test objects, they rarely tried to get rid of them—either by offering them to the Parent and/or Agent, pushing them away, or throwing them on the floor—and there was no difference between the Anger and Neutral groups in this regard.[5]

Another (related) lean interpretation is that infants in the Anger group relinquished the toys to prevent any further engagement with the "bad" Emoter. This too seems unlikely given that there were very few instances in which infants leaned or turned away from the Emoter, pushed her hand away, or tried to get off the parent's lap during the engagement tasks. Most importantly, there were no differences between the Anger and Neutral groups in terms of the frequency of these avoidance behaviors. Also, infants in the Anger group were no less likely to look at the Emoter (visual avoidance) than were those in the Neutral group.

Infant appeasement behavior and how infants cope with social threat

Although we acknowledge that it is speculative, we suggest that the overall pattern of findings may be best understood in terms of infant "appeasement" efforts. In the current testing setup, infants could choose to relinquish the toys in an effort to keep themselves from becoming the target of the Emoter's anger. Based on the observation of a pattern of angry behavior in the eavesdropping trials, infants may have expected the Emoter to become angry if they did not appease her and give her the toys that she requested. In contrast, infants in the Neutral group may have felt more comfortable ignoring the Emoter's request to hand over the attractive toys, because these infants were not expecting their noncompliance to elicit an angry response.

It is possible that infants in the Anger group might not have employed an appeasement strategy had they not been confined to their parent's lap at a table with no apparent means of escape. In other circumstances, infants might avoid engaging with

[5]Each of these behaviors occurred in ≤ 5 of 108 trials in each experimental group.

the Emoter and actively retreat (e.g., crawl or walk away). We are currently exploring this idea through further experimental manipulations.

An interesting point to consider is why infants in the current study relinquished toys to a negative character (i.e., the previously angry Emoter), whereas those in Hamlin et al. (2011) were less likely to distribute a resource to a negative (i.e., antisocial) than a positive (i.e., prosocial) puppet. Aside from differences in infant age (15 vs. 19 to 24 months) and the type of agents (live adults vs. puppets), there are also important differences in the psychological task used in the two studies. For instance, Hamlin et al. measured infants' social preferences, whereby an adult asked infants to choose which of two puppets should receive a treat. In contrast, in the current study, it was not a matter of preference and beneficence, but whether or not infants complied with the previously angry adult's request for a toy. Moreover, there was a potential cost (possibly more adult anger) to infants in the current study if they did not comply with the Emoter's request, whereas in Hamlin et al. choosing one agent over another was not a costly decision. There was no strong reason for infants to expect that the antisocial puppet would respond negatively or retaliate in some way if it were not the chosen recipient of the treat. In sum, there is not a direct contradiction between the two sets of findings. The appeasement interpretation presented here is perhaps more similar to the work of Dahl, Schuck, and Campos (2013), who reported that 17- and 22-month-old infants did *not* show a preference for giving an out-of-reach object to a prosocial live adult relative to an antisocial live adult. Moreover, despite the fact that differential helping was shown by 26 months of age, even these older infants were willing to help the antisocial adult in at least one of the trials.

Broader implications for social developmental theory and infant affective cognition

The current findings indicate that, early in the second year of life, infants can track a person's emotional behavior over multiple trials, learn the behavioral consistencies, and then generalize this information to form expectations about that person's emotional behavior in a new social situation. This cross-situational prediction and stability suggest that infants did not view the Emoter's angry behavior as being driven purely by external factors. Instead, infants behaved as if the Emoter was an "anger-prone" person and expected this behavioral tendency to generalize across situations. Looked at in this way, the emotional generalization observed here may be a precursor to the later emergence of "trait-like" inferences about other people's emotions.

The process of trait attribution has been studied in adults by social psychologists, but less is known about its developmental origins. There is emerging evidence that, in some circumstances, preschool-age children can make behavior-to-trait inferences and trait-to-behavior predictions (e.g., Liu, Gelman, & Wellman, 2007; Seiver, Gopnik, & Goodman, 2013). However, work on the roots of trait-like attributions in infants is limited. The current study, along with the one reported by Repacholi et al., (2016), begins to fill this gap in the literature. We suggest that the ability to make predictive generalizations about another person's emotional behavior supports the development of children's later capacity to attribute emotional traits to others. Most Western adults tend to assume that traits are relatively stable—enduring both over time and across situations (Jones & Harris, 1967; Ross & Nisbett, 1991). Infants in the current study generalized across social situations, which is a key new result. Left to investigate is whether infants also expect other people's emotional behaviors to endure over a significant delay in time (our change of social context occurred after only a short delay).

It is also worthwhile considering whether infants construed the Emoter not only as anger-prone, but also as socially dominant. Adult observers rate angry facial expressions as high on dominance traits (Hareli, Shomrat, & Hess, 2009; Knutson, 1996). Studies using infant looking-time methods (and 2-D shapes as agents) suggest that infants may be able to abstract dominance cues (size; conflict outcomes) as early as 10- to 12-months of age (Mascaro & Csibra, 2012; Thomsen, Frankenhuis, Ingold-Smith, & Carey, 2011). In our study, infants may also have made inferences about dominance. The Emoter's angry outbursts along with the Agent's neutral face and soft-voiced response (e.g., "Oh, I thought it was really interesting") to the Emoter's anger, could have provided cues to social dominance. Then, when the previously angry/dominant adult tried to engage in a social interaction with the infant and requested a toy, the prudent and much smaller infant behaved submissively, relinquishing the toy. Future research could address this idea by examining whether infants expect the previously angry Emoter to prevail in a subsequent conflict with the Agent over resources (e.g., space and toys).

In conclusion, when observing a third-party interaction between two adults, infants are not limited to learning about a person's *current* emotional state in a *particular* context. Infants can also use information from these third-party emotional interchanges to predict a person's future affective behavior using novel toys in a different social context involving their own dyadic interactions (i.e., she will become angry with *me* if I do not give her what she wants). Such generalizations about other people's emotional tendencies may be a foundation for more mature inferences about people's emotional dispositions across time and context, which underlies so much of our adult (Western) ideas about people's "personality traits."

REFERENCES

Ambady, N., & Rosenthal, R. (1992). Thin slices of expressive behavior as predictors of interpersonal consequences: A meta-analysis. *Psychological Bulletin*, *111*, 256–274.

Caplan, M., Vespo, J., Pederson, J., & Hay, D. F. (1991). Conflict and its resolution in small groups of one- and two-year-olds. *Child Development*, *62*, 1513–1524.

Carlson, S. M., & Moses, L. J. (2001). Individual differences in inhibitory control and children's theory of mind. *Child Development*, *72*, 1032–1053.

Chow, V., Poulin-Dubois, D., & Lewis, J. (2008). To see or not to see: Infants prefer to follow the gaze of a reliable looker. *Developmental Science*, *11*, 761–770.

Dahl, A., Schuck, R. K., & Campos, J. J. (2013). Do young toddlers act on their social preferences? *Developmental Psychology*, *49*, 1964–1970.

Dodge, K. A. (2006). Translational science in action: Hostile attributional style and the development of aggressive behavior problems. *Development and Psychopathology*, *18*, 791–814.

Dunfield, K., Kuhlmeier, V. A., O'Connell, L., & Kelley, E. (2011). Examining the diversity of prosocial behavior: Helping, sharing, and comforting in infancy. *Infancy*, *16*, 227–247.

Ekman, P., & Friesen, W. V. (1975). *Unmasking the face: A guide to recognizing emotions from facial clues*. Englewood Cliffs, NJ: Prentice Hall.

Fenson, L., Dale, P. S., Reznick, J. S., Thal, D., Bates, E., Hartung, J. P., …, Reilly, J. S. (1993). *The Macarthur communicative development inventories: user's guide and technical manual*. Baltimore, MD: Paul H. Brookes Publishing Co.

Floor, P., & Akhtar, N. (2006). Can 18-month-old infants learn words by listening in on conversations? *Infancy*, *9*, 327–339.

Gampe, A., Liebal, K., & Tomasello, M. (2012). Eighteen-month-olds learn novel words through overhearing. *First Language*, *32*, 385–397.

Grossman, T. (2010). The development of emotion perception in face and voice during infancy. *Restorative Neurology and Neuroscience*, *28*, 219–236.

Hamlin, J. K., Wynn, K., & Bloom, P. (2007). Social evaluation by preverbal infants. *Nature*, *450*, 557–559.

Hamlin, J. K., Wynn, K., Bloom, P., & Mahajan, N. (2011). How infants and toddlers react to antisocial others. *Proceedings of the National Academy of Sciences of the United States of America*, *108*, 19931–19936.

Hanna, E., & Meltzoff, A. N. (1993). Peer imitation in toddlers in laboratory, home and day-care contexts: Implications for social learning and memory. *Developmental Psychology*, *29*, 701–710.

Hareli, S., & Hess, U. (2010). What emotional reactions can tell us about the nature of others: An appraisal perspective on person perception. *Cognition and Emotion*, *24*, 128–140.

Hareli, S., Shomrat, N., & Hess, U. (2009). Emotional versus neutral expressions and perceptions of social dominance and submissiveness. *Emotion*, *9*, 378–384.

Hertenstein, M. J., & Campos, J. J. (2004). The retention effects of an adult's emotional displays on infant behavior. *Child Development*, *75*, 595–613.

Hirshberg, L. M., & Svejda, M. (1990). When infants look to their parents: I. Infants' social referencing of mothers compared to fathers. *Child Development*, *61*, 1175–1186.

Izard, C. E. (1979). *The maximally discriminative facial movement coding system (MAX)*. Newark. DE: University of Delaware, Instructional Resources Center.

Jones, E. E., & Harris, V. A. (1967). The attribution of attitudes. *Journal of Experimental Social Psychology*, *3*, 1–24.

Keltner, D., Young, R. C., & Buswell, B. N. (1997). Appeasement in human emotion, social practice, and personality. *Aggressive Behavior*, *23*, 359–374.

Klein, P. J., & Meltzoff, A. N. (1999). Long-term memory, forgetting, and deferred imitation in 12-month-old infants. *Developmental Science*, *2*, 102–113.

Klinnert, M. D., Emde, R. N., Butterfield, P., & Campos, J. J. (1986). Social referencing: The infant's use of emotional signals from a friendly adult with mother present. *Developmental Psychology*, *22*, 427–432.

Knutson, B. (1996). Facial expressions of emotion influence interpersonal trait inferences. *Journal of Nonverbal Behavior*, *20*, 165–182.

Learmonth, A. E., Lamberth, R., & Rovee-Collier, C. (2004). Generalization of deferred imitation during the first year of life. *Journal of Experimental Child Psychology*, *88*, 297–318.

Liu, D., Gelman, S. A., & Wellman, H. M. (2007). Components of young children's trait understanding: Behavior-to-trait inferences and trait-to-behavior predictions. *Child Development*, *78*, 1543–1558.

Mascaro, O., & Csibra, G. (2012). Representation of stable social dominance relations by human infants. *Proceedings of the National Academy of Sciences of the United States of America*, *109*, 6862–6867.

Meltzoff, A. N. (1985). Immediate and deferred imitation in fourteen- and twenty-four-month-old infants. *Child Development*, *56*, 62–72.

Meltzoff, A. N. (1988). Infant imitation after a 1-week delay: Long-term memory for novel acts and multiple stimuli. *Developmental Psychology*, *24*, 470–476.

Mumme, D. L., & Fernald, A. (2003). The infant as onlooker: Learning from emotional reactions observed in a television scenario. *Child Development*, *74*, 221–237.

Quinn, P. C., Anzures, G., Izard, C. E., Lee, K., Pascalis, O., Slater, A. M., & Tanaka, J. W. (2011). Looking across domains to understand infant representation of emotion. *Emotion Review*, *3*, 197–206.

Repacholi, B. M., & Meltzoff, A. N. (2007). Emotional eavesdropping: Infants selectively respond to indirect emotional signals. *Child Development*, *78*, 503–521.

Repacholi, B. M., Meltzoff, A. N., & Olsen, B. (2008). Infants' understanding of the link between visual perception and emotion: "If she can't see me doing it, she won't get angry". *Developmental Psychology*, *44*, 561–574.

Repacholi, B. M., Meltzoff, A. N., Rowe, H., & Toub, T. S. (2014). Infant, control thyself: Infants' integration of multiple social cues to regulate their imitative behavior. *Cognitive Development*, *32*, 46–57.

Repacholi, B. M., Meltzoff, A. N., Toub, T. S., & Ruba, A. L. (2016). Infants' generalizations about other people's emotions: Foundations for trait-like attributions. *Developmental Psychology*, Advance online publication doi: 10.1037/dev0000097.

de Rosnay, M., Cooper, P. J., Tsigaras, N., & Murray, L. (2006). Transmission of social anxiety from mother to infant: An experimental study using a social referencing paradigm. *Behaviour Research and Therapy*, *44*, 1165–1175.

Ross, L., & Nisbett, R. E. (1991). *The person and the situation: Perspectives of social psychology*. New York, NY: Mcgraw-Hill.

Seiver, E., Gopnik, A., & Goodman, N. D. (2013). Did she jump because she was the big sister or because the trampoline was safe? Causal inference and the development of social attribution. *Child Development*, *84*, 443–454.

Sommerville, J. A., & Crane, C. C. (2009). Ten-month-old infants use prior information to identify an actor's goal. *Developmental Science*, *12*, 314–325.

Sommerville, J. A., Schmidt, M. F. H., Yun, J.-e., & Burns, M. (2013). The development of fairness expectations and prosocial behavior in the second year of life. *Infancy*, *18*, 40–66.

Sullivan, M. W., & Lewis, M. (2003). Emotional expressions of young infants and children: A practitioner's primer. *Infants and Young Children*, *16*, 120–142.

Thomsen, L., Frankenhuis, W. E., Ingold-Smith, M., & Carey, S. (2011). Big and mighty: Preverbal infants mentally represent social dominance. *Science*, *331*, 477–480.

de Waal, F. B. M. (1982). *Chimpanzee politics: Power and sex among apes*. New York, NY: Harper & Row.

Warneken, F., & Tomasello, M. (2007). Helping and cooperation at 14 months of age. *Infancy*, *11*, 271–294.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Data. S1. Exploratory correlational analyses.