Developmental Psychology
2016, Vol. 52, No. 3, 364–378

0012-1649/16/$12.00 http://dx.doi.org/10.1037/dev0000097

Infants' Generalizations About Other People's Emotions: Foundations for Trait-Like Attributions

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Adults often attribute internal dispositions to other people and down-play situational factors as explanations of behavior. A few studies have addressed the origins of this proclivity, but none has examined emotions, which rank among the more important dispositions that we attribute to others. Two experiments (N = 270) explored 15-month-old infants' predictive generalizations about other people's emotions. In exposure trials, infants watched an adult (Experimenter) perform actions on a series of objects and observed another adult (Emoter) react with either anger or neutral affect. Infants were then handed the objects to test whether they would imitate the Experimenter's actions. One chief novelty of the study was the inclusion of a generalization trial, in which the Experimenter performed a novel act on a novel object. We systematically manipulated whether the Emoter did or did not respond angrily to this novel demonstration, and whether the Emoter watched the infant's response. Even when no further emotional information was presented in the generalization trial, infants were still hesitant to perform the act when the previously angry Emoter was watching them. Infants tracked the Emoter's affective behavior and, based on her emotional history, they predicted that she would become angry again if she saw them perform a novel act. Making predictive generalizations of this type may be a precursor to more mature trait-like attributions about another person's emotional dispositions.

Keywords: emotion, generalization, trait attribution, imitation, social cognition

Adult humans are amateur psychologists, seeking to explain and predict other people's behavior. In Western cultures, we often do this by attributing a variety of traits to other individuals, as well as to ourselves (Choi, Nisbett, & Norenzayan, 1999; Winter & Uleman, 1984). In its most mature form, trait attribution involves inferring the existence of enduring psychological qualities that motivate people's overt behavior (Ross & Nisbett, 1991). For example, if Sally volunteers at a soup kitchen, we might conclude that she is a "generous" person, and that this trait will lead her to engage in other forms of generosity in the future. We might make a *predictive generalization* that goes beyond volunteerism and predict that she is likely to donate money to charity. We infer the existence of personality traits based on our behavioral observations and often tend to down-play or even ignore situational factors (Heider, 1958; Jones & Harris, 1967; Ross, 1977; see Shoda & Mischel, 2000 for a more detailed and nuanced account).

Children make trait attributions, although less frequently and with less ease than adults (Kalish, 2002). It has been argued that children do not understand traits as stable, internal psychological characteristics underlying behavior until around age 7 or 8 (e.g., Livesley & Bromley, 1973; Rholes & Ruble, 1984). Evidence is emerging that, in some circumstances, even preschoolers can engage in trait-like reasoning or the precursors to it (e.g., Boseovski, Chiu, & Marcovitch, 2013; Heyman & Gelman, 2000; Liu, Gelman, & Wellman, 2007; Seiver, Gopnik, & Goodman, 2013). However, there is little research investigating the origins of trait-like attributions during infancy. As a first step toward closing this gap, the current research explores infants' nascent ability to make predictive generalizations about other people's emotions.

There are a handful of infant studies relevant to the developmental origins of a trait-attribution capacity. These have typically used the visual violation-of-expectancy paradigm, and none involve the attribution of emotions. For example, studies have indicated that infants can make attributions about another person's tendency to perform specific actions (e.g., Song, Baillargeon, & Fisher, 2005) and to reach for specific objects (e.g., Guajardo & Woodward, 2004). Infants' attributions about other people's social (or interpersonal) dispositions have also been explored. For example, Mascaro and Csibra (2012) familiarized 9- and 12-month-old infants to a video involving geometric figures. Initially, infants saw a "subordinate" agent collecting some objects. A "dominant" agent then entered the scene and the subordinate remained still, allowing the dominant one to collect the objects. Infants were subsequently shown generalization events. The 12-month-olds looked longer at an inconsistent scene (the subordinate prevailed) than a consistent scene; 9-month-olds failed to do so. The authors argued that 12-month-olds can make attributions about social dominance and can generalize this to a new scene.

This article was published Online First February 4, 2016.

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This research was supported by grants from the University of Washington Royalty Research Fund (65-8070) to BMR and the University of Washington Ready Mind Project Fund to ANM.

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This research and other related studies (e.g., Chow, Poulin-Dubois, & Lewis, 2008; Kuhlmeier, Wynn, & Bloom, 2003) suggest that infants can track an agent's social behavior over time, learn the behavioral consistencies, and use this information to make predictions about the agent's future behavior. It is open to debate whether infants appreciate that internal or psychological characteristics of the individual agents underlie these behaviors, as entailed in trait attribution. Even if infants do not understand this, these types of predictive generalizations could be critical building blocks for the later emergence of mature trait attribution and reasoning.

There is, however, an important gap in the current infant generalization literature. There have been no studies on infants' predictive generalizations about other people's *emotional* behaviors. This is surprising given that some of the most important and ecologically significant attributions made by adults are those that refer to other people's *emotional* dispositions (e.g., "anxious," "surly," or "morose").

There is a relatively large social referencing literature that explores how 12- to 18-month-old infants use other people's emotional expressions to evaluate objects and events (e.g., this is forbidden or dangerous). Crucially, however, this research has not explored the question of predictive generalizations about emotions and does not directly address the question of whether infants make attributions about other people's emotional dispositions. From the extant work on social referencing we do not know, for example, whether infants who encounter an individual who has the same emotional reaction to different objects, expect there to be continuity in this person's affective behavior. Do they predict that this person will have the same reaction to a new object—in other words, do they view this person as being prone to expressing a particular emotion? Anger is an especially salient emotion for older infants and toddlers (Campos, Anderson, Barbu-Roth, Hubbard, Hertenstein, & Witherington, 2000; Grossmann, Striano, & Friederici, 2007; Saarni, Mumme, & Campos, 1998). Here we examined whether 15-month-old infants make this type of generalization about another person's angry behavior. In essence we test whether infants come to see a person as anger-prone.

To investigate infants' attributions about emotions, we adapted the "emotional eavesdropping" paradigm introduced by Repacholi and Meltzoff (2007). In the standard eavesdropping procedure, infants watch one adult (the Experimenter) demonstrating an action on an object. Another adult (the Emoter) enters the room and sees the Experimenter performing the action. The Emoter responds by expressing Anger (or Neutral affect) toward the Experimenter. Infants are then given an opportunity to play with the object, during which time the Emoter gazes at the infant, with a neutral facial expression.

A series of eavesdropping studies has shown that 15- and 18-month-olds are hesitant to play with the objects when the Emoter has previously been angry versus when her prior reaction was emotionally neutral (Repacholi & Meltzoff, 2007; Repacholi, Meltzoff, & Olsen, 2008; Repacholi, Meltzoff, Rowe, & Toub, 2014). Two types of control groups rule out simple contagion or general emotional arousal. First, infants exposed to the same anger by the same adult in the same situation are not hesitant to play with the objects as long as the previously angry person is not watching their behavior. Second, infants are not hesitant to play with the objects if an Emoter who was not previously angry is now watching them. Thus, it is not a simple "catching" of the Emoter's negative affect. The authors hypothesize that infants engage in a more nuanced process of weighing the Emoter's prior emotion coupled with whether the Emoter is now watching one's own behavior. The inference that has been drawn is that infants understand that the Emoter will get angry when she sees people performing the "forbidden act."

One question that arises is whether, in a new trial using a *new action* on a *novel object* and *no further emotional information*, infants expect the Emoter to become angry if the infant plays with this new object. Do infants generalize and predict the Emoter's anger in this new situation? Given the centrality of emotional dispositions to adult social life, and the ecological validity of studying how infants interpret and attribute emotions, we designed this type of emotional generalization test.

Experiment 1

Infants were randomly assigned to four experimental groups that differed in theoretically driven ways (Tables 1 and 2). The first three trials in all experimental groups were the same as those used in standard eavesdropping studies (as described above). These trials provided infants with an opportunity to gather information about another person's typical emotional reactions. The novel aspect of the experiment was the inclusion of a Generalization phase (see Table 2) in which we: (a) administered a fourth trial to test infants' generalizations concerning the Emoter's reaction to new actions on a novel object, and (b) systematically manipulated whether or not the Emoter expressed any emotion in this fourth trial.

In the *Anger-then-absent* group, the Emoter was out of the room when the Experimenter demonstrated the action in Trial 4 (generalization). Consequently, the Emoter did not express anger or any other emotion in this trial. Instead, the Emoter returned to the room at the end of the demonstration and simply watched the infant during the ensuing response period. Will infants generalize from the earlier trials (in which the Emoter expressed anger) to predict that the Emoter will become angry about a new action on a novel object?

As a further test of the circumstances in which infants might generalize people's emotions, we included another group in which the Emoter expressed anger in the first three trials and was likewise kept unaware of the Experimenter's actions in Trial 4, albeit for a different reason. In this *Anger-then-turnaround* group, the Emoter was initially seated with her back to the Experimenter and infant in Trial 4. The Emoter did not express any vocal anger and her neutral facial expression could not be seen by the infant. After the Experimenter's demonstration of the action, the Emoter rotated her chair so that she could watch the infant during the response period. Even if infants generalize the Emoter's emotion in Trial 4 in the *Anger-absent* group, they might not do so in the *Anger-then-turnaround* group. Because the Emoter is present during the demonstration in Trial 4 for this group, infants might attribute her lack of anger to a meaningful change (or malleability) in her emotional behavior; on the other hand, infants might recognize that the Emoter did not respond emotionally because she *could not see* what the Experimenter had done. If so, then, given the Emoter's prior history of anger, infants might still expect the Emoter to

Table 1
Temporal Flow of Procedure

	Phase 1: Emotion exposure	Phase 1: Emotion exposure	Phase 1: Infant response period[a]	Phase 2: Generalization	Phase 2: Generalization	Phase 2: infant response period[a]
Experimental groups	Emoter's gaze	Emoter emotional reaction	Emoter's gaze	Emoter's gaze	Emoter emotional reaction	Emoter's gaze
Experiment 1						
1. *Anger-standard*	Watches demonstration	Anger	Looks toward infant	Watches demonstration	Anger	Looks toward infant
2. *Neutral-standard*	Watches demonstration	Neutral	Looks toward infant	Watches demonstration	Neutral	Looks toward infant
3. *Anger-then-absent*	Watches demonstration	Anger	Looks toward infant	Out of room and unable to see demonstration	No response	Looks toward infant
4. *Anger-then-turnaround*	Watches demonstration	Anger	Looks toward infant	Back turned and unable to see demonstration	No response	Looks toward infant
Experiment 2						
1. *Anger-standard*	Watches demonstration	Anger	Looks toward infant	Watches demonstration	Anger	Looks toward infant
2. *Anger-then-turnaround*	Watches demonstration	Anger	Looks toward infant	Back turned and unable to see demonstration	No response	Looks toward infant
3. *Neutral-then-turnaround*	Watches demonstration	Neutral	Looks toward infant	Back turned and unable to see demonstration	No response	Looks toward infant
4. *Anger-then-no-looking*	Watches demonstration	Anger	Looks toward infant	Back turned and unable to see demonstration	No response	Back turned and Unable to see infant
5. *Anger-then-blank-slate*	Watches demonstration	Anger	Looks toward infant	Watches demonstration	No response	Looks toward infant

[a] During the response period for all groups, when the Emoter was looking at the infant, she was silent and maintained a neutral, pleasant face.

become angry at them if they play with the new object in this trial.

Method

Participants. The sample consisted of 120 (60 male) 15-month-old infants, tightly clustered in terms of age (M = 15.02 months, SD = 5.49 days, range = 14.66–15.32 months). Additional infants were excluded from the final sample because of fussiness/inattention (n = 13), procedural error (n = 8), parent interference (n = 7), and equipment failure (n = 2). Infants were recruited from a database of parents who had expressed interest in volunteering for studies at the University of Washington. All infants were full term (37–43 weeks), normal birth weight (2.5−4.5 kg), with no known physical, sensory, or mental handicap. The racial composition of this infant sample was White (78%), Black (1%), and mixed race (18%); with 3% of the parents not wishing to provide this information. About 9% of the parents identified their child's ethnicity as "Hispanic or Latino." Previous analysis of the participant pool indicated that the majority of infants were from middle- to upper-class families.

Design. Infants were randomly assigned to one of four independent groups (n = 30 participants in each; see Table 1): *Anger-standard*, *Neutral-standard*, *Anger-then-absent*, and *Anger-then-turnaround.* All infants participated in four trials, each involving a different test object and target act. Gender and object order was counterbalanced within each group.

Stimuli. The stimuli consisted of three components: the test objects, the Experimenter's target acts, and the emotional reactions displayed by the Emoter, as described below.

Test objects and acts. The four test objects were the same as those used in previous studies of infant imitation (Meltzoff, 1988) and emotional eavesdropping (Repacholi et al., 2008). One object was dumbbell-shaped, consisting of two wooden cubes, each with a plastic tube extending from it. The demonstrated (or target) act was to grasp the cubes and pull outward, which caused the object to come apart with a popping sound. The second object was a collapsible cup. The target act was to flatten the cup by pushing down on the top with a flat hand. The third stimulus was a box with a recessed button on the top surface and a wooden stick. The target act was to press the button with the stick, creating a buzzing sound. The fourth stimulus was a string of beads presented alongside a plastic cup. The target act was to pick up the beads at one end and drop them into the cup.

Emotional expressions. Two female adults were used, an Emoter (who displayed the emotions) and an Experimenter (who performed the target acts). The Experimenter demonstrated how to use the test objects in specific ways and in the *Anger* groups, the Emoter became "angry" each time, as if the Experimenter was performing a "forbidden act" whereas in the *Neutral-standard* group she did not. The Experimenter's facial and vocal expressions were always neutral when interacting with the Emoter.

In the three *Anger* groups, the Emoter's facial emotional expression followed Ekman and Friesen's (1975) description, and the Emoter's tone of voice was also angry. The angry emotion words used in the script were selected to be too difficult for 15-month-olds to understand (Fenson et al., 1993); thus, the assumption was that infants would use the tone of the voice as the relevant vocal cue for anger. Different verbal scripts were used in each anger

Table 2
Generalization Phase (Trial 4) as a Function of Experimental Group

Experimental groups	Emotional history of the emoter	Does Emoter see experimenter action?	Does Emoter express emotion toward experimenter?	Does Emoter see infant with object in response period?
Experiment 1				
1. *Anger-standard*	Anger	Yes	Yes	Yes
2. *Neutral-standard*	Neutral	Yes	Yes	Yes
3. *Anger-then-absent*	Anger	No	No	Yes
4. *Anger-then-turnaround*	Anger	No	No	Yes
Experiment 2				
1. *Anger-standard*	Anger	Yes	Yes	Yes
2. *Anger-then-turnaround*	Anger	No	No	Yes
3. *Neutral-then-turnaround*	Neutral	No	No	Yes
4. *Anger-then-no-looking*	Anger	No	No	No
5. *Anger-then-blank-slate*	Anger	Yes	No	Yes

trial, but all were similar in their structure and syllable length (see Appendix A). In the *Neutral-standard* group, the Emoter's mouth was relaxed, her forehead was smooth, there was minimal facial movement, and she spoke in a matter of fact fashion. The Neutral scripts were similar to the Anger scripts in terms of structure and number of syllables, and different Neutral scripts were used in each trial (see Appendix A). A series of manipulation checks indicated that the Emoter's facial and vocal displays were administered correctly (see Appendix B for details).

Equipment. One video-camera recorded the infant (head, torso, and hands) and part of the table surface in front of the infant. This recording was later used to examine infants' instrumental behavior. Another camera recorded a close-up view of infants' faces to later examine their facial expressions. A third camera provided a wide-angle view of the Experimenter and the Emoter. This video-record was used to determine whether the Emoter's affective displays were recognizable to naïve adult coders and to check that the Emoter remained neutral during all of the response periods (see Appendix B).

Procedure. Infants were individually tested while seated in their parent's lap at a table. An adult Experimenter sat on the other side of the table. Each infant participated in an Emotion Exposure Phase followed by a Generalization Phase.

Phase 1: Emotion exposure (Trials 1–3). The first three trials of all groups followed the procedure used in Repacholi and Meltzoff (2007). In Trial 1, the Experimenter demonstrated a target act on an object, two times. The Emoter subsequently entered the room, seated herself to the left of the Experimenter, and pretended to read a magazine. The Experimenter then requested the Emoter's attention ("Hillary, look at this"), using a neutral tone of voice. The Emoter then watched the demonstration with a neutral facial expression. After watching the Experimenter demonstrate the target act a third time, the Emoter expressed one of two emotions. In the Anger groups, the Emoter expressed anger (facially and vocally) toward the Experimenter in response to her action on the object (as if it was a forbidden act). In the Neutral group, an identical procedure was followed except the Emoter's facial expression and tone of voice were neutral. During this time, the infant was simply a bystander, "eavesdropping" on the emotional interchange between the two adults. The infants observed, but did not have an opportunity to act until the response period (described below). They were learning about the regularities in the adults' behavior.

After this emotional interchange, the procedure was identical and controlled for all of the groups. The Emoter adopted a neutral facial expression, oriented her body toward the infant, and looked with an attentive face in the infant's direction. The Experimenter placed the test object in front of the infant, and said "Here" in a neutral tone of voice. Infants were given a 20-s response period, during which the Experimenter looked down at her lap and maintained a neutral facial expression. The Experimenter retrieved the object at the end of the response period, and the Emoter exited the room. The next two trials followed an identical procedure, using different object-action pairs and emotion scripts each time (see Stimuli section).

Phase 2: Generalization (Trial 4). In the *Anger-standard* and *Neutral-standard* groups, Trial 4 proceeded in the same manner as the first three exposure trials. As usual, the Emoter entered the room just before the Experimenter's final demonstration of the new action on the new object. The Emoter watched the demonstration and then expressed anger or neutral affect toward the Experimenter. Infants were given 20 s in which to play with the object. Thus, in these two groups, Trial 4 was no different from the first three trials. These groups were used as comparisons to determine whether generalization occurred in the other two novel groups (described below).

Anger-then-absent group. In Trial 4, the Emoter did not enter the room until *after* the Experimenter had completed the third demonstration of the action. Thus, the Emoter did not witness the target act or express any anger. Upon entry, she sat down in her usual seat, and the test proceeded. The Experimenter presented the infant with the test object for a 20-s response period and the Emoter watched the infant, as in all other groups and trials.

Anger-then-turnaround group. In Trial 4, the Experimenter demonstrated the target act two times before the Emoter entered the room. Crucially, however, in this fourth trial the Emoter read a magazine with her back to the Experimenter and infant. During this time, the Experimenter produced the target action for the third time. Thus, the Emoter was physically present when the new act was performed on the new object in the generalization trial but did not perceptibly react to it one way or another (because she had her back turned). After this, the Emoter rotated her (swivel) chair so that she now faced the infant, and everything proceeded as it had before—the Experimenter gave infants the object for the standard 20-s response period as described above.

Coding. All coders were blind to both the experimental hypotheses and infants' group assignment. All of the video records of the 20-s response periods were identical in format, and were edited so that they contained no record of what preceded these segments. The dependent measures were infants' instrumental behavior and their affect during each of the four 20-s response periods. Infant affect was also scored during each emotional interchange between the Emoter and the Experimenter. Infant affect was scored from the camera focused on infants' faces, and therefore, contained no visual record of the adults' behavior. The sound was disabled during this scoring, however, to keep the coder naïve to the content of the emotional interchange.

Infant instrumental behavior. Latency to touch the object and infants' imitation of the demonstrated action were of interest because group effects have been consistently found for these dependent measures in previous eavesdropping studies. Latency to touch was defined as the time (in seconds) from when the object was placed on the table to the time the infant first touched it. If infants did not touch the object, the latency was recorded as 20 s (i.e., the length of the response period). Infants' performance of the target action in each trial was coded using a dichotomous (yes/no) measure (based on Hanna & Meltzoff's, 1993, criteria).

Infant affect. Following procedures used in the social referencing literature (e.g., Hirshberg & Svejda, 1990; Mumme & Fernald, 2003), two 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 period and the 20-s 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: (a) a frown/furrowed brow accompanied by any of the other facial movements that qualified for a score of 1, or (b) the infant actively avoided the Emoter by leaning away from her or leaning back into the parent plus one of the facial movements that met the criteria for a score of 1, or (c) a cry face. This coding system was adapted from Hertenstein and Campos (2004).

Intercoder agreement. Scoring agreement was assessed having an independent coder rescore 33% of the sample. Agreement was excellent for all dependent measures: latency to touch $r = .98$; imitation scores, no disagreements; infant positive affect during emotional interchange $r = .90$; infant negative affect during emotional interchange $r = .87$; infant positive affect during response period $r = .92$; and infant negative affect during response period $r = .94$.

Results and Discussion

In Experiments 1 and 2, all statistical tests were two-tailed and α was set at $p < .05$. Fisher's least significant difference (LSD) procedure was used in both experiments, such that pairwise comparisons were only conducted when the omnibus analyses were significant.

Phase 1: Did infants regulate their behavior as a function of the Emoter's affect? Infants' object-directed behavior in the first three trials of all groups (Phase 1) was analyzed to confirm that the basic eavesdropping effect had been obtained (i.e., infants exposed to anger should be hesitant to play with the objects relative to infants exposed to neutral affect).

Latency to touch. A mean latency to touch score was calculated for each infant (see Table 3). As expected, a one-way analysis of variance (ANOVA), corrected for unequal variances, indicated that there was a significant group effect, Welch's $F(3, 52.94) = 8.00$, $p < .001$, est. $\omega^2 = .15$. Follow-up *t* tests (corrected for unequal variances) indicated that infants in each of the three Anger groups had longer latencies to touch the objects compared to those infants in the Neutral group, all $ps < .05$, $d = .66–.91$. There were no significant differences between the three Anger groups, all $ps > .05$. A subsidiary analysis was also conducted using latency scores based only on those trials in which infants touched the object. The same results were obtained with this alternative latency calculation.

Imitation. An imitation score (0–3) was calculated for each infant representing the number of trials in which they performed the target act (see Table 3). Nonparametric analyses were deemed most appropriate for this type of score. As expected, a Kruskal-Wallis test indicated that there was a significant group effect, $H(3, N = 120) = 17.56$, $p = .001$, $\eta^2 = .15$. Follow-up Mann–Whitney *U* tests indicated that infants in the Neutral group had significantly higher imitation scores than did infants in each of the Anger

Table 3
Experiment 1: Infant Instrumental Behavior as a Function of Experimental Group and Phase

	Experimental group			
	Anger-standard	*Neutral-standard*	*Anger-then-absent*	*Anger-then-turnaround*
Measure	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Exposure Phase (Trials 1–3)				
Latency to touch (in seconds)	3.73 (5.99)	.87 (1.45)	3.74 (5.24)	6.01 (7.90)
Imitation score (range 0–3)	1.07 (.98)	2.17 (.79)	1.20 (1.13)	1.40 (1.22)
Generalization Phase (Trial 4)				
Latency to touch (in seconds)	3.84 (6.48)	.60 (.75)	4.71 (7.63)	5.05 (7.49)

Note. $n = 30$ per group.

groups, all *p*s $< .01$, $r = .32–.53$. There were no significant differences between the Anger groups, all *p*s $> .05$.

In summary, the basic emotional eavesdropping effect was replicated. In the exposure trials (Phase 1, Trials 1–3), infants in the Anger groups were hesitant to touch the objects and perform the target acts relative to infants in the Neutral group. As argued in previous eavesdropping studies (based on more detailed dependent measures and analyses), infants in the Anger groups behaved as if they understood that the Emoter gets angry when she sees people playing with these objects (for more theoretical analyses, see Repacholi & Meltzoff, 2007, pp. 516–520; Repacholi et al., 2008, pp. 571–573).

Phase 2: Did infants generalize the Emoter's anger to novel acts? The fourth (generalization) trial was analyzed to determine whether infants in the *Anger-then-absent* and *Anger-then-turnaround* groups generalized the Emoter's affect to a novel object-action pair, when the Emoter had *not* emotionally reacted in any way to this new stimulus.

Latency to touch. Infants' latency to touch scores in Trial 4 (see Table 4) were analyzed in a one-way ANOVA and this revealed a significant group effect, Welch's $F(3, 49.37) = 8.42$, $p < .001$, est. $\omega^2 = .16$. Follow-up *t* tests (corrected for unequal variances) indicated that infants in each of the Anger groups took longer to touch the object than did infants in the Neutral group, all *p*s $< .05$, $d = .70–.84$. There were no significant differences between the Anger groups, all *p*s $> .05$. (Identical results were obtained when these analyses were restricted to the subset of infants who touched the object in this trial.)

Imitation. The number of infants in each group who performed the target act in Trial 4 was analyzed using a 4(Groups) × 2(Yes/no) χ^2 test, and as expected, there was a significant group effect, $\chi^2(3, N = 120) = 14.29$, $p = .003$, Cramer's $V = .34$. Follow-up 2(Groups) × 2(Yes/no) χ^2 indicated that significantly more infants in the *Neutral-standard* group (87%) imitated the target act than did those in each of the three Anger groups, all *p*s $<$ .01, $\varphi = .39–.45$. There were no significant differences between the Anger groups (*Anger-standard* = 43%; *Anger-then-absent* = 50%; *Anger-then-turnaround* = 50%), all *p*s $> .05$.

In summary, even though infants in the *Anger-then-absent* and *Anger-then-turnaround* groups did not receive any emotional information in Trial 4—infants had no perceptual information about how the adult might react to the new object and new act in this trial—they were hesitant to play with this object relative to infants in the *Neutral-standard* group. Indeed, infants in these two Anger groups behaved in the same way as infants in the *Anger-standard* group, in which the Emoter had *again expressed anger* toward the Experimenter in this trial.

What is the basis of the emotional generalization effect? The foregoing findings show infant emotional generalization in Trial 4. What, specifically, is being generalized? One possibility is that infants automatically "caught" the Emoter's negative emotion in the earlier trials, and infants' own negative affect was "carried over" into the fourth trial. The argument might be this: Even in the absence of further Emoter anger, infants in the *Anger-then-absent* and *Anger-then-turnaround* groups were still experiencing negative affect *themselves* and this was the root cause of the Trial 4 effects. It was not their prediction about the *other* person's emotional behavior ("she will get angry") so much as a maintenance of their *own emotion.*

Previous eavesdropping studies have explored contagion and reported a detailed series of analyses showing that the basic emotional eavesdropping effect is not reducible to contagion alone (see, e.g., Repacholi et al., 2008, p. 572). To explore the contagion idea within the context of the current study, infant affect was analyzed during both the emotional interchange between the Emoter and Experimenter and the 20-s response period. Such an analysis can inform us about infants' *own* emotional expressions (neuro-physiological measures were not conducted, although they could be implemented in the future).

In Phase 1 (Trials 1–3), infants' positive and negative affect scores during the emotional interchange were examined in two separate 4(Groups) × 3(Trials) repeated-measures ANOVAs. As

Table 4
Experiment 1: Infant Affect as a Function of Experimental Group and Phase

Measure	*Anger-standard* M (SD)	*Neutral-standard* M (SD)	*Anger-then-absent* M (SD)	*Anger-then-turnaround* M (SD)
Exposure Phase (Trials 1–3)				
Emotional Interchange				
Positive Affect	.22 (.44)	.33 (.50)	.20 (.29)	.24 (.50)
Negative Affect	.13 (.24)	.31 (.41)	.24 (.36)	.28 (.36)
Response Period				
Positive Affect	.87 (.63)	1.20 (.55)	1.01 (.72)	1.03 (.71)
Negative affect	.13 (.40)	.18 (.30)	.19 (.33)	.27 (.48)
Generalization Phase (Trial 4)				
Emotional interchange				
Positive Affect	.27 (.64)	.60 (.72)	N/A	N/A
Negative Affect	.37 (.61)	.29 (.52)	N/A	N/A
Response Period				
Positive Affect	.93 (.78)	.97 (.81)	.90 (.76)	.93 (.87)
Negative Affect	.23 (.63)	.23 (.57)	.10 (.40)	.37 (.61)

Note. All affect ratings based on a scale from 0–2.

reported in previous eavesdropping studies, infants in the current experiment displayed very little positive or negative affect during the emotional interchange (see Table 4). Moreover, infant negative affect did not differ significantly as a function of Group, $F(3, 116) = 1.47$, $p = .23$; or Trial, $F(2, 232) = .18$, $p = .83$, and there was no significant Group $\times$ Trial interaction, $F(6, 232) = .18$, $p = .98$. Analysis of infants' positive affect scores likewise revealed that there were no main effects of Group, $F(3, 116) = .53$, $p = .66$; or Trial, $F(2, 232) = 1.21$, $p = .30$; and no interaction between these two variables, $F(6, 232) = 1.70$, $p = .12$.

In Trial 4, infant affect during the emotional interchange was also examined (see Table 4). (This was measured in the *Anger-standard* and *Neutral-standard* groups, in which the Emoter produced an affective response to the Experimenter's action.) There were no significant differences between the groups for infant positive or negative affect [respectively, $t(58) = 1.89$, $p = .06$; $t(58) = .69$, $p = .49$]). (The Trial 4 positive affect analysis approached significance because the Neutral group displayed more positive affect in Trial 4 relative to the earlier trials, perhaps because they were anticipating being given another interesting object to play with.)

Infants' mean positive and negative affect scores were also analyzed during the response periods, using separate 4(Groups) $\times$ 4(Trials) repeated-measures ANOVAs. Once again, infants displayed very little negative affect (see Table 4). Moreover, there were no significant main effects of Group, $F(3, 116) = .78$, $p = .51$; or Trials, $F(3, 348) = 1.38$, $p = .25$; and no Group $\times$ Trial interaction for the negative affect scores, $F(9, 348) = 1.02$, $p = .43$. Consistent with previous eavesdropping studies, infants' displayed more positive affect in the response periods when they were given an opportunity to play with the object (see Table 4). Infants' positive affect scores did not differ as a function of Group, $F(3, 116) = .83$, $p = .48$; or Trial, $F(3, 348) = 1.95$, $p = .12$. There was also no significant Group $\times$ Trial interaction, $F(9, 348) = .68$, $p = .72$.

Taken together, these affect analyses suggest that infants' emotional expressions did *not* significantly differ as a function of group, as might be expected if "emotional contagion" was the sole explanation of the significant group differences in infants' instrumental behavior.

We favor the hypothesis that, based on the Emoter's affective history (Trials 1–3), infants in the *Anger-then-absent* and *Anger-then-turnaround* groups expected the Emoter to become angry again in Trial 4. We also recognize, however, that further lower-level explanations need to be ruled out. For instance, it is possible that infants developed a dislike for the Emoter (or were even fearful of her) as a result of her angry behavior, such that when they encountered her again in Trial 4, their object exploration was inhibited. Alternatively, infants' object exploration may have been disrupted because there were unexpected changes in the Emoter's behavior in Trial 4 (i.e., she was absent or had her back turned during the Experimenter's demonstration). These alternative interpretations were addressed in a second experiment.

Experiment 2

This experiment had two aims: (a) to test the low-level explanations of the "generalization" effect discussed above and (b) to examine the extent to which these emotional generalizations about another person are open to revision when counterevidence is provided. To achieve these goals, we used three novel experimental groups, along with the *Anger-standard* and *Anger-then-turnaround* groups.

To determine whether the procedural changes in Trial 4 disrupt infants' object exploration, we used a *Neutral-then-turnaround* manipulation. In this group, the Emoter sat with her back turned during the Experimenter's demonstration of the target action in Trial 4, and consequently did not express any emotion (see Table 2). However, she subsequently rotated her chair and, as usual, looked toward the infant during the response period. If the changes in the Emoter's behavior in Trial 4 disrupt infants' object exploration, then, like infants in the *Anger-then-turnaround* group, those in the *Neutral-then-turnaround* group should be hesitant to play with the new object.

To determine whether dislike or fear of the angry Emoter explains the "generalization" effect, we included an *Anger-then-no-looking* group (see Table 2). In this group, in the fourth trial, the Emoter had her back turned during the Experimenter's action demonstration *and* during the response period when the infant had access to the object. Thus, the Emoter: (a) did not see and emotionally respond to the Experimenter's action and (b) was also unable to see what the infant was doing with the object. If infants simply continue to feel negative about the Emoter (because of her prior anger), they should be hesitant to play with the object in Trial 4.

The second goal was to explore the extent to which infants' emotional generalizations are open to change. Adults typically expect other people's traits to be relatively enduring. However, there is some suggestion in the trait attribution literature that young children are more likely than older children and adults to assume that there is some degree of malleability in other people's dispositions, especially in the case of negative traits and behaviors (Diesendruck & Lindenbaum, 2009; Heyman & Giles, 2004; Lockhart, Chang, & Story, 2002). As an initial exploration of this issue, we included a new experimental group that received information in the generalization trial suggesting that the Emoter was no longer angry. In this *Anger-then-blank-slate* group, the Emoter witnessed what the Experimenter did with the new object in Trial 4, however the Emoter did *not* respond with anger when the Experimenter completed the target act (see Table 2). Thus, there was perceptual evidence that she was not consistently angry. In this context, will infants still expect the Emoter to become angry if they play with the new object or will they change their expectation?

Method

Participants. The final sample consisted of 150 (75 male) 15-month-old infants ($M = 15.03$ months) who were closely clustered in age ($SD = 4.84$ days, range $= 14.66$–15.32 months). Additional infants were excluded from the final sample because of procedural error ($n = 7$), fussiness/inattention ($n = 18$), or parent interference ($n = 5$). The racial/ethnic breakdown of the sample was 84% White, 15% mixed race, and 1% Native Hawaiian/Other Pacific Island; with 7% of the parents identifying their infants' ethnicity as "Hispanic or Latino."

Experimental stimuli, equipment, and design. The experimental room, test objects, and the demonstrated target acts were identical to those in Experiment 1. A different female Experimenter and female Emoter were used. Equal numbers of boys and girls were randomly assigned to each of the five groups ($n = 30$): *Anger-standard*, *Anger-then-turnaround*, *Neutral-then-turnaround*, *Anger-then-no-looking*, and *Anger-then-blank-slate* (see Table 1). Gender and object order was counterbalanced within groups.

Procedure. The procedure had two phases.

Phase 1: Emotion exposure (Trials 1–3). The first three trials in the Neutral and the Anger groups duplicated those in Experiment 1 (see Table 1).

Phase 2: Generalization (Trial 4). Two groups (*Anger-standard* and *Anger-then-turnaround*) were the same as in Experiment 1 (see Table 2) to see if we replicated the effects; however, there were three novel groups. The novel groups are described below.

In Trial 4 of the *Neutral-then-turnaround* group, the Emoter did not see the Experimenter's demonstration because her back was turned and she read a magazine during this time (see Table 2). Thus, the Emoter did not express neutral affect (or any other emotion). As in the previous trials, however, the Emoter looked toward the infant during the response period.

In Trial 4 of the *Anger-then-no-looking* group, the Emoter sat with her back to the Experimenter and infant during the *entire* trial while reading a magazine (see Table 2). Thus, it was not only the case that the Emoter did not see and respond to the Experimenter's actions, but she was also unable to see what the infant did with the object. The Experimenter performed the target act and then presented infants with the object for a 20-s response period.

In Trial 4 of the *Anger-then-blank-slate* group, the Emoter initially sat with her back to the Experimenter and infant while reading a magazine (see Table 2). Then, the Experimenter requested the Emoter's attention, and the Emoter turned around and *watched* the demonstration. However, unlike the exposure Trials 1–3, the Emoter did *not* express anger (or any other affect) toward the Experimenter. Next, infants were presented with the test object for a 20-s response period, and the Emoter looked toward the infant during this time.

Coding. Infants' behavior was scored in the same manner as in Experiment 1 with coders blind to infants' experimental group assignment and the experimental hypotheses. Intercoder agreement (based on 33% of the sample) was excellent: latency to touch $r = .96$, and no disagreements for the imitation scores.

Results and Discussion

The results are presented for the two phases of the experiment.

Phase 1: Did infants regulate their behavior as a function of the Emoter's affect?

Latency to touch. As expected, a one-way ANOVA revealed a significant group effect for infants' latency to touch scores, Welch's $F(4, 64.27) = 8.36$, $p < .001$, est. $\omega^2 = .16$ (see Table 5). Follow-up t tests, corrected for unequal variances, indicated that infants in each of the Anger groups had significantly longer latencies to touch the objects than did those in the Neutral group, all $ps < .05$, $d = .69$–1.08. There were no significant differences between the four Anger groups, all $ps > .05$. (The same results were obtained when the latency to touch scores were based only on those trials in which infants touched the object).

Imitation. Infants' imitation scores (0–3) during Phase 1 (see Table 5) were analyzed with a Kruskal-Wallis test and, as expected, there was a significant group effect, $H(4, N = 150) = 18.05$, $p = .001$, $\eta^2 = .12$. Follow up Mann–Whitney U tests indicated that infants in the Neutral group had significantly higher imitation scores than did infants in each of the Anger groups, all $ps < .01$, $r = .38$–$.48$. There were no significant differences between the Anger groups, all $ps > .05$.

In summary, the eavesdropping effect was obtained in the first three trials: Infants in the Anger groups were less likely to play with the objects relative to infants in the Neutral group.

Phase 2: Generalization effect. The omnibus analyses revealed significant group effects for infant latency to touch the object in Trial 4, Welch's $F(4, 58.54) = 7.89$, $p < .001$, est. $\omega^2 = .16$, and for whether infants performed the target action in that trial, $\chi^2(4, N = 150) = 23.52$, $p < .001$, Cramer's $V = .40$. Planned pairwise comparisons were conducted to determine whether the generalization effect observed in Experiment 1 was also evident here. Specifically, infants' object-directed behavior in the *Anger-then-turnaround* group was compared to that of infants in the *Anger-standard* and the *Neutral-then-turnaround* groups.

Latency to touch. In replication of Experiment 1, infants in the *Anger-then-turnaround* group were slower to touch the object than were those in the *Neutral-then-turnaround group*, $t(29.27) = 2.28$, $p = .03$, $d = .59$ (see Table 5). And, as expected, there was no significant difference between the *Anger-standard* and the *Anger-then-turnaround* groups, $t(55.51) = 1.62$, $p = .11$. (The

Table 5
Experiment 2: Latency to Touch as a Function of Experimental Group and Phase

	Experimental group				
	Anger-standard	Anger-then-turnaround	Neutral-then-turnaround	Anger-then-no-looking	Anger-then-blank-slate
Measure	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Exposure Phase (Trials 1–3)					
Latency to touch (in seconds)	4.08 (5.63)	4.62 (7.01)	1.07 (1.82)	7.39 (8.04)	4.74 (6.79)
Imitation score (range 0–3)	1.20 (1.19)	1.50 (1.17)	2.37 (.81)	1.33 (1.21)	1.40 (1.19)
Generalization Phase (Trial 4)					
Latency to touch (in seconds)	6.50 (8.27)	3.35 (6.68)	.56 (.45)	3.18 (6.04)	3.40 (1.19)

Note. $n = 30$ per group.

same results were obtained when analyzing only the subset of infants who touched the object in Trial 4.)

Imitation. Again in replication of Experiment 1, infants in the *Anger-then-turnaround* group (53%) were less likely to imitate the action in Trial 4 than were those in the *Neutral-then-turnaround* group (90%), $\chi^2 = 9.93$, $p = .002$, $\varphi = .41$. There was no significant difference between the *Anger-standard* (37%) and the *Anger-then-turnaround* groups, $\chi^2 = 1.68$, $p = .19$.

Together, the findings indicate that the generalization effect obtained in Experiment 1 was replicated with a new Emoter and new Experimenter. Even though the Emoter did not express anger in Trial 4, infants in the *Anger-then-turnaround* group were as loath to play with the object as were those in the *Anger-standard* group in which the Emoter expressed anger again.

Lean interpretation #1: Did changes in the Emoter's Trial-4 behavior disrupt infants? A potential explanation of the generalization effect that relies solely on low-level factors was the possibility that the unexpected changes in the Emoter's behavior (e.g., sitting with her back turned) in Trial 4 disrupted infants' object exploration. The *Neutral-then-turnaround* group was included to test this possibility, and the behavior of these infants is inconsistent with this idea. Infants in the *Neutral-then-turnaround* group were significantly less hesitant to play with the object in Trial 4 than were those in the *Anger-then-turnaround* group. Trial 4 was identical in these two groups—the only difference was in terms of the Emoter's affective history (i.e., the emotion expressed in the first three trials). As an additional empirical evaluation of the disruption idea, repeated-measures analyses were conducted to determine whether infants in the *Neutral-then-turn-around* group were more hesitant to play with the object in Trial 4 relative to the previous emotion exposure trials. A repeated-measures ANOVA indicated that infants' latency to touch the object did not vary as a function of trial, $F(2.16, 62.58) = .50$, $p = .62$. A Cochran's Q-test indicated that the proportion of infants performing the target act did not significantly differ across the four trials, Trial 1 = .67, Trial 2 = .87, Trial 3 = .83, Trial 4 = .90, $Q(3, N = 30) = 7.25$, $p = .06$. Thus, consistent with the latency findings, infants were not more hesitant in Trial 4 relative to the earlier trials (indeed, after Trial 1, the proportions are very similar, and if anything, infants are somewhat more likely, not less likely, to produce the target act in Trial 4 relative to Trial 1). In summary, two different analyses (between- and within-subject comparisons) do not support a low-level explanation of the generalization effect in Trial 4 as being reducible to disruption.

Lean interpretation #2: Did infants' dislike or fear of the Emoter inhibit their object exploration in Trial 4? A second open question from Experiment 1 was whether infants developed a dislike for the Emoter or became scared of her during the anger exposure trials and this negative attitude was then carried over into Trial 4, thereby dampening their object exploration. The *Anger-then-no-looking* group was designed to test this issue. In this group, the Emoter was not only unable to see the Experimenter's actions in Trial 4 (and thus did not express any anger), but she was also unable to see what the infant was doing. As expected, a repeated-measures ANOVA revealed a significant trial effect for latency to touch the object in this *Anger-no-looking group*, $F(2.03, 208.39) = 5.43$, $p = .007$, $\eta_p^2 = .16$. Follow-up paired t tests indicated that these infants were faster to touch the object in Trial 4 ($M = 3.18$, $SD = 6.04$) than in each of the other three trials ($M_{\text{Trial1}} = 6.71$, $SD = 8.61$; $M_{\text{Trial2}} = 7.42$, $SD = 9.07$; $M_{\text{Trial3}} = 8.02$, $SD = 8.68$), all $ps < .05$, $d = .47–.65$. In this experimental group, as expected from our preferred interpretation, infants' production of the target behavior also differed as a function of trial, Cochran's Q(3, $N = 30$) = 16.88, $p = .001$. Follow-up McNemar tests indicated that the proportion of infants producing the target behavior in Trial 4 (.80) was significantly greater than that in each of the other three trials (Trial 1 = .43, $p = .003$; Trial 2 = .50, $p = .02$; Trial 3 = .40, $p = .002$; $\varphi = .17–.27$).

In summary, in Trial 4, infants in the *Anger-no-looking* group behaved as if they did not expect the Emoter to become angry with them if they reproduced the Experimenter's action. Indeed, despite the Emoter's history of anger, these infants were as willing to imitate the target act in this Trial 4 (80%) as were those in the *Neutral* group (90%). These findings are consistent with previous eavesdropping research (e.g., Repacholi et al., 2014) and suggest that simple disliking or fear of the Emoter, based on her angry behavior in Trials 1–3, cannot easily account for the results. The same emotional displays produced by the Emoter did not always lead to the same effect in Trial 4 – it was not a simple matter of infants' negative attitude or automatic feelings about the Emoter being carried over to a new trial. Instead, infants' behavior varied as a function of other subtleties in Trial 4 (i.e., the Emoter's emotional history in combination with whether she could or could not see the infant during the response period).

Other lean interpretations. Another low-level interpretation of the effects obtained in Experiments 1 and 2 is that infants were making a generalization about the test objects, rather than the Emoter's affect. In other words, in the Emotion Exposure trials, infants may have interpreted the Emoter's anger as being about the nature of the objects (i.e., bad) and then generalized this negative attribute to the new object in Trial 4 (i.e., here is another bad object). If this were the case, then infants should have made this generalization even if the Emoter could not see what they were doing—they should have been as hesitant to play with the object in Trial 4 as they had been in the first three trials. And, as noted above, the *Anger-no-looking* data are inconsistent with this account.

The findings from the *Anger-no-looking* group also help address another interesting possibility. Rather than assuming that the Emoter was angered because the Experimenter was performing forbidden actions in the first three trials, infants in the various anger groups might have interpreted the Emoter's reaction as evidence that the Experimenter was performing the actions incorrectly. Consequently, infants would be uncertain about how to correctly manipulate the objects, and this uncertainty about the Experimenter's expertise might have generalized to Trial 4. If so, then infants should have been uncertain about how to play with the objects regardless of whether or not the Emoter was looking at them during the response period in Trial 4. That was not the case. Infants in the *Anger-no-looking* group behaved as if they knew what to do with the new object—they imitated to the same extent as did those in the *Neutral* group.

One final lean interpretation to consider is that infants did not have any expectations about whether the Emoter would become angry again in Trial 4, and instead, they simply did not like the previously angry Emoter *looking* at them. Although this cannot be completely ruled out, it is at odds with the findings in the *Anger-then-blank-slate* group. In Trial 4, these infants were given evidence that the Emoter was no longer angered by the Experimenter's actions yet infants were as hesitant to play with this new object as they had been in the earlier trials when the Emoter had expressed anger. It is difficult to explain this finding without referring to infants' expectations about what might happen if they played with the new object. Moreover, if infants did not like the Emoter looking at them, one might expect that, over the course of the trials, infants would become increasingly upset by the Emoter's looking behavior and that their hesitancy to play with the objects would also increase. It is noteworthy, however, that in Experiment 1, infants' affect scores did not significantly vary across the exposure trials. Furthermore, the analyses conducted in Experiment 2 for the *Anger-then-blank-slate* group, indicated that infants' latency to touch the object did not increase, and imitation of the target action did not decrease, across the exposure trials. Thus, while we cannot completely rule it out, we do not favor this alternative interpretation. Our favored interpretation of the Trial 4 effects is that infants are making predictive emotional generalizations about the Emoter in nuanced ways, which will be described, after first considering how the results bear on the second aim of Experiment 2.

Are infants' emotional generalizations resistant to change? The second chief aim of this experiment was to begin exploring the degree to which infants' emotional generalizations, once formed, are resistant to change. The *Anger-then-blank-slate* group was designed to address this issue. In Trial 4 (generalization) for this group, the Emoter watched the Experimenter's demonstration but failed to express any affect when the target act was completed. In essence, infants were given evidence that the Emoter was *not* angered or otherwise upset when she saw the Experimenter's new actions on this new object. Analyses were conducted to determine whether, in this group, infants' object-directed behavior in Trial 4 differed from that in the earlier emotion exposure trials. A repeated-measures ANOVA indicated that there was no trial effect—infants were as slow to touch the object in Trial 4 as they had been in the exposure trials, $F(3, 87) = 1.50$, $p = .22$. There was likewise no trial effect for infants' performance of the target action, Cochran's $Q(3, N = 30) = 7.14$, $p = .07$. Infants in this group were hesitant to perform the target action across the four trials (Trial 1 = .37, Trial 2 = .50, Trial 3 = .53, Trial 4 = .63). (Looking at the individual trial proportions, it appears that infants were somewhat more inhibited in Trial 1, which is not surprising given that this was the first time that they encountered the angry Emoter. The proportions are then similar across Trials 2, 3, and 4.) Taken together, these findings suggest that infants did not view the Emoter's lack of anger in Trial 4 as evidence that it was safe for them to play with the new object. We now turn to an integrative account of the overall pattern of findings obtained.

General Discussion

These experiments show that by 15 months of age infants are able to make predictive generalizations about other people's emotional behavior. When an adult had a history of expressing anger about people's actions on objects, infants behaved as if they expected there to be a continuity in the adult's emotional reactions. Specifically, in a generalization trial involving a new action on a novel object, and no further emotional information, infants were slow to touch the object and hesitant to imitate the target act when the Emoter was watching them.

The infant affect data in Experiment 1 and the infant behavioral data in two control groups in Experiment 2 (*Neutral-then-turnaround*, *Anger-then-no-looking*), weigh against various low-level explanations for this Trial 4 generalization effect (emotion contagion; unexpected changes in the Emoter's behavior; dislike or fear of the Emoter; dislike of the objects; uncertainty about how to manipulate the objects; and dislike of being watched). Although further experimentation is required to definitively rule out these alternative explanations, we favor a somewhat richer interpretation of infants' behavior.

We suggest that infants used the pattern of emotional information presented in the Exposure Phase (Trials 1–3) to make a prediction about the Emoter's likely affective behavior in the Generalization Phase (Trial 4). More specifically, infants were able to keep track of the Emoter's affect over the first three trials and detected the consistency in her emotional responses to the different object-action pairings (they received three different exemplar cases and the Emoter was angry in each). Then, in a fourth trial, *in the absence of any further anger*, infants expected that the Emoter would become angry again if they touched the new object and duplicated the Experimenter's new action. This interpretation is consistent with the studies reviewed in the Introduction suggesting that infants are able to make generalizations about other people's behaviors (social and nonsocial) and can use this information to predict their future behavior. Among the advances of the current work is the extension to infants picking up on and generalizing about other people's *emotions* and the fact that it influenced their own *behavior*.

It is of interest to social developmental theory that these emotional generalizations occurred quickly. Indeed, on average, the emotional exchange between the Experimenter and the Emoter lasted about 7 s per trial. There appears to be "fast mapping" of emotional behaviors in infancy. It is known that adults' trait attributions are sometimes derived from a brief sample of behavior (Ambady & Rosenthal, 1992). On the other hand, and not in contradiction with this, it has been demonstrated (e.g., Boseovski & Lee, 2006) that younger children need more exemplars to generalize another person's behavior than do older children—as do younger versus older infants in studies measuring looking time (e.g., Song & Baillargeon, 2007). It is unclear, in the current studies, whether infants required one, two, or three short trials to make a generalization about the Emoter's affective behavior—but regardless, they were generalizing based on a very "thin slice" of the Emoter's behavior, doing so quickly, and having this drive their manual behavior (both touching and imitation).

Experiment 2 provides evidence suggesting that infants not only rapidly make generalizations about other people's emotional behaviors, but that once formed, these generalizations may be somewhat resistant to change. In Trial 4 of the *Anger-then-blank-slate* group, the Emoter watched the Experimenter's action demonstration but failed to emotionally respond to it, thereby suggesting that she was not bothered by how the Experimenter acted on the new object. However, infants behaved as if they continued to believe that the Emoter would become angry with them if they played with the object.

This finding is consistent with the adult social psychology literature, in which it has been suggested that first impressions tend to be resistant to change. Gawronski, Rydell, Vervliet, and De Houwer (2010), for instance, found that when a new piece of information contradicted a first impression, adults typically construed this new data as being a context-specific "exception." The first impression continued to prevail in all other contexts. Likewise, in the current experiments, once infants formed an impression of the Emoter as being a source of anger, her later failure to display anger (or any other emotion) in Trial 4 may have been dismissed as an anomaly. Related to this, if infants are using frequency or statistical information to make these generalizations (three exemplars by the person across different action-object pairings), then one instance of "no anger" in response to the Experimenter's action might not be sufficient to change infants' impression. Prior research suggests that infants can detect statistical regularities in events over time (e.g., Saffran, Aslin, & Newport, 1996) and that they can use this type of information to make inferences about other people's preferences (e.g., Kushnir, Xu, & Wellman, 2010). It is possible that statistical learning also applies to the emotional domain. Infants' detection of an emotional "pattern" or a person's "emotional history" might, therefore, underlie this preverbal affective impression formation process.

It is also worth considering that infants' attributions about people's *negative* emotional behaviors may be more difficult to change than those that reflect positive emotionality. Although our current experiments do not specifically address this issue, there is evidence from social psychology supporting the existence of a negativity bias in adult trait reasoning and impression formation (Rozin & Royzman, 2001). For example, adults pay more attention to and are more influenced by negative than positive trait-relevant information (Fiske & Taylor, 1991). Vaish, Grossmann, and Woodward (2008) have suggested that a negativity bias is also evident during infancy. For instance, in social referencing studies, there is an asymmetry in infants' responsiveness to other people's negative versus positive emotional expressions, such that it is the negative display that primarily guides infants' behavior (e.g., Hornik, Risenhoover, & Gunnar, 1987; Mumme, Fernald, & Herrera, 1996). Thus, infants in the current eavesdropping studies might be resistant or unable to change their impression of the Emoter because negative emotional information is so salient and the potential cost of making a mistake is relatively high. Infants' default strategy might be "better safe than sorry" in these interpersonal situations involving adult negative affect.

If we widen the developmental age period to early and middle childhood, there have been reports about the power of positive information in children's impression formation. Boseovski and Lee (2006) reported that young children required more behavioral evidence to make a negative than a positive trait attribution. In a similar vein, Lagattuta and Sayfan (2013) found that young children were more likely than older children and adults to predict positive outcomes after being presented with either two negative events or one positive and one negative event. Such findings might seem to be at odds with the suggestion that there is a negativity bias in infancy. However, it is entirely possible that different informational biases are more or less adaptive at different ages (e.g., Boseovski, 2010). A positivity bias might come to the fore when peers become central in children's lives and facilitate positive peer interactions (Lagattuta & Sayfan, 2013). Moreover, when applied to oneself, this bias might help young children to persist in acquiring new skills and maintain a positive view of the self even in the face of failure (Lockhart et al., 2002), thereby figuring into the emergence of early childhood self-esteem (Cvencek, Greenwald, & Meltzoff, 2016).

In contrast to these older children, a negativity bias might be more pronounced in the infants' world because they are vulnerable to physical harm (e.g., they have a more limited understanding of environmental dangers) and this bias might serve an important protective function (Rozin & Royzman, 2001). In addition, a negativity bias might also be more readily apparent in early childhood when the negative information contains an element of "threat" (Kinzler & Vaish, 2014). For example, Kinzler and Shutts (2008) found that 3- to 4-year-old children were more likely to remember the face of a person who had been described as mean rather than nice, but no memory advantage was evident when the person was described as being sad rather than happy. In line with that finding, LoBue (2009) reported that 5-year-olds (and adults) detected fearful and angry faces more rapidly than happy and sad faces. Thus, studying impression formation in threat-relevant contexts, especially those involving social threat (as was done in the current studies), might reveal that young children show context-specific manifestations of the negativity bias.

Do Infants Attribute "Trait-Like" Emotional Qualities to People?

We come now to the key theoretical question raised by this research. Do infants make trait-like emotional attributions about other people? The current work suggests so, but it is only a first step down this interpretive path, and it would be premature to conclude that infants view other people's emotional tendencies as enduring psychological characteristics in the same way that adults do. The current findings do, however, provide valuable information about origins. If, as argued here, infants can detect the regularities in people's emotional expressions and use this information to make predictions about a person's likely future emotional behavior, this would suggest that they have prerequisite social–cognitive skills to support the development of more mature trait reasoning.

Personality traits are considered to be stable over time, consistent across situations, and person-specific. Exploring the extent to which infants generalize emotions over time is important: The temporal factor is one major feature that adults use to distinguish a mood from an emotional trait (Ekman, 1994). In addition, in the Western adult psychological model, traits belong to particular individuals, and we have yet to establish that infants' emotion generalizations are person-specific (we are currently adapting the paradigm described here to test these issues in infants).

Even if it can be demonstrated that infants' emotion and/or other social attributions exhibit stability over time, consistency across situations, and are person-specific, infants might still fall short of a mature understanding of personality traits. Infants and young children might detect patterns in other people's behaviors and make predictions about future behavior, without fully appreciating that *internal psychological* factors produce these regularities. They might still lack an understanding of traits as causal, psychological constructs (Meltzoff & Gopnik, 2013). Thus, although toddlers might notice that another child rarely shares their toys, they may not view the child as someone who possesses a specific internal psychological quality (e.g., mean) that underlies this behavioral regularity. Moreover, given that the mature trait attribution process involves multiple components (Rholes, Newman, & Ruble, 1990), the developmental trajectory might be extended over time and experience. For instance, for the mature state to be reached, young children will need to notice that other diverse behaviors tend to co-occur with "not sharing"—such as snatching toys, teasing, arguing, and telling other people what to do. They will then need to understand that these diverse behaviors are conceptually related (e.g., a lack of concern for the welfare of others). Language may also intersect: Young children might initially only use trait words to label a cluster of *behaviors* (e.g., mean behavior) rather than to characterize the *person* or *their underlying psychological makeup*. Some of these kinds of distinctions have been considered in research with verbal children in early childhood. For instance, when given trait labels (e.g., mean), 4-year-olds can then predict trait-consistent behavior (e.g., not sharing toys; Liu et al., 2007). However, it is not until around about 7–8 years of age, that children are able to use past trait-relevant behavior (e.g., teasing) to predict future trait-consistent behavior (e.g., snatching), and spontaneously use trait labels to describe themselves or other people (Kalish, 2002; Rholes & Ruble, 1984).

Conclusions

This research adds to the small extant literature suggesting that infants' can detect the regularities in another person's social behavior and use this information to make predictions about that person's future behavior. Like adults, 15-month-old infants in the current studies made rapid affective judgments about another person, based on relatively limited behavioral evidence. Infants appear to use this emotional information to predict that person's future emotional response (anger). In other words, infants behave as if they expect there to be continuity in people's emotional behavior and use these predictions to govern their own behaviors, such as their proclivity to imitate when the anger-prone person is watching them.

These types of predictive generalizations could be a precursor to the emergence of more mature trait attribution processes. Ultimately, if future research provides further evidence that infants have an ability to attribute primitive "trait-like" emotions to others, then this might suggest that the starting state for person perception is a kind of "dispositionalism" (which, in Western cultures, becomes more complex with age). Moreover, individuals in some non-Western cultures might, in response to socialization experiences, gradually move *away* from an initial dispositionalism and develop a different explanatory framework (Choi et al., 1999; Morris & Peng, 1994)—one that places more weight on the social situation and physical context in explaining the behaviors of other people.

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Appendix A

Dialogue Between Emoter and Experimenter

4 Anger Scripts (One Per Trial)

Script 1

Emoter: "That's aggravating! That's so annoying!"

Experimenter: "Oh, I thought it was really interesting."

Emoter: "Well, that's just your opinion! Its aggravating!"

Script 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!"

Script 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!"

Script 4

Emoter: "That's distressing! That's really disconcerting!"

Experimenter: "Oh, I apologize for upsetting you."

Emoter: "Well, I don't care! That was really distressing!"

4 Neutral Scripts (One Per Trial)

Script 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."

Script 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."

Script 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."

Script 4

Emoter: "That's amusing. That's so interesting."

Experimenter: "Oh, I didn't think you'd notice what happened."

Emoter: "I did notice. And it was amusing."

(*Appendices continue*)

Appendix B

Manipulation – Experiment 1

A manipulation check was conducted to ensure that the Emoter had conveyed the appropriate affect. Naïve coders used a five-point scale to assign an overall rating for the hedonic tone of the Emoter's facial expression (-2: very negative to 2: very positive). These ratings were performed without sound. In addition, the coders indicated which discrete emotion was predominant, based on the following list: happiness, interest, neutral, surprise, sadness, anger, disgust, and fear. The Emoter's vocal expressions were low-pass filtered at 475 Hz, to make the lexical content unintelligible. Two other naïve coders listened to the filtered audio-files and rated (from -2 to 2) the hedonic tone of these vocalizations. Inter-coder agreement, based on 33% of the sample, was excellent; all of the correlation and kappa coefficients exceeded .80.

As expected, the manipulation check confirmed that the Emoter's expressions met the procedural requirements. The Emoter's facial and vocal expressions during her dialog with the Experimenter were equally "negative" across the Anger groups: the predominant facial expression was consistently identified as "anger," and the face ratings were significantly more negative in the Anger groups ($M = -1.98$, $SD = .15$) than in the Neutral group ($M = .47$, $SD = .52$), $t(29.96) = 25.81$, $p < .001$. Likewise, the Emoter's vocalizations in the Anger groups were significantly more negative ($M = -1.00$, $SD = 0.00$) than those in the Neutral-standard group ($M = 0.00$, $SD = 0.00$). Furthermore, in line with the experimental protocol, in the response period for all groups, the Emoter's facial hedonic tone was rated as 0 and the predominant emotion was identified as "neutral."

Received February 23, 2015
Revision received November 18, 2015
Accepted November 19, 2015 ■