

**WHY IS THAT GIRL SCARED?: INFANTS' UNDERSTANDING OF OLDER  
CHILDREN'S EMOTIONS**

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In the wake of growing interest in the development of very young children's intention, desire, and emotion understanding, the issue of children's competencies in their peer interactions has been largely ignored. Social referencing studies have suggested that by 12 months of age infants have the ability to use emotion-laden information provided by an adult to modify their behavior toward a strange or novel object. In this study, a social referencing paradigm was employed to examine whether 12-, 18-, and 24-month-old children can use an older child's positive and negative expressions towards one toy (but not toward a distracter toy) to direct their own behavior toward or away from that toy. Results indicated that when presented with an older child's affect towards a novel toy 12-month-old children performed randomly while 18-month-old children reduced their touch to the target toy in the negative condition only. Twenty-four-month-old children increased their touch to both toys regardless of the direction of the affect that they viewed. The results suggest that the developmental course of understanding and utilizing older children's emotions differs substantially from the ability to glean and use emotion information provided by adults.

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## **1.0 INTRODUCTION**

In recent years the question of what very young children understand about others' emotions, both as a tool for learning about the world around them, and as a possible source of insight and self-awareness, has become a "hot" topic. While research has focused on young children's abilities to understand the desires and emotions of adults around them, comparatively little work has been conducted to examine the early origins of children's understanding of other children's emotions.

Emotion understanding has important implications for children's functioning in the world. Individual differences in children's early social understanding and competencies predict later peer competence as well as their abilities to form relationships with others (Denham et al., 2003; Parke, 1994; Saarni, 1990). In particular, emotion competence, of which emotion understanding is a vital component, is associated with social competence with peers in childhood, which, in turn, is linked to school success and protection from psychological maladjustment (Denham, 1998; Rubin, Bukowski & Parker, 1998). Robust relations have been found between understanding one's own emotions and peer social status as early as the preschool years, and preschoolers who show greater empathy toward their peers are more likely to succeed with them and to be seen by teachers and peers as socially competent (Denham, 1998; Parke & Ladd, 1992; Saarni, 1990). Whereas the importance of emotion understanding in childhood peer relationships is clear, the origins and role of emotion understanding in very young children's interactions with other children have not been clearly delineated.

A plethora of questions have yet to be answered: Can and do young children read other children's emotions? When do they understand that other children's emotions are connected meaningfully to objects, people and events in the world? Moreover, when can they use other children's emotions to inform their own behavior? While research has been conducted to document the development of children's emotion understanding in adults, early understanding of same-age or older peers remains largely uncharted territory. Yet, children's abilities in the peer arena can provide a strong test of their "true" understanding because adults contribute so disproportionately to adult-infant social interactions. When adults are removed from the picture the true competencies of young children may be revealed, in the company of other children, because interactions with other children require that young children interpret and understand the actions of others without many of the overt behavioral and communicative cues that adults usually provide. Moreover, research has shown the importance of understanding peers' emotions for preschool age and older children, but very little is known about the early roots of these abilities.

There is good empirical evidence that by the end of the first year of life infants are not only attentive to adults' emotion communications, but they have also started to use adults' emotions to gather information about the world around them. In "social referencing" paradigms, infants have been shown to look to their caregivers for information in ambiguous or potentially-dangerous situations, and then to adjust their behavior in response to their caregivers' facial and vocal expressions (Campos & Stenberg, 1981; Feinman, 1982). In a classic social referencing study, Sorce, Emde, Campos & Klinnert (1985) gave 12-month-old infants the opportunity to locomote over a clear, plexi-glass surface mounted over a base that appeared to drop off, like a cliff. They directed mothers to entice their infants with an attractive toy from the other side, the

deep end of the “visual cliff,” while displaying either positive or negative facial and vocal expressions. The findings were stark: when mothers displayed fearful expressions, none of the 17 infants crossed over the cliff. In contrast, when mothers displayed happy expressions, three quarters of the infants crossed over. An entire literature has developed exploring this phenomenon, largely concerning infants’ behavior toward ambiguous stimuli such as novel toys, animals, or unfamiliar adults (Boccia & Campos, 1989; Feinman & Lewis, 1983; Gunnar & Stone, 1984; Hornik, Risenhoover & Gunnar, 1987; Klinnert, 1985; Moses, Baldwin, Rosicky & Tidball, 2001; Walden & Baxter, 1989; Walden & Ogan, 1988; Zarbatany & Lamb, 1985). Most of these studies have concluded that infants’ behavior is based on their interpretations of adults’ facial expressions of emotion. It has also been found that vocal expressions, as well as facial expressions, are enough to elicit behavior regulation in 12-month-olds (Mumme, Fernald & Herrera, 1996; Vaish & Striano, 2004). So, evidence has accumulated suggesting that 12-month-olds are able to use both facial and vocal emotion expressions of adults to regulate their behavior towards unfamiliar objects, events, or people.

Research has pointed to continuing developments over the course of the second year in understanding adults’ emotions. By the end of their first year infants are beginning to understand positive and negative emotion expressions as referring to objects in the world (Phillips, Wellman & Spelke, 2002), and by 18-months they may be able to understand an adult’s expressions of desire and disgust and to modify their own behavior in accordance (Repacholi & Gopnik, 1997). Similarly, toddlers begin to respond prosocially to adult emotional distress, though these responses are still sporadic in the second year of life, and could be governed in part by emotional contagion (Radke-Yarrow & Zahn-Waxler, 1984; Zahn-Waxler & Radke-Yarrow, 1982; Zahn-Waxler, Radke-Yarrow, Wagner & Chapman, 1992). By the end of the second year of life

children are using emotion words and have become good readers of adults' expressions, with a burgeoning awareness of others' mental states (Bartsch & Wellman, 1995; Bretherton & Beeghly, 1982; Bretherton, McNew & Beeghly-Smith, 1981; Phillips, et al., 2002). However, there is no empirical reason to believe that children's competencies in their interactions with parents and other adults necessarily extend to their interactions with peers. Indeed, very young children's social competence with peers appears to lag behind that with adults by several months to a year (Brownell, Ramani & Zerwas, 2006).

Infants are interested in their same-age peers, but prior to 18 months of age, children's peer interactions are comparatively rare, uncoordinated, and relatively limited in complexity (Brownell & Brown, 1992; Eckerman & Peterman, 2001). Over the course of the second and third years of life, children's social awareness rapidly expands and they are developing both the skills and the social understanding that enable them to generate cooperative interactions with peers (Brownell & Carriger, 1990; Brownell et al., 2006; Eckerman, Davis & Didow, 1989). So, it should be expected that children's understanding of other children's emotions would also be developing rapidly over this time.

Many of the affectively-laden social interactions of young peers revolve around one another's toys. Possession struggles over toys are a hallmark of toddler interactions. Hay, Caplan, Castle & Stimson (1991) found that two-year-olds were less likely than one-year-olds to share a toy in which their peer had expressed interest. This suggests that young children are aware of which of their toys they have to protect from peers, suggesting they may be attuned to other children's desires, i.e., peers' interest in, intentions toward, or affective relationships with objects in the environment. Moreover, Caplan, Vespo, Pederson and Hay (1991) found that one- and two-year-olds had frequent conflicts over toys even when duplicate toys were available. In

fact, fully one quarter of these conflicts occurred when the aggrieved child was holding a matching toy! So, there is suggestive evidence that very young children may be attentive to the foci of their peers' positive attention and interest, at least when those foci are toys, and may link their peers' emotional responses to toys with mental states like desire, interest, or intention.

Very young children may also attend to one another's distress and sometimes, at the end of the second year of life, respond with help-seeking behavior, or tentative comforting gestures (Dunn, 1987, 1988; Eisenberg, 1982; Hoffman, 1982; Lamb, 1993; Radke-Yarrow, Zahn-Waxler & Chapman, 1983). However, naturalistic observations have found extremely low base rates of responding to peers' distress (Lamb & Zakhireh 1997). Others have found that young children may be aware of, but are not usually responsive to, the distress of other children (Caplan & Hay, 1989; Howes & Farver, 1987; Phinney, Feshbach & Farver, 1986; Zahn-Waxler et al., 1992). Still other research points to the importance of contextual factors, such as familiarity with the peer and whether the peers' distress occurs in daycare or at home (Demetriou & Hay, 2004; Howes & Farver, 1987; Lamb & Zakhireh, 1997). Thus, the picture that emerges of toddlers' responses to peers' affect is complex: they may notice their peers' negative affect but do not systematically respond, and a variety of contextual and individual difference characteristics may explain responsiveness and non-responsiveness.

One factor that has been shown to influence the development of children's social and emotion understanding of other children is their interactions with older children. For example, both preschool and toddler-aged children with older siblings have been shown to perform better on standard tasks of social understanding, such as theory of mind tasks, than children without older siblings (Dunn, 1999; Dunn, 2002; Howe, Petrakos & Rinaldi, 1998; Hughes & Ensor, 2005; Hughes, Fujisawa, Ensor, Lecce & Marfleet, 2006; Perner, Ruffman & Leekham, 1994).

Likewise, a small empirical literature on interactions between unfamiliar mixed-age groups of children suggests that preschool-aged children may have more frequent interactions and enhanced communicative performance with older children than with same-aged peers (Fishbein & Osborne, 1971; Lougee, Grueneich & Hartup, 1977). In one study of 18- and 24-month-old children's mixed age interactions, for example, it was found that 18-month-olds used more imitation and vocalized more in their interaction with older children than same-age children (Brownell, 1990). Thus, there is some evidence that toddler-aged children might display enhanced social understanding when interacting with older children than they do with same-age peers.

In summary, it appears that around the time of their first birthday infants are able to use a variety of interpersonal communication clues from adults – both facial and vocal – to glean relevant emotion information from their environment. Yet, despite their emerging ability to understand adults' emotions, children in their second year of life often do not respond to the emotional signals of their same-age peers. Their emotion understanding of older peers might be enhanced, but no study has systematically explored that possibility. One could argue that it may be more adaptive for children to use emotion-laden information from an adult to regulate their own behavior than to utilize emotion information from a same-age or older peer because adults are more reliable sources of information about objects in the world. Yet, by the same argument, emotion information pertaining to toys should have increased salience for children at this age because their interest in one another's possessions is so high. However, the question of whether children in their second year of life have either the ability to understand and utilize affective information provided by another child, or the motivation to do so, has never been addressed.

Social referencing is a useful empirical tool to study this question, as it tests young children's capacities for using affective information to modify their behavior and it has often been used with toys or toy-like objects, toward which peers' emotions may be especially informative for young children. In a carefully designed social referencing study, Mumme and Fernald (2003) tested 10 and 12-month-old infants to see if they gleaned emotional information about toys from a televised adult. Two important features of this study distinguished it from much prior social referencing research. First, the study presented two toys, rather than just one, to determine whether children could link the adult's emotion expressions to specific referents rather than simply generalize the emotion information to any object, testing the "referential specificity" hypothesis. Second, the study used a neutral-baseline condition to ascertain whether the children's reactions following positive or negative emotion expressions differed from their reactions to simple gaze and attention and neutral vocalization toward the toy. Finding differences between this neutral baseline condition and the experimental condition allowed the authors to conclude that it was the affective information, and not just adults' attention to a given toy, that drove infants' preference for or avoidance of the novel toy. This type of control condition is especially important where an older peer expresses emotion about a toy because young children may be responsive to any attention of other children towards a toy, rather than to specific affect. Mumme & Fernald (2003) found that 12-month-olds avoided the target toy after the negative emotion display (fear) but did not differ in their play with the target objects between the positive and neutral emotion conditions. In comparison, 10-month-olds did not show any consistent pattern in their responses to the different emotion conditions. Overall, these results indicate that 12-month-old infants can and will use the negative emotion expressions of a televised adult to regulate their behavior towards toys.

In the current study the emotional expressions of an older peer were used as the stimuli, modeled after Mumme and Fernald (2003). The study was conducted with 12-, 18-, and 24-month-old children to track age-related changes in toddlers' ability to use negative and positive emotion information from an older peer about novel toys. The use of televised stimuli emphasizes the infant's role as an onlooker, which is particularly relevant during the second year of life, when peer interactions may be marked as much by watching as by engaging socially with one another.

We hypothesized that 24-month-old children and perhaps some 18-month-old children, but not 12-month-old children, would use another child's emotion expressions to govern their play and exploration of a novel toy. Evidence from the study of early peer interaction suggests that by 24 months of age, toddlers can attend to and interpret the actions of another child, but that they are unable to do so at 12 months of age. While other researchers have found that 12-month-old infants respond to adults' negative emotion expressions by playing less with a novel toy we did not expect that an older child would be an effective emotion informant given the relatively undeveloped nature of peer interactions among 12-month-olds and the greater salience and relevance of adults. Additionally, given the limitations in peer social understanding of children in the second year of life and the great salience that other children's toys have for toddlers, we hypothesized that toddlers might respond to an older peer's emotions systematically but without referential specificity. That is, perhaps 18- and 24-month old children would respond appropriately to the older child's emotions but would generalize their reactions to both toys. Thus, we had no hypotheses regarding referential specificity. We tested both emotion-specific responsiveness, i.e., increased or decreased play with both toys in response to positive or

negative emotions as compared to simple attention and interest, as well as referentially-specific responsiveness to the specific toy that was the target of the peer's emotion.

## **2.0      METHOD**

### **2.1      PARTICIPANTS**

Nineteen 12-month-old infants, 17 18-month-old infants and 17 24-month-old children (within three weeks of their birth date) were tested. Participants were predominantly middle-class and Caucasian (75.5%,  $N= 40$ ). 9.4% of participants ( $N=5$ ) were African-American while 15.1% ( $N=8$ ) of participants were defined as “other”, including South-east Asian, Asian-American and Latino. All children who began the task completed it. However, two children were excluded from the sample: one child who was tested (a 12-month-old female) did not touch any of the toys and the other child (a 24-month-old male) refused to sit in front of the television and was not tested.

### **2.2      PROCEDURE**

Infants first participated in a brief warm-up period with a few age-appropriate toys while their caregiver and the examiner reviewed consent procedures in the same room. After a few minutes, the infants and caregivers were taken to another room where testing occurred. The entire procedure took less than 20 minutes.

Infants were seated in a high chair at a 1.5-m x .6-m table, with a 44-cm color television monitor positioned at the end of the table approximately 2 m away from the child. The caregiver sat 15-cm to the child's left, facing the child diagonally and with her back to the video display. Three participants refused to sit in the highchair and participated instead while sitting on their mothers' lap. All caregivers were given questionnaires to fill out and instructed not to interact with the child. A camera was focused on the caregiver's face to check for social interactions or displays of affect. A separate camera filmed the child, placed on top of the television monitor, but obscured from the child's view by a cloth screen. The experimenter sat to the right of the table obscured by a curtain.

### **2.3 MATERIALS**

Four novel objects were presented in pairs to children and were the focus of the peers' emotions: a 14-cm spiral letter holder covered with red and blue tape; a 14-cm blue rubber jack; a 12-cm green and black Y-shaped hose adaptor; a 12-cm plastic white tube with a red wing nut. These toys were employed because they were neutral objects with which children were very unlikely to have prior familiarity. Additionally, they had bright colors to make them visually appealing to young children but no sharp edges or affordances that would render them hazardous playthings. These objects were similar to the four novel stimuli employed by Mumme & Fernald (2003).

To present children with a standard set of peer emotion expressions six separate 20-s video presentations were created in which a six-year-old girl directed neutral, positive, or negative facial expressions and vocalizations towards one of the two novel toys positioned in front of her, approximately 30-cm apart, on a white surface. The four objects were varied in

each set of videos. In addition, a seventh clip with a positive emotion toward an unrelated toy, an 18-cm Fisher Price plastic airplane, was shown so that all infants finished on a positive note.

To create the stimuli a young-looking six-year-old female was coached to display either happiness or fear toward each of the novel toys, using prototypical facial expressions and acoustic properties for each emotion (Ekman & Friesen, 1975; Scherer, 1986). The child-actress was chosen because she was young enough to appear visibly child-like but old enough to meet the rigorous task demands of expressing neutral, positive and fearful facial and vocal expressions towards a series of neutral objects. A female child was chosen in order to be consistent with previous social referencing literature which employs female emotion informants in order to minimize stranger anxiety among infant participants. Because of the demands of this task, the child's voice was recorded separately and edited onto the video of her facial expressions. Emotion expressions were accompanied by neutral descriptions of the toys (e.g. "It's red and white; It is made out of plastic").

## **2.4 TESTING**

Once the child was settled in the high chair the experimenter started the video-taped stimulus, which began with 5 seconds of an engaging abstract design to center the child's attention on the television monitor. Before each video clips was shown, the experimenter placed the appropriate toys on a tray directly under the television monitor, aligned with the video display and out of the infants' reach.

Each session consisted of three 50-second trials. The first trial was the neutral-baseline trial, followed by either a positive or a negative affect trial, and finishing with a third, always

positive trial. Each trial consisted of 20 seconds of the peer's expression directed toward one of the two toys, then 30-seconds of play time with the pair of toys where the child could play with the toy(s) of his or her choice. Immediately following the end of each video clip, the experimenter (obscured behind a curtain) pushed the tray to the end of the table within the infant's reach. After 30 seconds, the experimenter asked the caregiver to remove the toys from the infant, and a 5-second clip of an abstract design was played on the television monitor to draw the infants' attention back to the monitor. If the child dropped a toy, the caregiver immediately returned it to the tray.

## 2.5 DESIGN

The study employed a mixed-effects design with emotion valence (positive or negative) and age as the between-subjects factors and trial (neutral baseline, affect condition) as the within-subjects factor. Half the children at each age watched the peer display positive emotion (enthusiasm) toward one of the two toys, and the other half watched the peer display negative affect (fear).

A separate video was created for each of 4 object-presentation orders, with the rubber jack always paired with the letter holder, and the hose adapter always paired with the plastic tube. The jack and letter holder pair was always accompanied by neutral affect, while the tube and hose adapter pair was always accompanied by either positive or negative affect. Half of the infants received right-sided target stimuli and the other half received left-sided stimuli to control for side biases (see *Table 1*).

## **2.6 CODING AND RELIABILITY**

Coding was conducted by the author with the help of two highly-trained undergraduate assistants. Coders were blind to condition because sound was muted and the camera displayed only the faces of the infant, and not the video display. Two infant behaviors were coded from the videotapes: 1) total duration of looking at the video display during each presentation; and 2) total duration of touching each object during the play periods. The first behavior was coded to ensure that infants were attentive to the video display of the peer's emotions. The second behavior was the variable of interest. Coding was completed with the Noldus<sup>TM</sup> Observer 5.0 computer-based observation software, which allowed for duration coding.

### **2.6.1 Duration of looking at the video display**

Coders were instructed to begin coding when the blue screen of the video display could be seen reflected on the child's face, indicating that a trial was about to begin. All time spent looking straight ahead toward the video display was coded as looking at the video and toy display. Coding ended when the toy tray was pushed into view of the camera. Seventeen percent of tapes were coded for reliability by all three coders. Pearson's correlations for duration of looking were 1.0 between each coder and the author.

### **2.6.2 Duration of touching the objects**

Touching was coded as any touch to the toys, including passive holding as well as active play and exploration, and it encompassed both brief and prolonged touching of the toys. Coders were

instructed to begin coding touch to the objects as soon as the child began to touch either one. Touch to each toy separately and to both toys simultaneously were coded as mutually exclusive. Thus, if the child was coded as holding only the tube, and then picked up the hose adaptor while retaining the tube, she would then be coded as touching both. Coding continued until the parent reached for the first toy to remove it. All children were given 30 seconds of play time with the objects, but the amount of time that the parent took before removing the object varied. Thus, total available touch time with the toys was also recorded and proportion scores were used rather than raw touch time scores. Seventeen percent of tapes were coded for reliability by all three coders. Pearson's correlations for duration of touch to toys between each coder and the author ranged from .82 to .92,  $M = .87$ .

Three touch time variables were created as proportions of the total time available with the toys: 1) total time touching only the target toy, i.e., the toy toward which the peer directed attention or emotion (target touch); 2) total time touching only the distracter toy, i.e., the unattended toy (distracter touch); 3) total time touching spent playing with either or both of the toys (all touch). That is, the first two measures excluded time when children played with both toys simultaneously whereas the third variable indexed all touching to either or both of the toys, including both simultaneous touching to both toys *and* playing individually with either one of the toys.

## **3.0      RESULTS**

### **3.1      PRELIMINARY ANALYSES**

Means and standard deviations for the dependent measures are presented in *Table 2*. Preliminary *t* tests confirmed that there were no sex differences, thus all analyses were conducted on data collapsed over sex. *T* tests were also conducted to investigate whether children who dropped a toy at some point during the play period performed differently on any of the three dependent measures than those who never dropped a toy. There were no significant differences, so all subjects were included in subsequent analyses.

To probe whether children demonstrated toy preferences, two sets of paired samples *t*-tests were conducted on the total touch to each toy for each set of toys. Neither test approached significance. In addition, a one-way ANOVA with toy side (right, left) as the between-subject factor was conducted to examine whether children exhibited side preferences. No significant differences were found. Last, to examine whether the two positive or the two negative videos differed in their effectiveness, two sets of independent samples *t*-tests were conducted, one comparing target touch outcomes between the two positive video stimuli, and the second comparing the two negative video stimuli. Neither demonstrated significant differences.

### **3.1.1 Duration of looking to the video display**

All subjects watched the 20-second positive or negative emotion presentation for at least 10 seconds ( $M = 18.28$  s,  $SD = 2.80$  s, range = 10.5-20 s). Children's attention to the 20-second neutral emotion presentation (baseline) exhibited more range ( $M = 15.44$ s,  $SD = 4.98$  s, range = 2.5-20 s). A mixed-effects ANOVA with emotion valence (positive, negative) as the between-subjects condition and trial (neutral baseline, affect condition ) as the repeated factor revealed a main effect for trial,  $F(1, 51) = 23.63$ ,  $p < .01$ , reflecting an overall bias to look more at the emotion presentation than the baseline presentation. However there was no significant interaction between trial and emotion valence, suggesting that this tendency did not differ as a function of whether children watched positive or negative emotions. A follow-up one-way ANOVA comparing short lookers, i.e., those children who looked at the baseline video for less than 10 seconds, with regular lookers, i.e., subjects who looked at both videos for at least 10 seconds, as the between-subjects factor was conducted to examine whether those children who looked for less than 10 seconds in the baseline condition touched the target or distracter toys differentially in either the baseline or emotion condition and no significant effects were found.

## **3.2 SUBSTANTIVE ANALYSES**

### **3.2.1 Did infants use a peer's emotion to change their behavior towards the toys?**

We first asked whether children at any age changed their toy play based on a peer's emotions without referential specificity, i.e., by differentially touching either or both toys in response to a

peer's emotions, rather than just the target toy. To this end, a mixed-effects ANOVA with emotion valence (positive, negative) as the between-subjects factor and trial (neutral baseline, emotion condition) as the within-subject factor was conducted separately for children at 12 months, 18 months, and 24 months. The dependent measure was "all touch", i.e., total touching to either or both of the toys. No significant effects were found for 12 month olds or for 18 month olds. However, for 24 month-olds a significant main effect was found for trial,  $F(1, 15) = 7.51$ ,  $p < .05$ , reflecting a tendency for 24 month olds to touch the toys more during the affect condition ( $M = .77$ ) than during the baseline condition ( $M = .61$ ) regardless of whether they saw a peer responding positively or negatively to the toys. No significant interactions were found.

### **3.2.2 Did infants use a peer's emotion to change their behavior toward the target toy?**

A second round of analyses was conducted, this time isolating the two affect conditions from each other to examine age-related patterns of responding to the target toy as a function of whether the peer simply attended to it with neutral affect or displayed either positive or negative emotion toward it. Two mixed effects ANOVAs were conducted with age (12, 18, and 24 months) as the between-subjects factor and trial (neutral baseline, emotion) as the within-subject factor. The dependent measure in this set of analyses was "target touch", i.e. touching of the target toy *only* rather than both the target *and* distracter. Analyses were conducted separately for children who received the negative affect stimulus and the positive affect stimulus. For children who watched the peer react negatively toward the toy a marginally significant Trial x Age interaction was found  $F(2, 25) = 3.19$ ,  $p < .10$ . Follow-up *t*-tests revealed that 12 and 24 month olds did not significantly change their touch time to the target toy between the neutral baseline trial and the negative affect trial. However, 18-month-olds who viewed an older peer's negative

affect toward the toy reduced their touch to that toy ( $M = .23$ ,  $SD = .21$ ) compared to the amount of time they touched the target toy when the peer responded to it with simple interest and neutral affect ( $M = .45$ ,  $SD = .15$ ),  $t(1, 8) = 2.23$ ,  $p < .10$ .

For children who watched the peer respond positively toward the target toy a slightly different pattern emerged. Again, there was a trend toward a significant Trial x Age interaction  $F(2, 22) = 3.11$ ,  $p < .10$ . In this case, follow-up  $t$ -tests revealed that 12 month olds decreased their touch of the target toy from the neutral baseline trial ( $M = .43$ ,  $SD = .26$ ) to the positive affect trial ( $M = .19$ ,  $SD = .18$ ),  $t(1, 8) = 1.93$ ,  $p < .10$ . However, neither 18 nor 24 month olds' touch time changed significantly between the neutral baseline trial and the positive affect trial.

### **3.2.3 Did infants use a peer's emotion toward the target toy specifically to change their behavior to the target toy compared to the distracter toy?**

In the final analysis we addressed the referential specificity hypothesis, i.e., whether children changed their behavior towards the target object in contrast to the distracter or unattended object in each pair of objects. Thus, the dependent measures in this analysis were touch to the target object exclusively (target touch), and touch to distracter object exclusively (distracter touch). A mixed-effects ANOVA with emotional valence (positive, negative) as the between-subject factor and trial (neutral baseline, emotion condition) and object (target, distracter) as the within-subject factors was conducted for each age group separately. No significant main effects or interactions were found for the 12-month-old group. For the 18-month olds, a significant Trial x Object interaction was found  $F(1, 15) = 6.42$ ,  $p < .05$ . In the neutral baseline condition 18-month-olds touched the target object ( $M = .38$ ) more than the distracter object ( $M = .24$ ), whereas in the emotion condition they touched the distracter object ( $M = .36$ ) more than the target object ( $M = .24$ ).

.24) regardless of the affect directed towards the target toy. That is, 18-month-olds reduced their touch to a toy toward which an older peer expressed positive or negative emotion relative to a toy which the peer did not attend, whereas they played more with a toy toward which the peer was neutrally interested compared to the unattended toy. In the 24-month-old group a trend towards a significant main effect was found for trial,  $F(1, 15) = 3.66, p < .10$ , consistent with the previously reported tendency at this age to touch both toys more during the affect trial, regardless of which affect condition they received, compared to touching during the baseline trial.

## **4.0 DISCUSSION**

In this study we examined the ability of 12-, 18- and 24-month olds to use an older peer's emotions to adjust their own behavior towards novel toys. The results suggest that understanding of an older child's emotions may not develop in a clear linear pattern. Instead, the salience of a peer's positive or negative affect towards toys changes over the second year of life.

On the whole, 12-month-olds did not alter their behavior toward the toys as a function of a peer's response to them. In fact, 12-month-olds responded relatively randomly to the peer's emotion attention. The only trend towards a significant effect for 12-month-olds was a paradoxical one, where they seemed to decrease touch to the target toy when they saw a peer respond positively to that toy. It should be noted that in another very similar study 12-month-olds were shown to reduce their play toward the specific toy to which an adult actress displayed negative affect (Mumme & Fernald, 2003). It is possible that, as a group, 12-month-olds simply do not have enough experience with older peers to modify their behavior towards shared toys in any meaningful way. It certainly suggests that 12 month olds do not understand that an older peer can be informative in the same way that an adult can. The findings of the current study are consistent with our hypothesis that 12-month-olds would not demonstrate the same prowess in emotion understanding when among children as they can when adults lead their social interactions. Thus, when researchers make claims about very young children's abilities to understand their social milieus, these claims should be examined across social contexts.

In comparison, 18-month-olds appeared to find an older peer's negative attention to a toy, as compared to neutral interest in a target toy, to be a sign that they should avoid that toy. They only responded in this manner when they saw an older child being negative towards the toy, and they did not change their touch time in the opposite direction when the peer's attention was positive as compared to neutral. Thus, in the peer context 18-month-olds could use an older child's fearful expressions to guide them away from a novel toy. However, 18-month-olds decreased their touching to the target toy from the neutral baseline to the emotion trial regardless of whether they watched an older peer express positive *or* negative emotions towards that toy, although only the negative condition elicited a significant decrease in touching. We had no specific hypotheses about referential specificity, the ability of the children to change their behavior towards the toy that was the specific target of the older child's affective attention compared to the unattended toy. In this study 18-month-olds did display some referential specificity, reducing their touch to the target relative to the distracter toy in the emotion trials as compared to the neutral trial. However, they touched the target toy less than the distracter regardless of whether they viewed a peer displaying positive or negative emotions to that toy. This suggests that 18 month olds inhibited their touch to the target of the peer's emotion specifically, regardless of the affect they observed. Thus, for 18-month-olds, the emotion attention of an older child towards a specific toy appeared to have a mild inhibiting effect for that toy. These results are in keeping with the advancing abilities of 18-month-olds to understand adults' desires and intentions as well as their increased interest in peers (Brownell et al., 1992; Repacholi et al., 1997). Unlike 12-month-olds, 18-month-olds are systematically responding to emotion information provided by an older peer. This systematic response is to decrease touching when they see an older peer's affect towards a toy, especially negative affect. It appears that an

older child's positive attention towards a toy is not as salient to 18-month-olds as a fearful response from the older child. Thus, 18-month-olds appear to react to an older peer's negative emotions in a similar manner as they might respond to an adult. While this finding points to strengths in the social understanding of 18-month-olds, it may also highlight an interesting weakness: 18-month-olds don't understand older peers well enough to realize that these peers may be better sources of informants about positive toys than negative ones! It is possible that 18-month-olds are still new enough to complex peer interactions that they cannot correctly interpret an older peer's positive response to a toy and instead, out of confusion perhaps, inhibit touch to it.

Twenty-four-month-olds, however, do not show this same pattern. They did not discriminate between the target toy and distracter toy, i.e., they did not show referential specificity and instead touched both toys more in the affect condition than in the baseline, regardless of the affect. This suggests that an older peer's affect towards a toy, regardless of valence, was in some way activating for them. For two-year-old children any emotion attention toward a toy from an older peer piqued their interest in both toys. This pattern is consistent with increasing possession struggles over toys that can occur between older toddler peers (Hay, 2006; Hay & Ross, 1982).

It is interesting to note that affective communications, regardless of the direction, were more compelling than a neutral communication for 24 month olds. It is certainly possible that 24 month olds know enough about negative communications to be intrigued by what the older child was scared of, rather than to become frightened themselves. This may particularly be the case because the toys themselves were novel and interesting, but not inherently scary. Thus, as children learn more about emotions over the second year of life, their greater understanding of

peers' emotions could lead them to understand that peers' fear is not as salient a warning as the fear of an adult might be. Moreover, they may respond less strongly to a neutral-seeming toy than they would if the warning were about something more ambiguous, such as a robot, a stranger, or an animal. It is also possible that 24-month-olds might respond in this manner regardless of whether the emotion informant is a child or an adult. In fact, at least one researcher has found a paradoxical effect in children of this age, in which older children approached toys that their parents had indicated were negative more than they approached toys that parents had indicated were positive (Walden & Ogan, 1988). It is possible that social referencing is a methodological technique that loses some validity for children over the course of the second year of life. Perhaps by their second birthday, children have more complicated notions about affective communications and what sorts of behaviors should be elicited by them, or two-year-olds' desire to test limits exceeds their need to follow the good advice of others. Thus, an abundance of questions regarding the performance of 24-month-olds on this task remains. Primarily, we have to wonder whether their performance on this task reflects a deficit in emotion understanding, or whether it reflects simply a more complex stage of understanding the internal states of older children. Thus, a series of follow-up studies could be planned to address these questions.

The current study extends findings on infants' social understanding of peers, a literature with many unanswered questions. However, like any single study, it has a number of limitations. It is possible that the current study is underpowered to find significant results. It is also possible that the video-based emotion communications used in the current study were not strong or salient enough to elicit appropriate reactions from participants. This is a concern particularly because studies of children in the same age group have shown them to have limitations in their understanding of television as a symbolic representation of the real world (Troseth & DeLoache,

1998). However, other studies using similar methodology have demonstrated that infants will socially reference with a televised adult partner (Mumme & Fernald, 2003). In the current study all children watched the videos and even watched the affective videos for significantly longer than they attended to the neutral videos. Thus, though the effects might have been weakened by a televised stimulus, they did emerge nonetheless.

Although it is possible that children may respond differently to the presentation of live affect than to the more artificial televised presentations that they saw, it should be noted that children at this age are often exposed to quite a bit of television. In the current study, parents reported that their children watched an average of 6.3 hours of television per week with a range from 0 to 50 hours. While parents of 20% of the sample reported that their children watched no television, the remaining 80% were exposed every week to television. Much of this exposure is presumably to television shows that are designed for infants and toddlers, where many of the actors and actresses are older peers. Given how much television infants and toddlers are being exposed to, it is an important stand-alone question to query what these infant viewers make of the emotional information that is provided by older peers on television. The current study suggests that while 12-month-olds may take relatively little away from these televised affective displays, older children may glean lessons. Specifically, by 24 months, children may deduce that objects that are the subject of negative attention from an older peer on television may still be interesting and compelling. Thus the educational value of trying to teach children this age to stay away from dangerous objects by showing them televised affective information may be of dubious effectiveness.

The possible educational value of messages from televised older peers aside, the current study represents an important step in examining very young children's understanding of older

peers' emotions. The study confirms that while 12-month-olds may be interested in the emotion of older peers, they do not respond systematically to it. In comparison, 18-month-olds appear to be inhibited by the emotion attention of an older peer to a neutral toy. This effect is especially strong when the older child's emotion information is that of fear, as opposed to enthusiasm. Lastly, 24-month-olds seem to find any emotion attention of an older peer, whether positive or negative, to be activating in their play with neutral toys. Thus, 24-month-olds may have learned that peers' attention indexes a desirable plaything, and the strong desire of two-year-old children to possess another child's compelling toy may outweigh the quality of emotional attention that the older child is conveying. In sum, the social context of emotional information does affect the ensuing behavior of children in their second year of life. The age and authority of the messenger may count just as much, if not more than, the content of the message.

## APPENDIX A

**Table 1 Object Presentation Orders**

Order	Trial	Left Object	Right Object
1	Neutral	<b>Rubber Jack</b>	Letter Holder
2	Emotion	<b>Hose Adapter</b>	Plastic Tube
3	Neutral	Rubber Jack	<b>Letter Holder</b>
4	Emotion	Hose Adapter	<b>Plastic Tube</b>

*Note.* The bolded object is the target object. Both a positive and negative emotion stimulus was created for each emotion trial order.

**Table 2 Descriptive Statistics for Primary Outcome Measures**

	N	Gaze (secs)	Gaze Standard Mean	Target Touch (%)	Target Touch Standard Mean	Distracter Touch (%)	Distracter Touch Standard Mean	Total Touch (%)	Total Touch Standard
Boys	22	18.93	2.12	.23	.23	.30	.24	.73	.24
Girls	31	17.82	3.15	.24	.19	.31	.21	.67	.21
12 mo	19	17.79	3.54	.19	.17	.28	.26	.61	.21
18 mo	17	17.56	2.74	.24	.21	.35	.24	.72	.22
24 mo	17	19.56	1.17	.29	.24	.29	.17	.77	.22
Positive Condition	25	17.62	3.36	.22	.19	.34	.22	.70	.23
Negative Condition	28	18.88	2.08	.25	.22	.28	.23	.69	.22

*Note:* Gaze is presented in seconds while touch measures are presented as proportions of total touch time available.

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