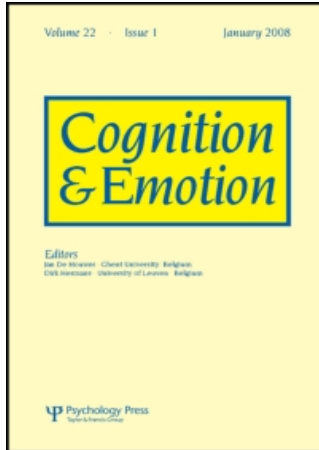


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Publisher: Psychology Press
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Cognition & Emotion

Publication details, including instructions for authors and subscription information:
<http://www.informaworld.com/smpp/title~content=t713682755>

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Online Publication Date: 01 January 2005

To cite this Article: Barna, Joanne and Legerstee, Maria (2005) 'Nine- and twelve-month-old infants relate emotions to people's actions', *Cognition & Emotion*, 19:1, 53 — 67

To link to this article: DOI: 10.1080/02699930341000021
URL: <http://dx.doi.org/10.1080/02699930341000021>

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Nine- and twelve-month-old infants relate emotions to people's actions

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Under investigation was whether 9- to 12-month-olds appreciate that a person's expression of pleasure when gazing toward an object is consistent with that person's subsequent handling of the object. Infants were randomly assigned to an experimental and control group. In the experimental group infants during the pretrials saw a Happy or an Unhappy person saying either "Oh I like objects" or "I don't like objects", respectively, while looking at an abstract object. In the habituation phase, infants saw an actor holding the abstract object, but the emotional expression of the actor was obscured. In the posttrial, infants were alternately presented with either the Happy or the Unhappy actor holding the object. In the control group, infants received the same three phase procedure, except that no object was present during the pre- and habituation trials. Analyses comparing the between-subjects variables revealed that infants in the Experimental group looked significantly longer at the Unhappy actor than infants in the Control group but less long at the Happy actor. This study is the first to compare positive and negative emotions and to show that infants as young as 9 months use these emotions to make inferences about people's subsequent actions on objects.

By about 4 years of age children produce a variety of internal state terms when describing people's actions, such as believing, thinking, and feeling (Bartsch & Wellman, 1995; Bretherton & Beeghly, 1982). It has been suggested that these terms imply that at that age, children hold complex mental states that allow them to attribute internal representations to people (e.g., "John believes that the apple

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This research was funded by a grant from the Social Sciences and Humanities Research Council of Canada (419-019-0197) to M. Legerstee. Portions of this research were part of a Masters' thesis submitted to the Faculty of Arts at York University by Joanne Barna. We would like to thank Phillip Zelazo, Roger Lecuyer, Juan Pascual-Leone, for discussions with regard to method, and Mark Schmuckler for providing us with the habituation programme. We thank the research assistants and Mirka Ondrack for statistical support, and the North York General for helping to recruit the participants. Special thanks go to mothers and babies who so generously donated their time and energy to participate in this study.

* Authorship determined alphabetically.

is in the cupboard''; Bartsch & Wellman, 1995). Three-year-olds do not readily understand or talk about beliefs, instead, they focus on the person's desire (e.g., "John wants an apple"). Even 2-year-olds understand readily that people want or desire things, and that therefore they will act to get these things (Wellman, 1990). Consequently, Wellman (1990, p. 16) has argued that "before becoming belief-desire psychologists young children are simple desire psychologists". Because these developmental changes—from primitive to complex understanding of emotions, desires, and beliefs, seem like actual theory changes—this phenomenon is called the infant's developing theory of mind (Gopnik & Wellman, 1992). Thus prior to operating with complex mental states infants operate with primitive mental states. These primitive mental states allow infants to perceive people as intentional agents whose actions are purposeful and goal directed.

For instance, when watching people who direct their attention and emotion toward objects in the environment, infants with primitive mental states understand that these cues may signal the person's intention to act on the object, but they do not understand that people may have mental representations about the object. Although much work has been done to investigate the child's understanding of beliefs and desires (Bartsch & Wellman, 1995; Flavell, Flavell, Green, & Moses, 1990; Flavell, Green, & Flavell, 1986; Wimmer & Perner, 1983), little is known about the origins of these abilities.

The purpose of the present paper was to shed light on infants' understanding of people as intentional agents. We investigated whether 9- and 12-month-olds appreciate that a person who emotes positively while gazing toward an object, may subsequently want to reach and grasp it. If they do, then these infants do not just focus on the physical movements of people (e.g., the direction of head, vocal sounds, etc.) but rather interpret these actions as goal directed. Bartsch and Wellman (1995) name this "early desire-psychology" which is the earliest precursors to a concept of desire.

Recently, Repacholi and Gopnik (1997) showed that by 18 months, infants have developed some aspect of the concept of desire. In this study, an experimenter tasted either crackers or broccoli and facially and vocally expressed either disgust or happiness. Following the displays of emotions the experimenter made a verbal and manual request gesture for the food by moving the tray in front of the infant, and then putting her hand between the bowls in which the food was presented with the palm of her hand turned upward. The experimenter asked the infant, "Can you give me some?" Although the 18-month-old infants responded correctly to the experimenter's request, the 14-month-olds usually gave the experimenter the food that they liked themselves. The authors concluded that only the 18-month-olds understood the subjective nature of desires, and the relation between emotional expressions and desires.

Although the 14-month-olds in the Repacholi and Gopnik (1997) study responded egocentrically, they did appear to understand that the experimenter

desired something. In order to determine how younger preverbal infants reason about such actions, nonverbal tasks rather than verbal tasks should be used and the infants' looking behaviour rather than active (manual) participation should be recorded. Infants tend to look less long at familiar events that confirm expectations and longer at events that are novel or violate expectations (Spelke, Breinlinger, Macomber, & Jacobson, 1992).

If 18-month-old infants demonstrate an appreciation of a person's desires and intentions, then the origins very likely can be traced to early infancy. Infant research consistently points to a transition in the infants' awareness of people's actions between 8 and 12 months. During this time infants demonstrate that they perceive people as intentional agents, whose actions are directed at objects. For instance, Phillips, Wellman, and Spelke (2002) found in a habituation paradigm that 14- but not 8-month-old infants understand that people are likely to obtain objects that they regard with positive affect. The authors presented 8- and 14-month-old infants with an event in which an actor looked at one of two similar objects with a positive facial expression. After a few seconds, the emoter reached for the object she was looking at. After familiarisation, a curtain then hid the actor and objects. When the curtain opened the infants were presented with two test events. In one test event, the actor looked and smiled at an object she had not looked at during habituation (new object). After a few seconds, she picked up the new object. This test event is *consistent* with the expectation that people may handle things to which they regard with positive affect. In the other test event, the actor looked and smiled at the original object she had looked at during habituation, but proceeded to take the other object. This test event is *inconsistent* with the expectation that people may handle things to which they emote positively. Additional studies employing small variations and controls with 12- to 14-month-olds supported the earlier findings. Phillips et al. suggested that 12-month-olds use information about direction of gaze and emotional expression to predict action. They argued that the 8-month-olds failed the tasks because the infants had difficulty following the actor's gaze when two objects were presented at the same time.

It should be noted that the emotion cues in the Phillips et al. study were not controlled (infants only saw the Happy actor emoting to objects). Consequently, it is not clear whether infants use the emotional valence of social messages and relate them to appropriate objects and actions. In addition, it may be possible that infants younger than 12 months are capable of performing the tasks if only one object is used at a time.

To investigate these questions we conducted the present study. Infants were randomly assigned to an experimental and a control group. In the experimental group infants were presented with a pretrial in which Happy and Unhappy actors alternately looked and emoted at an abstract object while vocalising. The appearances of the actors were kept similar. Following these displays, the infants

were shown a habituation event, where one of the actors was holding the object, but the head of the actor was occluded and the actor did not vocalise. Thus, infants were prevented from knowing which actor (Happy or Unhappy) was holding the object. During this event, the infants had an opportunity to develop an idea about which actor they believed was holding the object. After habituation, infants were presented with test events that were either consistent or inconsistent with these inferences. In the test events, the curtain was raised to reveal that either the happily or unhappily emoting actor was holding the object. Because infants during the first year of life prefer Happy facial expressions to Unhappy facial expressions (Kuchuk, Vibbert, & Bornstein, 1986; LaBarbera, Izard, Vietze, & Parisi, 1976; Walker-Andrews, 1997), we expected infants to look longer to the Happy actor than the Unhappy actor during the pretrials. However, if during the habituation trials infants develop the idea when viewing the faceless and voiceless actor holding an object, that the Happy actor may hold the object, then during the posttrial they should look less long at the event where this idea is confirmed (familiarity) and longer when this idea is contradicted (novelty).

Infants in the control group were shown the same procedure as infants in the experimental group except that this time, no object was present during the pretrial and an entirely irrelevant set of habituation trials intervened between pre- and posttrial. Namely, infants were habituated to an actor who did not talk, whose face was obscured, and who did not hold an object. Because no object was present during the pre- and habituation trials the infants should not develop ideas about the actor's actions on objects and consequently these ideas cannot affect looking time during the post trials. As a result, infants in the experimental group should respond differently to the Happy and Unhappy post trials than infants in the Control group.

The present research extended and elaborated the Phillips et al. (2002) studies as follows. First, we included 9-month-old as well as 12-month-old infants in the design. Second, we habituated infants to Happy actors and used the Unhappy actor as a within subjects control. If infants recognise that people who emote positively to things, will obtain these things, then Happy actors picking up objects in the test event is consistent with this recognition, but the Unhappy actor picking up objects is inconsistent with it. Third, because the Happy actor was not picking up objects during habituation, infants looking time during the Happy posttrials cannot reflect the acquisition of a simple association (e.g., Phillips et al., 2002). Fourth, to facilitate an understanding of the tasks, infants were given a cue, namely, they were shown an actor holding an object but the facial and vocal emotional expressions (e.g., Happy or Unhappy) were concealed. Finally, because the results of the Phillips et al. (2002) study suggested that before 12 months infants have difficulty following the actors' line of gaze to one of two objects, we presented the infants with only one actor and one stimulus at a time.

METHOD

Participants

Eighty-two infants were recruited for the study. Twenty-two infants, seven 9-month-olds (4 girls) and fifteen 12-month-olds (7 girls) were excluded from the analysis because they failed to achieve a quiet state (Wolff, 1966). As a result, thirty (21 girls) 9-month-olds ($M = 287.61$ days, $SD = 11.03$ days), 16 in the Experimental, and 14 in the Control groups, and thirty 12-month-olds (18 girls) ($M = 379.93$ days ($SD = 8.73$ days), 16 in the Experimental and 14 in the Control Groups, participated in the study. Infants came from lower to middle class families based on parental educational level.

Apparatus and stimuli for experimental and control groups. Four curtains surrounded the infants to limit possible environmental distractions. Infants either sat on their mother's lap or were placed in an infant seat facing a colour television on which the target presentations were displayed. The television was positioned 30 cm in front of the infants. Mothers were not informed about the experimental hypotheses until after testing. They wore headphones and were asked to look away, and to refrain from communicating with the infants. Thus, mothers were naïve to the experimental paradigm and could not inform their infants one way or another. One camera and zoom lens focused on the infant's face from a distance of 1.8 m. The camera was positioned at the eye level of the infant and was placed above and behind the centre of the television. Another video camera and zoom lens focused on the televised presentations shown to the infants. This camera was situated behind and to the left of the infant.

Presented on the film was a table that was covered with a white tablecloth and on which an abstract stimulus was placed. To ensure that infants were not responding to the task with a situation-action script (infants may associate a particular behavioural patterns with familiar targets (e.g., Wellman et al., 1995), two different, unfamiliar abstract object stimuli were used throughout the study (see Figure 1). The Happy and Unhappy actors were situated, one at a time, behind a table. The actors were visible from the waist up. Infants were shown the two different actors twice alternately. Order of the two different displays were determined randomly, with the restriction that each was displayed first an equal number of times. Both actors were similar in appearance to control for confounding physical variables that could influence differential looking in infants (i.e., both actors were female, dressed in the same clothes, and were matched for hair and eye colour) The only difference was their emotional facial and vocal expressions during the pre- and post-trials. Five independent judges selected 4 of 17 actors, on the basis of an agreement that their affective expressions best portrayed the emotions of happiness and unhappiness. The experimenter counterbalanced the different actors across participants, for both the Happy and Unhappy trials. Each actor was filmed displaying a Happy and Unhappy facial

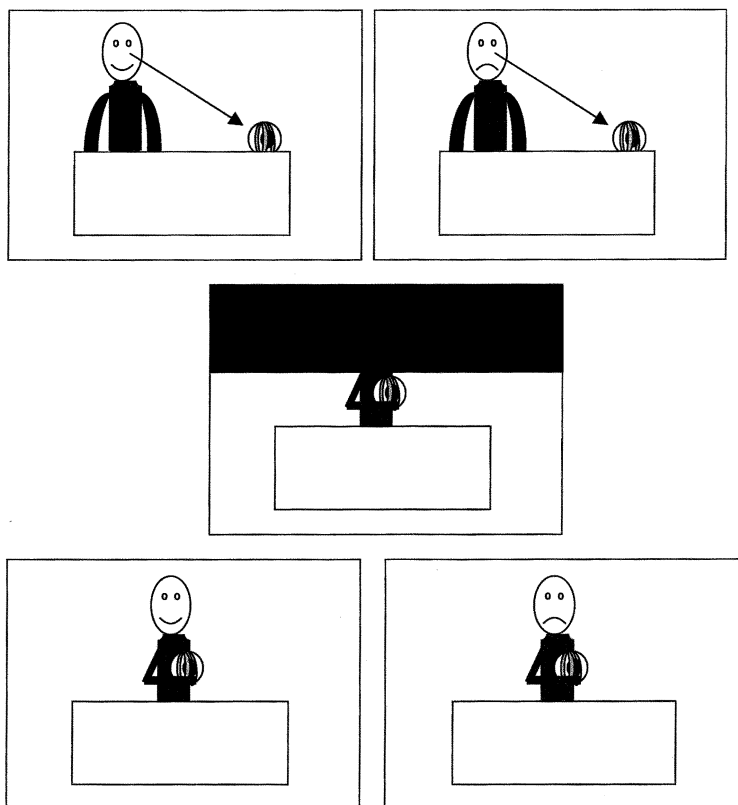


Figure 1. A schematic illustration of the pretrials (top row), habituation trials (middle row), and the consistent and inconsistent posttest trials (bottom row) presented to infants in the experimental group.

and vocal expression. The actors had studied and practised these facial expressions, using Ekman and Friesen's (1975) model, before they were filmed (see Haviland & Lelwica, 1987). An assistant watched the infants' looking behaviour on a television behind a curtain. This television displayed the infant's upper torso, arms, and head. The assistant operated a computer to calculate how long infants looked during the pretrials, and when the criterion for habituation was reached.

A television and two VCRs were situated in the operating room. The television enabled the experimenter to view which display the infants were watching. One VCR was used to play the various trials (e.g., prehabitation and test trials) throughout the study. The other VCR was employed to videotape the sessions of each infant. A date-time generator recorded the length of each session in seconds, for later coding purposes.

Procedure for experimental and control groups. All sessions were videotaped at the Centre for Infancy Research at York University in Toronto. Before the experiment began, infants were given a few minutes to become accustomed to the new environment.

Pretrials for the experimental group. When the infants were in an alert and quiet state (Wolff, 1966), they were shown one of the two televised events portraying either the Happy or Unhappy actors. They received two trials of these events. In each trial, the actor was seated at the left side of the table. After 4 s, the actor turned her head toward the abstract object on the table with either a Happy facial expression, while saying "Oh! I like objects!" or an Unhappy facial expression saying "I don't like objects". Multimodal (facial/vocal) Happy or Unhappy affective states were used to facilitate the perception of this affect (Walker-Andrews, 1997). The actor vocalised for 12 s (3 s bursts of vocalising with 1 s pauses between each) repeating the same phrase three times. After one actor had been presented, a curtain was lowered to obstruct the infants' view of the actor. Once the curtain was lowered, all that remained in the infants' view was the object on the table. Then the next actor was presented. The same number of syllables was contained within each expression. Order of presentation of the actors was randomised across infants.

Pretrials for the control group. The pretrials for the control groups were identical to those of the Experimental group except that no objects were present. The actors emoted their facial and vocal expressions while looking straight ahead.

Habituation trials for the experimental group. The habituation trials were presented immediately after the pretrials. Infants were habituated to a display of a televised event of an actor holding the object. This actor was always the person who had been the Happy actor during the pretrial. She was shown from the waist up, while holding the object in front of her. However, in this event a curtain blocked the actor from the shoulders to the head. Thus, the facial and vocal expression of the actor (Happy or Unhappy) was not perceptible to the infants. It was hypothesised that if infants understand that people who emote happily toward an object may want to act on it, then they should infer during this habituation sequence that the "Happy" actor is holding the object, and not the "Unhappy" actor. The habituation trials began when infants looked at the television event for at least 2 s. On subsequent trials, infants needed only look at the event for a minimum of 1 s. The trial ended when infants looked away from the television event for longer than 2 s. In this way, exposure to the trials was controlled by infants' looks.

The criterion for habituation consisted of infants producing two successive gazes at the televised event, for a total of less than 50% of the total duration of their first two consecutive gazes. The minimum number of habituation trials was four, and the maximum number of trials was 14 (Rosenblum, Schmuckler, & Johnson, 1997; Spelke et al., 1992). An interval of approximately 30 s transpired between the habituation phase and the posttest phase of the experiment.

Habituation trials for the control group. The same habituation paradigm was used for the Control group, with the exception that the actor was not holding an object. Again, the person who had been the Happy person during the pretrials, was the one infants were habituated to.

Posttrials for experimental and control groups. After reaching the criterion for habituation, infants were presented with two different types of test trials twice alternately. A test trial began when infants looked at the televised event for 1 s. A look ended when infants looked away from the display for longer than 2 s. A black screen appeared on the television between trials, and the interstimulus intervals were approximately 5–10 s (Rosenblum et al., 1997; Spelke et al., 1992). In one test trial, the curtain was raised to reveal that the “Happy” actor was holding the object. This event was the consistent event. In the other test trial, the curtain was raised to reveal that the Unhappy actor was holding the object. This was the inconsistent event. Order of test trials was determined randomly, with the restriction that there was an equal number of times that each test trial was first.

Measures and scoring. Gazes were coded as duration. Two research assistants coded the infants’ gazes during the habituation, and posttrials. Each research assistant underwent a rigorous training period with a practised coder to attain an interobserver reliability of 90%. The assistant who recorded the infants’ looking behaviour during the experiment, was blind to the experimental hypotheses and could not influence the results one way or another. The second assistant coded the videotaped recordings of the infants, without sound. Thus, the second assistant was blind to the order of the test trials. Pearson’s correlation coefficients were calculated on 30% of the data. The mean absolute difference between the scores of the practised coder and the first research assistant, averaged across habituation and test trials, was 0.943 s ($SD = 1.479$). The mean absolute difference between the practised coder and the second assistant for the test trials was 0.638 s ($SD = 1.227$). The scores were significantly correlated at: $r(242) = .956, p < .01$, for habituation and posttrials. Pretrials were coded at a later date. Pearson r was $r(22) = .954, p < .001$.

RESULTS

Habituation trials. The 9-month-old infants in the experimental group reached habituation criterion on an average of 7.6 trials. On the first two trials they looked for an average of 7.98 seconds ($SD = 6.69$). On the last two habituation trials they looked for an average of 3.19 seconds ($SD = 2.05$). The 9-month-old control infants reached habituation criterion on an average of 8.2 trials. On the first two trials they looked for an average of 7.25 s ($SD = 5.57$). On the last two habituation trials they looked for an average of 2.98 s ($SD = 1.6$).

The 12-month-old experimental infants took 10.3 to reach habituation criterion. On the first two trials they looked for an average of 5.60 s ($SD = 3.97$).

On the last two trials they looked for an average of 2.16 s ($SD = 1.25$). The 12-month-old control infants took an average of 9.5 trials to habituate. They looked for an average of 6.60 s ($SD = 4.93$) for the first two and an average of 2.59 s ($SD = 2.29$) for the last two trials. All infants habituated between 4 and 14 trials.

Pre- and posttrials for the experimental and control groups. Subsequent analyses focused on a comparison of infant looking times for the pre- and posttrials for the Experimental and Control groups. An ANOVA showed no difference for sex, presentation order, or age. These variables were collapsed for further analyses. Looking times were then subjected to a three-way mixed model ANOVA where Group (Experimental, Control) was the between-subjects variable, and Trials (Pre, Post) and Condition (Happy, Unhappy) were the within-subjects variables. The analyses revealed a significant three-way interaction, Greenhouse-Geisser $F(1, 58) = 8.765, p = .004$.

Post-hoc simple effects analyses on the within-subjects variables tested for the following hypotheses with respect to the Experimental group. First, because infants have been shown to prefer Happy people over Unhappy people (Walker-Andrews, 1997), we expect infants to look longer at the Happy over the Unhappy actors during the pretrials. This hypothesis was confirmed: $F(1, 58) = 36.205, p = .001$. Second, if infants are aware that people who emote happily toward objects may want to handle them during habituation, then they may infer that it is the happy person who is obstructed behind the display during habituation. If they do, then they are filling in that part of the display they cannot see (e.g., the Happy person). Therefore, they should be more bored when during the test trial they see that the Happy person rather than the Unhappy person is holding the object. Consequently, they will decrease looking from pre- to posttrial in the Happy person condition, but increase looking from pre- to posttrial in the Unhappy person condition. This hypothesis was also confirmed. Simple effects showed that infants in the experimental group decreased looking from pre- to posttrial in the Happy condition: $F(1, 58) = 6.595, p = .013$, but increased looking from pre- to posttrial in the Unhappy condition: $F(1, 58) = 5.295, p = .025$. Third, we also expected infants in the control group to look longer at the Happy versus the Unhappy actors during the pretrials. This hypothesis was confirmed: $F(1, 58) = 41.016, p = .001$. However, we did not expect a similar change from pre- to posttrial as was revealed for the Experimental group. There was no object during the pre- and habituation trials and consequently infants should not "fill in" who is holding objects during the obscured habituation trials. Therefore, no significant change from pre- to posttrial is expected. This hypothesis was confirmed. Simple effects showed that infants in the control group did not differ in looking time from pre- to posttrial in the Happy actor condition ($p = .905$), nor from pre- to posttrial in the Unhappy condition ($p = .224$).

Although these are interesting findings, the experimental group on its own does not allow us to conclude that infants perceive a happy person as being more

likely to pick up an object than an unhappy person. Because the infants looked longer at the happy actor during the pretrial, they may be looking at the unhappy person relatively longer in the posttrial because that person is more novel. The crucial test is whether infants behave differently during the posttrials as a function of whether they had been habituated to a person emoting toward an object, and then seeing an obstructed person holding an object, versus infants who were not exposed to people holding objects. In order to determine whether infants perceived the object-directed emotions as an understanding that people who emote happily at objects may want to pick them up, these infants should look significantly longer when the Unhappy person picks up the object for the Experimental group than for the control group, and less long for the Happy person condition in the Experimental group than for the Control group. Subsequent analyses comparing the between-subjects variables revealed a significant two-way interaction: $F(1, 58) = 16,108, p = .001$. Simple effects showed that infants in the Experimental group looked significantly longer at the Unhappy actor than infants in the Control group: $F(1, 58) = 6.672, p = .012$, but less long at the Happy actor: $F(1, 58) = 4.167, p = .046$ (see Figure 2) (3 outliers in Happy Group were replaced by their group mean).

In summary, because there was no age effect, it appears that 9-month-old infants expect people who attend and emote positively to things to act on them. The infants looked significantly longer at the Happy than the Unhappy actors during the pretrials in both groups. However, only the infants in the experimental group had developed an idea about which actor was holding the object. Consequently, they decreased looking from pre- to posttrial during the Happy actor condition, but they increased looking from pre- to posttrial during the

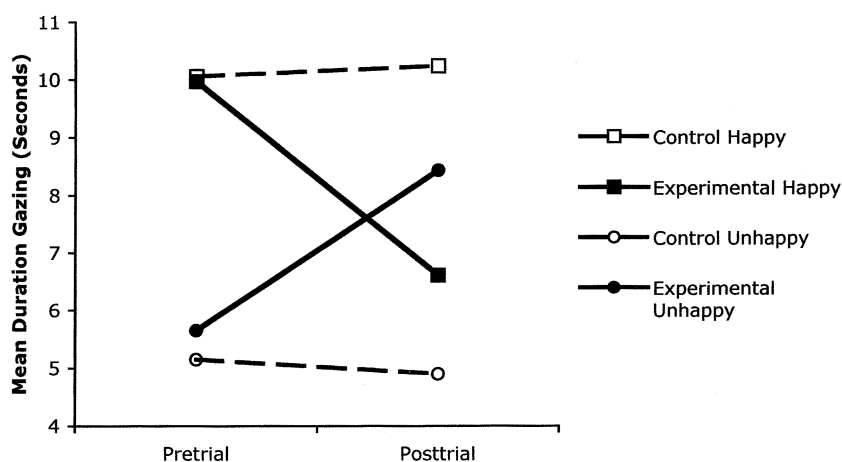


Figure 2. Duration of gazes at the Happy and Unhappy actors during pretrial and posttest trials in the experimental and control groups.

Unhappy actor condition. Infants in the control group did not show such changes. When comparing the posttrials of the experimental and control groups, infants revealed significantly different patterns of looking at the Unhappy and Happy actors. Taken together, the results of the experimental and control groups suggest that infants are aware that people who emote happily toward an object may want to hold it (Phillips et al., 2002).

DISCUSSION

The present study was conducted to determine whether 9- and 12- month-old infants appreciate that when people emote positively toward objects they subsequently want to handle them. The existence of this ability is important because it may be evidence of a primitive concept of desire (Bartsch & Wellman, 1995), which can be said to be a foundation of the mature concept of desire and a theory of mind (Wellman, 1990).

To recap briefly, during the pre- and habituation trials, infants in the experimental group saw happy and unhappy actors direct their emotions and gazes toward objects. These scenes were followed by an episode where an actor was now holding the object, but the emotional expressions (face and voice) were obscured. After this two-part sequence the infants saw posttrials similar to those during the pre- and habituation trials, except that no screen covered the head of the actors. Thus, the infants were now able to see which actor was holding the object. In one posttrial the infants saw the happily emoting actor holding the object. This scene is consistent with the idea that positive emotions are connected to subsequent handling of the object. In the other posttrial the infants saw the unhappy actor holding the object. This scene is inconsistent with the idea that positive emotions are connected to subsequent handling. If infants understand this, then during habituation infants should have encoded the happy actors as holding the object even though the identity of the person holding the object could not be seen. Consequently, the inconsistent event must have been seen as novel and elicited greater recovery from looking than the consistent test event. Infants in the control group received the same three-part sequence, except that now during the pre- and habituation trials, no object was present. During these trials, infants should not develop ideas about people's emotions and object-directed actions.

The results showed that infants in both groups preferred Happy over Unhappy actors during the pretrials. This preference disappeared in the posttrials in the experimental group, but not in the control group. These findings indicate that only infants in the experimental group had developed an idea that people who emote positively toward objects may want to act on them, and not infants in the control group.

The present study elaborated and extended the work by Phillips et al. (2002) by examining 9- and 12-month-old infants' responses in a paradigm in which infants were presented with *two*, rather than one, emotional expressions, namely,

Happy and Unhappy faces and voices. At both ages, infants altered their response as a result of the emotional message of the actors. Infants used the emotional valence of the actor's expression to predict action and understood that people's behaviours are not just movements, but rather are directed toward things. They were aware that people during the pre- and habituation trials desired a state of affairs (e.g., people emoting positively want to handle the object) and that this state of affairs was accomplished by the happy actor in the posttrial. This study is the first to compare positive and negative emotions and to show that infants as young as 9 months use these emotions to make inferences about people's subsequent actions on objects.

What is required in order to know that the emotions people direct to objects reveal something about what the person wants and is not a reflexive motor movement? Social understanding entails an apprehension of action before it occurs. That is, in order to perceive people's behaviour adequately and successfully, one must *anticipate* the actions of others (Astington, 2001). The infants in our experimental group seemed to be able to anticipate accurately what actions the actors would exhibit toward the objects, because they responded differentially to the happy and the unhappy actors during the experimental posttrials. These infants therefore perceived people as intentional agents, whose actions are purposeful and goal directed. What behaviours might infants use to infer that people are intentional agents? Wellman and Phillips (2001) argue that there are two important action features infants use to perceive intentions: (1) object directedness; and (2) action connectedness. Thus, when infants see a person gaze and emote toward an object (as in the pretrials), they perceive these emotions as *directed* (e.g., referring to the object on the table). When during habituation, an adult actually holds the object, infants connect the action "holding" with a particular emotion "Happy". This perceptual image is then either confirmed or not during the posttrial. That object directedness and action connectedness of behaviour can manifest and identify intentions is consistent with our findings in the control group. Remember that the experimental and control groups received identical conditions except that there was no object during the pretrials and habituation. Thus, although infants see people emoting, if there is no object to which these emotions are directed, then infants do not infer subsequent action connectedness during the posttrials. The experimental data not only indicate that infants have a preference for Happy over Unhappy faces in the posttrial, but that infant looking is sensitive to the existence of the object. When the Unhappy actor holds the object, the infants find this surprising (a violation of who they thought might hold the object) and increase their looking in relation to the pretrials but also in relation to the infants in the control trials. Thus, gazing and emoting toward an object are perceptual features that signal goal directedness and action connectedness to infants.

What allows for such precocious understanding of intentions in others? Domain general theorists, such as cognitive developmentalists (representation-

alists), who support a goal-directed definition of intention either posit the onset of intentionality early in the first year, as evidenced by goal-directed behaviour (Rovee-Collier, 1983), or later when infants begin to demonstrate not only an awareness of goals, but also a means for attaining that goal (Piaget, 1954; Tomasello, 1999). In contrast, some authors propose that the behaviours described above do not demonstrate an awareness of intentionality in human infants, but rather are evolved social behaviours (Povinelli, 2001), or conditioned responses (Corkum & Moore, 1998). In this context, infants are said to understand intentionality when they are able to reflect on this skill (e.g., acquire representational abilities).

If, in contrast to a domain-general view, one adopts a domain-specific view of development, then one can expect to find prerequisites to the infant's abilities to attribute intentions to the actions of others. Empirical evidence reveals that from birth infants recognise their conspecifics, and process information about social and physical events in different ways (Legerstee, 2000). Soon after birth, infants preferentially attend to human faces (Banks & Salapatek, 1983; Nelson, 1987). By 2 months infants imitate the facial gestures of people and not of inanimate objects simulating these gestures (Legerstee, 1991), and between 5 and 8 months infants begin to recognise their own faces and voices as familiar, and different from nonsocial stimuli (Legerstee, Anderson, & Schaffer, 1998). By 6 months, infants have come to expect that people behave differently towards persons and objects; namely, that people will talk to persons but not inanimate objects (Legerstee, Barna, & DiAdamo, 2000). Thus, infants perceive people, and not inanimate objects as agents that make things happen. Between 6 and 12 months, infants show that they are becoming aware of some critical aspects of people's behaviour that are continuous with more mature understandings of intentionality. They express their own intentions through monitoring the faces (gazes and emotions) of others (Butterworth & Cochran, 1980), to request help in obtaining objects, or to direct people's attention to interesting events (Baldwin & Moses, 1995; Carpenter, Nagell, & Tomasello, 1998; Legerstee & Barillas, 2003; Meltzoff, 1995; Phillips, Baron-Cohen, & Rutter, 1992; Walden & Ogan, 1988). Infants now also begin to read the emotions of others and either approach an object or try to avoid it (Feinman, 1982; Moses, Baldwin, Rosicky, & Tidball, 2000). And, as the results of the present study show, they start to appreciate that when others express positive emotions to something, they may act on it.

These findings show that at birth infants come *prepared* to interact with people. Through these interactions, infants *construct* progressively refined understandings that lead to an awareness, before the end of the first year, of people as intentional agents that will act on things they want.

In summary, as the present research shows, 9-month-old infants, when observing people directing emotions and attention to specific objects, interpret this behaviour as goal-directed, and as an intention for subsequent action. This

early awareness of the goal of the actions of people should promote a more explicit concept of intentional awareness and desire reasoning in children later on.

Manuscript received 13 May 2002

Revised manuscript received 5 August 2003

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