Infants’ social looking toward mothers and strangers

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This study investigated infant social looking in a social referencing procedure with mothers and strangers. Sixty-one infants and their mothers participated when the infants were 18 and 24 months old. The frequency and latency of looking toward each adult when the baby encountered remote-controlled ambiguous toys were measured. Mothers and strangers (female experimenters) expressed positive or negative emotional responses whenever children looked toward them. Results indicated that older infants looked more often and faster, especially toward strangers. Both age groups tended to look to the strangers more frequently than to mothers. The pattern of looking toward caregivers over time differed from looking toward strangers in both age groups. These results indicate that nonattachment figures may be preferred targets of referencing in certain situations. It is also implied that older infants’ looks to adults might differ from those of their younger counterparts in a number of ways.

By 10–12 months of age, infants look at their caregivers when they encounter novel situations such as a visual cliff (Campos & Stenberg, 1981; Klinnert, Emde, Butterfield, & Campos, 1986), ambiguous toys (Hornik, Risenhoover, & Gunnar, 1987; Walden & Baxter, 1989), and live animals (Hornik & Gunnar, 1988). Infants also base their behaviour toward situations on emotional messages caregivers provide, although the magnitude of influence differs with other factors (see Walden & Ogan, 1988).

This early behaviour, widely known as social referencing, is constituted by two aspects: “information gathering” and “regulation” (Walden, 1991). The former deals with the question of “why infants look”, and usually has been measured by looking behaviours. Regulation focuses on changes in infants’ behaviours toward stimuli after they receive emotional messages. Although the two integral parts are hard to separate, most studies so far have exclusively focused on the regulational aspect, while the number of empirical studies to investigate the infant’s social look is disappointingly small (Campos & Stenberg, 1981; Feinman & Lewis, 1983; Klinnert, 1984; Walden & Ogan, 1988). This relative paucity of relevant study is partly due to the multiple functions of referential looking (Feinman, Roberts, Hsieh, Sawyer, & Swanson, 1992). That is, infants may look to others for a variety of reasons such as seeking information about a situation, affect sharing, proximity seeking, or even information giving. Furthermore, those potentially different purposes cannot easily be discernible by observing looking behaviour per se.

In the literature on social referencing, two major theoretical frameworks about infant social looks have been proposed: One stream of the theories emphasises infants’ efforts to understand social situations (“social referencing perspective”); “(Infants) can purposely gather just the information they want, on just the topic that interests them, at just the time they require it” (Baldwin & Moses, 1996, p. 1934). On the other hand, theories focusing on mother–infant relations (“attachment perspective”) have indicated that the main purpose for infants’ social look is to secure proximity to attachment figures; “Maternal availability is the chief issue for an infant in an ambiguous situation” (Ainsworth, 1992, p. 359).

Several studies have compared looking patterns toward an attachment figure and those directed toward others (Klinnert et al., 1986; Zarbatany & Lamb, 1985), but the interpretations of their results are limited. In the study by Zarbatany and Lamb, for example, either mothers or strangers alone were present for referencing. If both sources had been available so the infants could choose toward whom they would look, looking patterns might have differed. Moreover, half of infants stayed with strangers by themselves and 20% of infants in the stranger condition were dropped due to separation anxiety. To address these concerns, Baldwin and Moses (1996) suggested that both mothers and strangers should be exposed simultaneously.

The present study examined differences in patterns of looking toward parents and strangers with equal availability in a typical social referencing experiment. Although the simultaneous presence of mothers and strangers may solve a number of issues from previous studies, that experimental design still does not address the question of why infants look. Thus, we added another condition in which different theories may predict different outcomes: age differences. Social referencing researchers argued that older infants might focus more on informative aspects of situations, whereas younger infants might be focused on other goals, such as checking for the

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mother’s presence (Feinman et al., 1992; Walden & Baxter, 1989). In short, a social referencing perspective predicts different looking patterns over age due to the development of social cognition, while there is no apparent reason to predict age differences in looking according to attachment perspective, which emphasises maternal availability.

Focusing on the social referencing perspective, the present study investigated two main hypotheses: (1) prediction of greater frequency and shorter latency of infants’ looks toward adults with increasing age, and (2) greater frequency and shorter latency of infant’s looks toward strangers with increasing age. The first hypothesis, a main effect of age in infant’s looking frequency and latency to adults, was in part predicted based on a previous study (Walden & Ogan, 1988), in which older infants showed more frequent looks to parents than their younger counterparts. Their looking to strangers, however, has not been thoroughly investigated, especially when mothers were present. The second hypothesis was a test of two different theoretical frameworks for infant social looks, social referencing vs. attachment perspectives. By simultaneously presenting two message providers and examining age differences, we were able to test predictions from the two theoretical perspectives. If older infants’ looking is more information-oriented than younger infants’, then they may look at a stranger, an information source without an emotional bond, more than their younger counterparts. Younger infants, on the other hand, may rely on looking to caregivers more than older infants.

Method

Participants

Sixty-one typically developing infants participated with mothers in a longitudinal study of social referencing. Twenty-five female and 36 male infants were recruited from local Nashville childcare centres, and observed longitudinally from 12 to 24 months of age. The present study was focused on different referential looks, rather than an onset of referencing; thus, the present study only included data from 18 and 24 months of age, in which all participants were involved in social referencing looks. The majority of subjects were Caucasian (87.3%). Three female students served as strangers throughout the experiment. Of the original 61 participants, 8 infants could not complete the experiment due to fussiness. There were 21 females and 32 males in the final sample. No sex differences were found in any subsequent analyses.

Stimuli

Three mechanically controlled toys served as stimuli. The stimuli were a remote-controlled robot with a foam ball for a head, a small white robot with red eyes, and a red furry toy with black button eyes. Each stimulus was similar in size (30 cm in height) and appearance. They were self-moving and generated mechanical noises intermittently. All stimuli were decorated in an unusual fashion in order to elicit uncertainty; the stimuli were chosen based on previous studies (Walden & Ogan, 1988; Walden & Baxter, 1989), that demonstrated that they did not spontaneously elicit positive or negative reactions from most infants.

Procedure

Infants and their parents were observed in a laboratory at Vanderbilt University. They participated in a social referencing experiment in which message providers gave emotional messages toward a variety of stimuli, contingent upon the infants’ looks toward one of the adults present. Prior to starting the experiment, parents and strangers received training in how to give vocal messages and appropriate facial expressions, based on facial expressions exemplified by Izard (1971). They were instructed to practice facial expressions along with specific vocal messages; “Nice toy. Oh I like that toy!” (positive message), and “Scary toy. Oh that toy scares me!” (fearful message). Parents and strangers were told that they could deviate from these verbal examples, but they were discouraged from directing the infant’s behaviour or saying “No”.

The experiment consisted of a free play trial and experimental trials. The first trial was a 5-min free play session to allow infants to become accustomed to the environment. Both parents and infants were allowed to interact and explore freely in a laboratory with a stranger, various toys, and books. Following the free play, a baseline measure of infant frequency of looking toward parents and strangers for an average of 10 s before stimulus onset was assessed (mean frequency score = .14 for parents and .15 for strangers, ns). The other conditions included positive and negative message conditions. Upon starting the main experiment, a stranger sat behind and to the right (or left) of the infant. Infants were placed in the middle of the room, with the parent sitting behind and to the left (or right) of them. Since parents and strangers were instructed not to initiate interaction with infants, infants needed to turn their heads to look at either adult in order to initiate interaction. Parents and strangers were instructed to show neutral facial expression at the start of each condition, but change to appropriate facial expressions when delivering messages. Every time the infant looked at either adult, that adult gave a message, so each look elicited a message from the target of the look.

Each experimental trial lasted approximately 90 s. For each trial, the toy emerged from behind a curtain in front of the infant. The toy moved back and forth in front of the infant, and then retreated. The next trial followed shortly. Each subject was randomly assigned to a message order and stimulus order, which were balanced in a Latin-Square design across subjects. The procedure for 18- and 24-month-old infants was identical.

Measures

Infant looking frequency. During each trial, infant looks were recorded whenever the infants turned their heads and looked to parents or strangers. Thus, each infant had two looking frequency scores, one toward parents and one toward strangers. When more than two looks occurred within 3 s, they were coded as one occurrence. Thus, the unit of infants’ looking profile was a 3 s “interval.” Two trained graduate students who were blind to the hypotheses watched videotapes and coded looks to parents and to strangers separately. Kappa reliability of looking was .75 (excellent) for 18-month and .73 (fair to good) for 24-month-old infants. Trial time differed slightly across age (M = 29.8 intervals, SD = 6.1 for 18 months; M = 39.7 intervals, SD = 5.5 for 24 months). Therefore, total frequency score was divided by the number of intervals in each trial and subsequent analyses were based on this rate.
Infant looking latency. Looking latency was calculated by identifying the interval in which the infant’s first look to each adult occurred. Thus, each infant had two looking latency scores, one for parents and one for strangers. Since the majority of infants (78%) looked toward one of the adults within the first 20 intervals (the minimum number of total intervals per trial), all infants who initially looked at an adult after the 20th interval were coded “21”. This truncation procedure was performed because the average length of 18- and 24-month sessions differed, so the latency would be affected if raw scores were used. Thus, the possible range of latency score was from “1” (infants looked at either adult in the first interval) to “21”. No score was obtained if infants never looked at either adult.1

Infant affect. Infants’ affective response toward stimuli was measured to check that infants were affectively neutral before the experiment started. The affect response was rated on a 5-point scale from “1”, extremely positive, to “5”, extremely negative, for every 10 s by observing videotapes. The overall affect score was generated by averaging each affect score in 10 s. Reliability for overall affect score was .75 for 18 months and .77 for 24 months.

Results

Baseline measures

Prior to examining the main hypotheses, data were examined to ensure that infants were in the neutral range affectively before they received emotional messages. Affect scores before infants received messages indicated that most infants fell into the neutral range of affective states before they received social messages (M = 3.09, SD = 0.59 for 18-month, and M = 3.17, SD = 0.56 for 24-month infants on 5-point scales).

ANOVA were performed to test order effects in the frequency and latency of looking toward each adult. Two possible order effects were tested: (1) absolute order of a particular experimental session, and (2) effects due to previous session’s message condition. No significant order effects were found in the frequency of looking toward parents, F(1, 8) = 1.30, partial η² = .03, p = .24, or toward strangers, F(1, 8) = 1.34, partial η² = .03, p = .22. That is, infants’ looks to adults were not affected by the absolute order.

Whether infants’ looks were influenced by the preceding experimental condition order was also examined. Infants’ frequency of looking to adults in the negative condition was not affected by preceding condition for either 18-month, F(1, 54) = 0.10, partial η² = .001, p = .75, or 24-month-old infants, F(1, 54) = 0.08, partial η² = .002, p = .78. Nor were significant differences found between looks in positive conditions preceded by negative versus other conditions F(1, 54) = 0.11, partial η² = .002, p = .74 for 18-month, and F(1, 54) = 0.46, partial η² = .01, p = .50 for 24-month infants. In summary, neither absolute order of the experiment or a specific pair of experimental sequences affected infants’ looks.

Infant looking frequency

Repeated measures analysis of variance was performed on the frequency of looking by three within-subject factors: age (2), adult message source (2), and message condition (2). Significant main effects were found for all three variables. First, older infants looked to adults more frequently than younger infants, F(1, 52) = 15.81, partial η² = .23, p < .001. Infants looked more often to strangers than to their caregivers, F(1, 52) = 28.32, partial η² = .35, p < .001. A significant effect of message condition, F(1, 52) = 14.18, partial η² = .21, p < .001, indicated that infants looked more frequently in the negative condition than in the positive condition.

In addition, interaction effects were found for message provider by age, F(1, 51) = 5.03, partial η² = .09, p < .05, and message provider by condition, F(1, 51) = 4.57, partial η² = .08, p < .05. Older infants looked toward the strangers more frequently, and more often during the negative condition. The three-way interaction was not significant, F(1, 52) = 2.00, p = .15.

To summarise, both younger and older infants looked more often toward strangers than toward their mothers. Looks to strangers differed from those toward mothers, as they significantly increased during negative conditions. In addition, older infants looked toward adults more frequently than younger infants, especially toward strangers (see Figure 1).

Infant latency to look at adults

Repeated measure analysis of variance examined the differences in infant latency to look by age (2) and information source (2). A main effect was found for age, F(1, 51) = 6.11, partial η² = .11, p < .05. That is, older infants looked at adults quicker than younger infants. No difference was due to message source, F(1, 51) = 1.29, p = .26. However, the means were in the direction of faster looking toward strangers (M = 8.12) than toward caregivers (M = 8.83) (see Figure 2). The interaction between age and information source was not significant, F(1, 51) = 0.2, p = .90.

Figure 1. Frequency of looking by age, information source, and message condition.
Information on slope between the 2nd and 3rd block, effect was largely due to a marginally significant effect of contrast procedure for parallelism revealed that the interaction mean of the adjacent previous block. The within-subject method, comparing the mean of each time block with the parallelism test was conducted using a repeated contrast source.

Pattern of looking across time for each information source

Looking toward parents during the first 20 intervals was compared to looking toward strangers by analysing each profile of infant looking over time. The profile was composed of four time blocks (five intervals per block), and the number of intervals in which looks occurred within each block was added to generate a measure of mean looking in each block (see Figure 3).

Repeated measures analysis of variance by age and time block showed an interaction between time and information source, \( F(3, 16) = 2.86, \) partial \( \eta^2 = .15, p < .05 \). A parallelism test was conducted using a repeated contrast method, comparing the mean of each time block with the mean of the adjacent previous block. The within-subject contrast procedure for parallelism revealed that the interaction effect was largely due to a marginally significant effect of information source on slope between the 2nd and 3rd block, \( F(1, 51) = 3.90, \) partial \( \eta^2 = .07, p = .054 \). While infant looking toward the stranger consistently increased with time, looking toward parents tended to drop in the middle of a session and recover later. This pattern was found for both 18- and 24-month-old infants.

Trend analysis was performed to identify models of fit for the data. Curvilinear regression analysis indicated that only a cubic model estimated the data well for the looking toward parents in both age groups, \( F(3, 16) = 6.67, p < .005 \) for 18 months, \( F(3, 16) = 4.03, p < .05 \) for 24 months. On the other hand, a linear model was the best model to describe looking toward strangers, with increased looking over time, \( F(1, 18) = 43.90, p < .001 \) for 18 months, \( F(1, 18) = 24.85, p < .001 \) for 24 months.

Discussion

The results of the present study call into question a common assumption. Implicitly or explicitly, many studies have assumed that primary caregivers would be a preferred source of referencing (Feinman et al., 1992). This assumption originated from the idea that infants would be selectively influenced by the nature of their relationships with those who provided the social-emotional messages.

As predicted, the frequency and latency of looking toward strangers increased and became faster with age. This result was more consistent with the social referencing perspective than the attachment perspective; that is, older infants are predicted to be more likely to seek social information than younger infants, who may be more oriented to emotional comfort. This idea is related to a postulate called "expertise effect". Proposed by Feinman (Feinman et al., 1992), this hypothesis assumes that infants might be capable of responding to different expertise levels of individuals in the social environment. According to the authors, what is important in social referencing is to refer to "people whose thought and behavior seem to improve the probability of receiving rewarding consequences (Feinman, 1982, pp. 460)". Therefore, if infants believe that the social information they acquire by referencing one person in a particular situation might be more valuable than others, they may shift their attention to the more informative person.

Because the present study did not manipulate expertise level, the above conclusion is speculative. Existant empirical studies do not provide definite evidence whether or not infants have some rudimentary understanding of expertise; although many studies indicated that older children misjudge one's mental states and abilities (e.g., Astington, 1991), others reported that even 12-month-old babies can successfully distinguish relevant message providers from irrelevant providers (Moses, Baldwin, Rosicky, & Tidball, 2001). Regardless, this issue is a promising topic for future studies. For example, an experiment in which each message provider delivers different messages, only one message provider delivers messages, or two strangers deliver messages, can shed light on many questions asked about the nature of infants' social looks.

Besides the expertise postulate, there are several alternative explanations for infants' looking toward strangers in the present study. Most alternative hypotheses, however, cannot easily explain the age differences found in the present study. For example, a "novelty effect" may explain why infants looked to strangers more frequently than their caregivers. That is, infant looking to the stranger might not be to gain information about the stimuli, but to gain information about the stranger.

![Figure 2](image1.png)

**Figure 2.** Mean latency to look at adult by age and information source.

![Figure 3](image2.png)

**Figure 3.** Profile of looking behaviour by information source.
herself. We believe that novelty plays an important role in attracting people’s attention in everyday situations, and it might be the case in our experiments too. On the other hand, novelty alone cannot readily explain why infants in the study tended to look toward strangers more often over time (see Figure 3), when novelty should decrease with increasing exposure. Second and more importantly, the novelty effect per se does not address the findings that 24-month-old infants looked more frequently toward strangers than 18-month-old infants. Thus, we concluded that although novelty might play an important role in infants’ looking toward strangers, the results of the present study suggest that such looks might be more than simply looking at novel stimuli.

Second, there is a possibility that the infants’ looking to adults may be influenced by the infants’ different experience with message providers. That is, since infants have interacted with their caregivers more often than strangers, it might be easier for them to detect subtle emotional messages from familiar figures than from strangers (a “familiarity effect”).

However, this hypothesis also does not easily explain the age differences. According to this view, 18-month-old infants might be expected to look to strangers more frequently than 24-month-old infants, who would be more efficient at encoding adult social behaviours than their younger counterparts. In addition, empirical studies have generally indicated that infants older than 7 months show no difficulty detecting adult happy and fearful expressions instantly (Kestenbaum & Nelson, 1990; Nelson & Dolgin, 1985; Walker-Andrews & Dickson, 1999). Thus, based on the above arguments, younger infants should have either looked at adults more than older counterparts, or at least equally as often.

A combination of several processes may provide better explanations. For example, social looking might be due to novelty plus experience. When infants meet strangers (e.g., go to a doctor’s surgery), they often encounter new stimuli too. Those experiences may associate novel objects with strangers, and familiar objects with familiar social partners. Likewise, a combination of novelty and development of infant’s social cognition may make strangers more novel to older infants. Thus, although the results of the present study are most consistent with the social referencing perspective, they do not rule out other possibilities.

A more definite answer might have been obtained if the impact of maternal messages in regulating infant behaviours had been compared to that of strangers’ messages, but it was impossible to disentangle those effects in the present study as both mothers and strangers were exposed simultaneously. Infants may refer to a stranger more, but they may be more inclined to be influenced by their mothers than by strangers, given their past emotional bond with primary caregivers.

Despite the limitations above, the findings of the present study suggested a number of vital topics about infant social referencing that remain to be answered. The present study addresses the question not only about “whether infants can do it or not”, but also the issue of “who they actively choose”. As Walden (1991) indicated, almost all studies of referencing in the adult social psychological tradition have tried to identify the factors influencing the referencing of strangers (e.g.; Giffin, 1967; McGinnies & Ward, 1980; Shavitt, Swan, Lowery, & Wanke, 1994), whereas developmental psychologists have been interested in the development of referencing of mothers.

The present study investigating infants’ looking toward mothers and strangers is a step toward integrating the accumulated knowledge of social and developmental psychology in social referencing.

References


