

Driven from distraction: How infants respond to parents' attempts to elicit and re-direct their attention

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Abstract

This experiment examined how parents' verbal and non-verbal behavioral cues cause infants to shift and share attention within environments where many objects compete for infants' attention. Fifteen- and 21-month-old infants played with toys while their parent periodically shifted attention to a distal object within a larger array. Parents' attention-shifts were indicated by a change in direction of gaze, a pointing gesture, and/or verbalizations. Verbalizations were either attention-eliciting or attention-directing. In some trials parents covered their eyes to occlude line-of-gaze. Both ages seldom followed simple gaze shifts, but frequently followed gaze with-points or gaze-with-directing verbalizations. Attention-eliciting verbalizations increased infants' looks to the parent. Gaze occlusion reduced infants' responses to directing verbalizations. Responses to eliciting verbalizations increased with age. Infant receptive vocabulary did not predict attention-sharing, even when parents named objects (i.e., directing verbalizations). Implications for development of attention-sharing, language and understanding of visual attention are discussed.

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1. Introduction

By their first birthday most infants can monitor and follow an adult's attention to share an experience. Before their second birthday toddlers can shift their attention to follow adults' line-of-gaze or pointing gestures, or in response to adults' verbal directives. These abilities exemplify the emerging facility for *attention-sharing*. Episodes of attention-sharing are critical for communication, social learning, and inferring others' interests and intentions. For example, deficits of attention-sharing are predictive of deficits in language ability (Dawson, Toth, Abbott, & Osterling, 2004; Mundy, Sigman, & Kassari, 1990). Yet little is known about which actions and combinations of actions compel infants to share a caregiver's focus of attention. Specific caregiver behaviors might offer infants critical spatial information (e.g., pointing towards an object), symbolic information (e.g., saying "Look at the balloon!"), or both.

To consider how caregivers' non-verbal/spatial and verbal/symbolic behaviors promote infants' attention-following, we conceptualize the process as typically two-phased: infant attention is first elicited to focus on the adult, and

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then re-directed toward a specific target or region specified by the adult's actions. By differentiating *eliciting* and *directing* effects we might better understand how adults' non-verbal and verbal behaviors promote attention-sharing.

The current investigation tested infants' attention-following in a controlled environment that contained many potentially distracting stimuli, akin to infants' everyday environments. This is different than most experiments which use impoverished test settings (Moore & Dunham, 1995). Within this test environment infants' responses to a variety of caregiver cues were tested. The overarching purpose was to investigate how infants follow typical combinations of caregiver attention-cue within a realistically distracting environment.

1.1. *Eliciting and directing infant attention*

Experimental studies of gaze- or point-following usually assume that infants are attending to the adult. Typically the adult calls the infant, then looks or points towards a target, and repeats this sequence for several trials. From this method we have learned, for example, that 12-month-old infants can follow gaze or a pointing hand to targets in front of or behind them (Deák, Flom, & Pick, 2000). Yet parents trying to direct their infants' attention do not typically call them and then silently turn or point towards a target (Deák, Krasno, Jasso, & Triesch, 2006). Rather, parents produce complex combinations of non-verbal and verbal cues, partly contingent upon the infant's ongoing actions. Also, infants 4 months or older do not constantly attend to caregivers (Bakeman & Adamson, 1984; Deák et al., 2006), so infants might not notice adults' attention cues (e.g., gaze shifts). Thus, to understand infants' attention-sharing we distinguish between caregiver behaviors that *elicit* and *direct* their attention.

An adult trying to re-direct infants' attention might first *elicit* their attention by verbalizing or making other sounds (e.g., clapping; saying "Wow!": Butler, Caron, & Brooks, 2000; Gewirtz & Pelaez-Nogueras, 1992). *Eliciting* cues are actions that tend to disengage the infant's current focus of attention (Hood & Atkinson, 1993) and re-direct it to the actor, thus potentiating subsequent social responses. A common and effective eliciting cue might be the sound of the infant's own name. Four-month-olds' attention is captured for longer by the sound of their name than another name (Mandel, Jusczyk, & Pisoni, 1995), and older toddlers seem to know that their name refers to them (Stipek, Gralinski, & Kopp, 1990). Yet it is not known when infants process the sound of their name not merely as a familiar word, but as a cue to subsequent social exchange. Thus, though *any* utterance might draw infants' attention, especially if said by a caregiver in infant-directed prosody (Fernald, 1985), attention-following requires orienting to the caregiver *and* preparation for a subsequent attention-shifting response. Infants who do not yet understand the illocutionary force of someone calling their name might orient to the sound, but then remain focused on the caller. We therefore tested 1-year-olds' tendency to orient to a caregiver calling their name, but remain responsive to subsequent cues instead of just focusing on the caregiver.

Besides the sound of their own name, non-verbal behaviors might also elicit infants' attention. Because peripheral retinal fields are relatively sensitive to motion, larger motions such as pointing gestures might effectively elicit infants' attention to the caregiver (especially if parents make wider-ranging manual actions when interacting with infants: Brand, Baldwin, & Ashburn, 2002). Thus, we compared the eliciting effects of a caregiver saying the infant's name versus making pointing gesture, in terms of the infants' looks to the caregiver and subsequent attention-following.

We also considered attention-directing functions of caregiver behaviors. Once an infant has oriented to an adult she or he might re-direct attention in response to non-verbal behaviors such as the direction of adult's gaze or point, or to verbal cues like an imperative utterance (e.g., "Hey, look at that!"). By 12 months, infants in experimental settings sometimes follow caregivers' gaze shifts, even towards targets behind them and out of sight (Deák et al., 2000). By 9–12 months infants reliably follow adults' points (Butterworth & Itakura, 2000; Butterworth & Jarrett, 1991; Deák et al., 2000; Flom, Deák, Phill, & Pick, 2003; Morissette, Ricard, & Gouin Décarie, 1995). The pointing advantage is found in experimental tests where infants start out attending to the adult. This suggests a robust attention-directing effect independent of any eliciting effects of pointing. Thus, we predicted that 1-year-old infants would follow caregivers' points more than gaze shifts. Also, although there is no evidence that points are more effective than gaze shifts at both eliciting *and* re-directing infants' attention, we speculated that in an environment with many distractions, the wide-ranging motion of pointing gestures might elicit infants' attention more effectively than head turns, and thus facilitate subsequent attention-following.

Adults also verbalize to direct infants' attention. Some verbalizations have *deictic* functions (Wales, 1979) analogous to pointing. However, the effects of such verbalizations are unclear. Namy and Waxman (2000) found 17-month-old

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