

## The Role of Target Distinctiveness in Infant Perseverative Reaching

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From a dynamic systems perspective, perseverative errors in infancy arise from the interaction of the perceptual cues with the memory of previous actions. To evaluate this account, we tested 9-month-old infants in a task in which they reached for two targets. Experimenters repeatedly cued the first target, which always matched the background (A), and then cued the second target, which varied in its distinctiveness (B). We predicted that a sufficiently distinctive B target would lessen perseverative responding. Results showed that infants perseverated when reaching for two identical targets, but that they made nonperseverative responses when reaching in the presence of a highly distinctive B target. Reach direction on each trial was jointly determined by the distinctiveness of the target, the immediately preceding perceptual events, and the history of reaches in the task. © 2001 Academic Press

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The purpose of this report is to revisit a long-standing issue in infant cognitive development: the response perseveration seen in 8- to 12-month-old infants in Piaget's A-not-B task (Piaget, 1954). In that task, the experimenter hides a toy in one location "A" as the infant watches, a delay is imposed, and then the infant is allowed to reach. On these A trials, infants typically reach to A, to where the object was hidden. After several successive hidings and reaches to A, the experimenter hides the object in a second location, "B," under an identical cover placed close to location A. Although the infants see the object hidden at B, and presumably want it, they reach perseveratively back to A.

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The present study is part of a larger research program motivated by the proposal that this error reflects basic perceptual–motor processes involved in visually elicited reaching for objects. (Diedrich, Thelen, Smith, & Corbetta, 2000; Smith, Thelen, Titzer, & McLin, 1999; Thelen, Schöner, Scheier, & Smith, in press). If this is so, then understanding perseverative responding by infants is crucial to understanding the development of reaching. Therefore, in the experiments reported here, we do not study Piaget's classic A-not-B task but rather a reaching analogue of that task. Our hypotheses are motivated by previous findings in the traditional hidden-object A-not-B task. However, since our concern is with reaching and not the representation of hidden objects, we use a simpler version of the task in which there are no hidden objects but only two competing reaching targets which are always in view. In this way, we may describe the factors that produce a reach directed to one location or another. Past findings about the A-not-B error and a new theoretical approach to reaching led us to study two related factors: (1) the perceptual qualities of the target objects for which infants are reaching and (2) infants' own recent histories of reaching to target objects. Since our specific hypotheses and experimental manipulations derive in part from past findings about infants' performance in the traditional A-not-B task, we begin with a review of the studies using the classic task that inform our hypotheses about perseverative reaching.

### *The A-not-B Error*

The present studies were motivated by an important previous result: Infants are less likely to perseverate on B trials if the A and B locations are visually distinct (see review by Wellman, Cross, & Bartsch, 1986). Specifically, frequencies of A-not-B errors declined when distinctive covers marked the two hiding locations (e.g., Bremner, 1978b; Butterworth, Jarrett, & Hicks, 1982; Wellman et al., 1986), when nearby landmarks were present that distinguished the two locations (Acredolo, 1978, 1990), and when infants were tested in their homes, with presumably familiar and useable visual landmarks (Acredolo, 1979). These findings suggest that as infants are better able to distinguish locations in space, they are also better able to remember the most current goal location. (e.g., Acredolo, 1985, 1990; Bremner, 1978a, 1978b; Butterworth, 1975, 1977; Horobin & Acredolo, 1986).

However, the literature on the A-not-B error also suggests that visually distinct locations are not always enough to eliminate perseverative responding. Specifically, the distinctiveness of the A and B locations appears to interact with other task factors. For example, in a series of experiments that varied cover color, background color, movement of the infant, and movement of the hiding locations, Bremner (1978a, 1978b, Bremner & Bryant, 1977) found decreased perseveration given distinctive hiding covers, but also an interaction with hiding location changes, infant position changes, and the number of trials at the original side. For example, cover differentiation was more effective when infants were rotated around the table than when the table was rotated around the infant. Notable, and especially relevant, is that when infants were given many trials to location A, they

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