

## Infants' persistence and mothers' teaching as predictors of toddlers' cognitive development

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### Abstract

This study examined the relative contributions of infants' persistence and mothers' teaching at 6 and 14 months to infants' cognitive development at 14 months in a sample of 65 low-income mother–infant dyads. Infants' persistence was assessed from a videotaped persistence task at 6 months and from the Behavior Record Scale of the Bayley Scales of Infant Development, 2nd ed. (BSID II) at 14 months. Mothers' teaching was assessed from a videotaped teaching interaction at 6 and 14 months using the Nursing Child Assessment Satellite Training (NCAST) teaching scale. Cognitive development at 14 months was based on the Mental Scale, BSID II. Infants' persistence at both ages and mothers' teaching at 6 months each explained unique variance in infants' cognitive status at 14 months. Persistence appears to be a stable quality that can be measured early on, and both infants' early persistence and mothers' teaching are direct pathways to cognitive status at the start of the second year.

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Examination of the factors that support cognitive development during infancy is important to the design of effective interventions for infants at risk of developmental delays or disabilities. This is especially true under difficult circumstances such as poverty, in which infants' development may be compromised. Poverty is associated with a host of adverse outcomes in early childhood, including language, cognitive delay and lower performance on indicators of school readiness (Brooks-Gunn & Duncan, 1997; Brooks-Gunn & Markman, 2005; McLoyd & Wilson, 1990; Petterson & Albers, 2001).

Persistence in infancy is one potential path to later cognitive achievement. Infants who persist in their engagements with objects and activities around them may be better positioned to learn from their environments, making them less likely to experience future developmental delay (Belsky, Friedman, & Hsieh, 2001; Petrill & Deater-Deckard, 2004). Sensitive and responsive maternal teaching is another putative path to enhanced cognitive development, both because responsive teaching may support infants' persistence and because it may promote other types of learning. Mothers who encourage their infants' exploration and learning in responsive ways, even in the context of economic stress, may buffer the deleterious effects of poverty (Huston & Aronson, 2005).

Research reveals that links between mother–child interactions and infants' persistence are bidirectional (Brazelton, Cramer, Kreisler, Schapi, & Soule, 1983; Cohn & Tronick, 1988; Hauser-Cram et al., 2001). Mothers influence infant

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behaviors and performance just as infants influence their mothers' interactions by providing cues about their emotional states, interests and needs. As such, infants are "active partners" who contribute to their own development through an influence on others (Bell, 1968; Frodi, Bridges, & Grolnick, 1985; Mahler, Pine, & Bergman, 1975; Yarrow et al., 1984). However, the way in which infant persistence and maternal interactions jointly contribute to infant's later cognitive development remains unstudied. To date, investigations of persistence and maternal teaching during infancy have largely been pursued separately. In this study, we explore pathways to cognitive development through infants' persistence and mothers' teaching in a sample of low-income mother–infant dyads. It was hypothesized that high levels of persistence in infancy coupled with high responsivity in mothers' teaching would predict better cognitive performance at the start of the second year.

## 1. Infants' persistence

White's (1959) writings on "effectance motivation" highlighted the need to examine curiosity, persistence and exploration in infancy. He theorized that exploration and persistence during play in infancy and early childhood reflected the desire to affect one's environment. He claimed that "effectance motivation" was further supported by the feelings of pleasure that infants' derived from successful "mastery" over the physical environment. White's belief that early indicators of infant persistence remained stable and would predict later competence motivated several subsequent investigations on developmental progressions of infants' persistent behavior.

Since White's work, researchers have proposed that persistence manifests itself differently at different periods in development (e.g., Barret & Morgan, 1995; Yarrow, Klein, Lomanco, & Morgan, 1975). When infants are presented with a new task, they typically transition from inattention to passive exploration (mouthing, touching and holding objects) to goal-directed, persistent behavior in which they actively explore the features of objects, for example by turning, banging, shaking or pushing buttons in purposeful ways to achieve effects. At approximately 6 months, most infants display this purposeful manipulation of objects. By 9 months, infants are able to select actions that are most appropriate for "solving" a specific task (e.g., choosing to push buttons rather than banging to create sound effects on a toy telephone). By 15 months infants strive to complete tasks independently, often resisting intervention from others. It is at this period that infants are thought to display a "persistent task approach" (Messer, 1995), which is the ability to shift attention between subcomponents of a task to attain a final goal while maintaining focus on the larger task at hand (e.g. finding a correctly shaped block, inserting in the correct hole, then moving to the next shape until all blocks have been inserted into the shape sorter).

Although there is evidence that persistence is a stable trait that appears early on and undergoes developmental change in its qualities from infancy through early childhood, it remains relatively under-examined. In particular, few studies of persistence exist in infants younger than 9 months. This gap is partly due to the notion that persistence is a quality that is either not present or something that cannot be reliably assessed during early infancy. In some instances, behaviors thought to reflect "persistence" in infancy might merely be transient ways of acting on objects with little meaning or predictive validity (McCall, 1995).

Here we suggest that persistence reflects a stable individual quality already evident in infancy, and that infants who persist at tasks in infancy and toddlerhood are more likely to perform well on current and later developmental measures. There is tentative support for such a claim. First, infants' manipulation of toys at 6–9 months, but toddlers' persistent task approach at 12–16 months, is associated with standardized developmental tests of cognition (Deater-Deckhard, Petrill, Thompson, & DeThorne, 2005; Jennings & Dietz, 2003; Rothbart, Ahadi, & Evans, 2000). In a longitudinal study of 5½ month olds, infants who were better able to manipulate novel objects had higher scores on the Stanford-Binet at 3½ years (Rose, Feldman, Wallace, & McCarton, 1989). In a study of toddlers (13–16 months), task approach as measured by persistent, active engagement with the Bayley Scales of Infant Development (BSID) task materials, was related to higher IQ scores on Fagan and Sheperd's (1989) Test of Infant Intelligence (DiLalla et al., 1990). In a third study, persistent exploration at 6 months predicted BSID scores at 12 months, and persistent task approach at 12 months predicted McCarthy Scales of cognitive abilities at 30 months (Messer et al., 1986). Thus, studies of typically developing infants and toddlers suggest that persistence accounts for significant variance in developmental status and intelligence (Belsky et al., 2001; Kelley, Brownell, & Campbell, 2000; Kelley & Jennings, 2003).

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