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Infant visual recognition memory

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Abstract

Visual recognition memory is a robust form of memory that is evident from early infancy, shows pronounced developmental change, and is influenced by many of the same factors that affect adult memory; it is surprisingly resistant to decay and interference. Infant visual recognition memory shows (a) modest reliability, (b) good discriminant validity, with performance depressed by numerous peri-natal risk factors, including teratogens and premature birth, (c) good predictive validity, relating to broad cognitive abilities in later childhood, including IQ and language, and (d) significant cross-age continuity, relating to memory in later childhood (through at least 11 years). Infant visual recognition memory is related to, and may be to some extent accounted for by, processing speed, forgetting, and certain aspects of attention (particularly look duration and shift rate). There is growing evidence that infant recognition memory may be an early form of declarative memory that depends on structures in the medial temporal lobe.

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Introduction

Infant visual recognition memory is an early emerging and fundamental form of memory. Its defining feature, namely, responsiveness to novelty, reflects a core biological adaptation. And, in fact, the response to novelty is central to several

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prominent theories of cognitive development (e.g., Piaget, 1950) and intelligence (e.g., Sternberg, 1985). For Piaget (1950, 1952), knowledge structures are altered or elaborated by encounters with new events, through a process of accommodation. For Sternberg (1985, 1981), the ability to deal with novel task demands or situations plays a major role in the experiential portion of his triarchic theory of human intelligence. It has both a motivational aspect (interest or curiosity about new situations) and an information-extraction component (acquisition of novel information). Individual differences in infant visual recognition memory are meaningful, in that they correlate fairly well with several cognitive abilities in later childhood. Indeed, the response to novelty may constitute one source of the continuity in the nature of intelligence across the life span (Sternberg, 1985).

Research on infant visual recognition memory grew out of two seminal observations made by Robert Fantz. First, he observed that chimps showed differential visual fixation to paired stimuli, thereby opening the door to the study of visually directed behavior (Fantz, 1956). Second, he observed that preferences change over time and highlighted the importance of novelty (Fantz, 1964). He presented infants with one photo for 1 min, 10 times in succession. During each exposure, it was paired with a new one. Infants over 2 months of age gave decreasing attention to the constant pattern and increasing attention to the novel one, revealing a proclivity to attend to novel stimuli. This preference method is the backbone of the visual paired-comparison (VPC) task, the paradigm that revolutionized the study of visual recognition memory in infancy.

In this paper, we first provide a brief description of basic paradigms used to study visual recognition memory in infants, and then give an overview of the factors that influence performance, including data bearing on the nature of the infant's mental representation, and current findings on the long-term duration and short-term capacity of infant memory. Following this, we consider findings on individual differences in visual recognition memory, including reliability, stability, and discriminant validity. We then describe the predictive relations of infant visual recognition memory to intelligence and specific abilities in later childhood and consider some mechanisms that might account for these individual differences. Finally, we consider the evidence indicating that infant visual recognition memory is an early form of declarative memory and highly dependent on structures in the medial temporal lobe, in particular the hippocampus and/or surrounding cortices (the parahippocampal, entorhinal, and perirhinal cortex).

Basic paradigms

Fagan (1970), in extending Fantz's pioneering work on the study of recognition memory, developed the VPC task. In this task, infants are initially familiarized with two identical stimuli presented side-by-side (or a single visual stimulus) and then tested for recognition by simultaneously presenting the previously viewed stimulus along with a new one. Typically, infants look more on test at the new stimulus than the old one. Recognition memory is inferred from this differential responsiveness to the two test stimuli. The primary measure of recognition memory is a novelty score,

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