The Development of Memory in Children

THIRD EDITION

ROBERT KAIL

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To my sons, Ben and Matt

Preface

My aim in writing the previous and current editions of this book has been to provide a comprehensible and interesting overview of our knowledge of memory development in children. In preparing this edition, the chapter on knowledge and memory (Chapter 4) was revised extensively to include discussions of scripts and memory as well as the links between knowledge and the use of strategies. A new chapter on applied aspects of memory (Chapter 7) describes research on memory in mentally retarded children, as well as research on eyewitness testimony by children. Throughout the book I describe what many would now consider "classic" studies in the field, as well as work published after I wrote the previous edition.

I want to thank the many people who have helped me to write this book, either by commenting on my plans or by reading drafts of the manuscript. Included are Gay Bisanz, Lynn Liben, Marion Perlmutter, Phil Carter, Barbara Pazak, Nora New-

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INTRODUCTION
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Sometime between the fourth and seventh months of life, a marvelous change occurs in the relationship between infants and their parents. Four-month-olds clearly distinguish between the human and the nonhuman in their environment. They will smile and babble more to a human face than to most nonhuman stimuli. However, 4-month-olds apparently do not distinguish between different human faces: They are as likely to smile at a stranger as at a parent. By 6 or 7 months, this state of affairs has changed considerably. Parents still elicit a warm smile, but strangers do not. Instead, the 6- or 7-month-old will cry as if wishing to avoid the stranger (Ainsworth, 1973). By 6 or 7 months, infants seem to *recognize* their parents as familiar and special individuals.

From infancy, we jump ahead a few years in development. Suppose that two girls, a 6- and a 9-year-old, have been invited to a skating party after school. Both are excited about the party and so are

quite concerned that they remember to take their
skates with them to school. However, only the older
girl actually *does* anything to make sure she will
take her skates. We see first that she places the
skates next to her lunchbox. She also writes the
word *skates* on a piece of paper and tapes the paper
to the bathroom mirror. The younger girl, in con-
trast, fervently hopes that she will remember the
skates, but does nothing to enhance her prospects of
doing so.

As our last stop in this excursion through devel-
opment, consider a junior high school student pre-
paring for an exam in a history class. We see that the
student is particularly attentive to passages that she
has underlined in the text. Periodically, she seems
to say parts of the passages to herself. Sometimes she
looks away from the text entirely and tries to re-
member the underlined passages. As we continue to
watch, we become more and more impressed with
the variety and creativity of our student's efforts to
prepare for the exam.

We begin with these examples because they
demonstrate three important features of memory.

First, put quite simply, memory develops. As
children grow older, they remember more effec-
tively. Of course, this fact is not surprising to anyone
who has worked with children. But describing these
changes precisely and explaining *why* they occur
are enormously complicated and challenging
problems.

The second characteristic made apparent by
these three examples is that memory refers to dif-
ferent skills. An individual's recognition of a face,
for instance, seems to represent a different type of

memory behavior than does preparation for an exam. Both clearly are instances of mnemonic behavior, but they just as clearly seem to represent different kinds of memory skills. The implication is that memory is not a single process or structure. Instead, *memory* is really a convenient descriptive term for a collection of cognitive processes. Memory development is a composite of change in each of several components of memory.

The third feature revealed is that memory is *not* an isolated intellectual skill. Rather, it is intimately involved in many of a child's intellectual and social endeavors. As Flavell (1971) put it,

Memory is in good part just applied cognition. That is, what we call "memory processes" seem largely to be just the same old, familiar, cognitive processes, but as they are applied to a particular class of problems. In other words, memory seems mostly to be just a matter of the head doing its characteristic "thing" while coping with the specific task of storing or retrieving factual information, ideas, and other cognitive contents. (p. 273)

One important implication of this view is that from research on the development of memory we can gain valuable insights into more general changes in children's intellectual functioning.

In this book, we will examine growth in different domains of memory. Our goals are, first, to understand how memory changes as children develop, and, second, to understand the role of memory in more general developmental changes in cognitive functioning.

The next three chapters of the book concern the development of memory in preschoolers, school-age children, and adolescents. We begin, in Chapters 2

and 3, by looking at instances of memory that call for deliberate, conscious, and voluntary activities on the part of the child. Two of the memory problems discussed in the opening paragraphs — trying to remember the events scheduled for a particular day or preparing for an exam — are instances of this class of mnemonic activity. A major conclusion that will be reached in Chapters 2 and 3 is that much memory development reflects the child's growing understanding of the intellectual demands of memory problems and the acquisition of appropriate skills or strategies to cope with these demands.

Most of the research described in Chapters 2 and 3 shares a common characteristic: The memory tasks used in the experiments are ones in which the information to be memorized is not rich in meaning. The stimuli are likely to be strings of digits, letters, or pictures that are unrelated to one another and that do not require sophisticated understanding or knowledge for the child to remember them. In this way, the information to be remembered is thought to be equally familiar, meaningful, comprehensible, and so on (or at least approximately equal) for children of different ages. However, in recent years psychologists have realized that the developing child's increased comprehension and understanding of her world is more than something to be controlled in experiments. In fact, it is a powerful mnemonic asset worthy of study in its own right. For example, the child uses her growing knowledge to establish elaborate, meaningful relations in the information to be remembered and, as a consequence, remembers more accurately. Put simply, conceptual development will often result in memory development. The relation between developmental ad-

vances in these two domains is the focus of Chapter 4.

In Chapter 5, we turn to the origins of memory, examining infants' memory skills. We will see that even newborns have rudimentary memory abilities and that these skills develop considerably in the first year of life. In this chapter we will also consider the phenomenon of *infantile amnesia*, the inability of adults to remember experiences that occurred early in their lives.

In Chapters 2 to 5, we will be concerned primarily with *describing* changes that occur in memory as children grow. In contrast, the topic of Chapter 6 will be the *mechanisms* of development. That is, we will consider why these changes in memory occur as they do. In doing so, we will address the second goal of the book: using research on the development of memory to enhance our understanding of more general cognitive changes in children.

In the final chapter we look at applications of the research described in the first six chapters of the book. Specifically, we will consider research in which the goal has been to understand the memory problems that are often experienced by mentally retarded children. In this same chapter we will examine children's memory problems in a very different context: children's eyewitness testimony.

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THE DEVELOPMENT
OF MNEMONIC
STRATEGIES

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We join the Edwards family as they finish dinner.
Mr. and Mrs. Edwards sit down to prepare a grocery
list before going to the market. Judy, their teenage
daughter, heads upstairs to begin her homework.
Tonight's task is to outline a chapter from her his-
tory book. Jim, their 10-year-old son, gets his base-
ball glove because tomorrow his gym class will play
baseball for the first time this spring. Jim decides to
put the glove near the front door so that he will be
sure to take it to school tomorrow morning.

This scenario, depicting the after-dinner rou-
tine of a typical family, provides three instances of
the phenomenon to be described in this chapter.
The activities of the different members of the Ed-
wards family have two common characteristics.
First, each person is faced with a memory problem
—trying to remember (1) things to be purchased, (2)
information in a textbook, or (3) the activities of the

coming day. Second, each person formulates a *strategy* for coping with his or her memory problem. Preparing lists, making an outline, and placing the glove near the door are all instances of strategies used to minimize the likelihood that a person will forget.

In this chapter, we will examine the general course of developmental change in use of such strategies. Before proceeding, we need to clarify what is meant by the term strategy. To do this, let us return to the scenario, looking for the common characteristics of the activities that we have chosen to call strategies. Consider the nature of the activities: two involve writing; the other, placing an object in a location. At the behavioral level, the first two seem to have nothing in common with the third. What this shows is that activities are called strategies not because of anything inherent in the activity but because of the reasons underlying the activity. That is, the essence of strategic behavior is that it is planful, goal-oriented behavior (Flavell, 1971). When the goal happens to be memory related, the behavior is a mnemonic strategy.

This chapter is divided into four parts. In the first, we will examine in detail developmental changes in one mnemonic — rehearsal. In the second, several other mnemonics will be examined briefly, to show that the developmental change in rehearsal typifies age-related changes in use of many mnemonics. In the third, we consider research in which the aim has been to teach students to use memory strategies. The final section is devoted to the young child, who throughout much of the chapter will often seem to be a rather passive creature who often fails to act strategically on mem-

ory tasks. We will see that this description is not always accurate and we will provide a more flattering picture of the young child as a memorizer.

The Case of Rehearsal

The Edmonton *Journal* carried the following story on January 13, 1981:

A nine-year-old boy memorized the licence plate number on a getaway car following an armed robbery, a court was told Monday. . . . The boy and his friend . . . looked in the [drug] store window and saw a man grab a 14-year-old cashier's neck. . . . After the robbery, *the boys mentally repeated the licence number until they gave it to police* (emphasis added).

Such mental repetition is referred to as *verbal rehearsal*, a strategy of repetitively naming stimuli that are to be remembered. Actually, rehearsal is not a single, well-defined strategy; instead, it refers to a class of mnemonics. The common characteristic of this class is the naming of stimuli, either overtly or covertly. Beyond this common component, rehearsal can take many forms. The simplest would be overt, repetitive naming of a single stimulus. Asked to remember the digits *9, 0,* and *8,* a child might simply say "*9*" several times, ignoring the other digits. An intermediate form would be cyclical naming of a set of stimuli: "*9, 0, 8, 9, 0, 8, 9, 0, 8,*" and so on. The most complex might involve generating associations for a stimulus and repetitively naming both the stimuli and the associations: "*9-0-8* is my birthdate, *9-0-8* is my birthdate."

The multifaceted nature of rehearsal is particularly important from a developmental perspective, for this means that there are at least two questions of interest concerning age changes in rehearsal. The first is "At what age do we typically first detect evidence of rehearsal in its most primitive form?" The second is "What is the pattern of developmental change from use of simple forms of rehearsal to use of the more complicated forms?"

One of the initial experiments concerning children's rehearsal, a study by Flavell, Beach, and Chinsky (1966), remains one of the most instructive. Children of 5, 7, and 10 years of age were shown seven pictures. Then the experimenter pointed to a subset of two to five pictures for the child to remember. Children were asked to recall these pictures aloud, either immediately or after a delay of 15 seconds. The experimenter was trained as a lip reader and thus could determine if children were overtly rehearsing the stimuli. The results were straightforward: The percentage of children who rehearsed during either immediate or delayed recall increased from 10 percent among 5-year-olds, to 60 percent among 7-year-olds, to 85 percent among 10-year-olds. Thus, rehearsal was first seen with some regularity at approximately 7 years of age.

These developmental trends were elaborated in studies by Cuvo (1975) and by Ornstein, Naus, and their colleagues (Ornstein, Naus, and Liberty, 1975; Ornstein, Naus, and Stone, 1977). The subjects in these studies ranged from 7-year-olds to adults. They were asked to remember 18 to 20 words, each of which was presented for 5 seconds. Rehearsal was measured by telling subjects that if they "thought about" the words, to do so aloud.