and smallest sticks in a group, but they had great difficulty constructing an ordered series of seven sticks. By age 6 or 7, most children could easily construct such a series and could also insert an additional stick in the correct place.

Interestingly, because of the way they approach seriation tasks, preschool children do much better when there are only three or four sticks to be put in a series (Blevins and Cooper, 1986). If you were given this task, you would probably start by finding the smallest stick and putting it on the left, finding the next smallest and putting it second, and so on until all the sticks had been arranged. This planned course of action requires that you grasp the nature of a seriated set before you begin. Such an overall plan guiding each move is not apparent in the behavior of young children, even when they are organizing only a small number of sticks. Instead, preschoolers seem to use a trial-and-error strategy, arranging the sticks more or less at random and then checking to see if the results look right. Such a strategy works for a small number of sticks, which can be arranged in a limited number of ways. But with a larger number, there are far more alternatives, and the trial-and-error approach is less likely to succeed.

Preschoolers’ approaches to seriation tasks illustrate some of the cognitive limitations characteristic of this age. Preschoolers cannot conceive of the relationship between members of an ordered set that is not visually present; they must see the whole array to know if it is right. This is the appearance-reality problem in a slightly different form. Young children’s attempts to order a set of seven sticks show evidence of centration. The array in Figure 9.2B, produced by a preschooler, looks seriated if you focus only on the tops. It is as if this child could not coordinate information from the two ends simultaneously and focused on the tops alone.

**Transitive Inference**

If you know that A equals B and that B equals C, you can conclude by transitive inference that A and C are also equal. Transitive inference can be used to reason about inequalities as well. If you know that Mikey is taller than Bryan, and Bryan is taller than Justin, you know by transitive inference that Mikey is the tallest of the three.

In Piaget’s initial studies of transitive inference, children could not solve such problems until middle childhood (Piaget, 1970), but later research found evidence of earlier skill in this area (Bryant and Trabasso, 1971; Riley and Trabasso, 1974). Tom Trabasso and his colleagues showed that even 4-year-olds can succeed at transitive inference problems if they are trained to remember the premise conditions (such as Mikey is taller than Bryan and Bryan is taller than Justin). Trabasso trained young children to remember five premise pairs, all involving relationships between pairs of real objects. It takes a long time to get 4-year-olds to master five pairs, but in the end they can answer questions such as “Who is taller, Mikey or Justin?,” even though they have never been directly taught that relationship. Preschoolers do have a much harder time with this task than school-age children do, partly because of the memory demands it involves and partly because centration makes it difficult for them to coordinate the information from multiple premise pairs.

**Distinguishing Between Appearance and Reality**

Throughout our discussion of the general characteristics of preschoolers’ thought we have given many examples in which children are misled by surface appearances. The development of the ability to distinguish between appearance and reality is also an area of research in its own right. In one of the earliest studies of this topic, children 3 to 6 years old got to know a cat named Maynard, and then researchers put a dog mask over Maynard’s head (De Vries, 1969). The children were then asked questions like, “What kind of animal is it now? Would this animal eat dog food or cat food? Does it bark or meow?” Three-year-olds frequently seemed to believe that the mask changed the identity of the animal, whereas 5- and 6-year-olds did not.

John Flavell and his colleagues have conducted many studies in which they investigated children’s understanding of the appearance-reality distinction (e.g., Flavell,
Green, and Flavell, 1986, 1990). In these studies, they showed children objects that looked like other objects, such as a sponge that looked like a rock, and had children view things through colored filters, which made them appear to change color. They asked children what the objects looked like and what they really were. Despite great efforts to ensure children understood the questions, they found that 3-year-olds consistently interpreted the appearance of an object as reality. Chinese children respond to appearance-reality tasks the same way as American children, suggesting the problem is not some peculiarity in the way the questions are worded in English (Flavell et al., 1983). The fact that other researchers have failed in attempts to train 3-year-olds to make the appearance-reality distinction further strengthens Flavell’s findings (Taylor and Hart, 1990).

However, a number of studies have shown that preschoolers’ limitations in this area are not as pervasive as originally thought. In one set of studies, children were presented with food that they had previously seen contaminated in some way, but that currently looked fine (Siegel and Share, 1990). For example, they watched a cockroach being removed from a glass of juice and were asked if the juice was now all right to drink. Children as young as 2½ said it was not drinkable, even though it looked fine. In another study, 3-year-olds were observed to use the word real to distinguish between toys and the real objects they represent, and the word really to differentiate between imaginary events and events that really happened (Woolley and Wellman, 1990). Clearly, even young children are starting to distinguish between appearance and reality, although in most situations their view of reality is dominated by appearances. By the end of the preschool years this difficulty is largely overcome. Five- and 6-year-olds still have a lot to learn about reality, but their view of it is no longer dominated by the way things look at the moment.

**PRESCHOOLERS’ ATTENTION AND MEMORY ABILITIES**

The focus in this section is on topics central to information-processing approaches, including the abilities to select and attend to information, to store it in memory, and to retrieve it. According to many information-processing theorists, information from the environment goes through various processing steps, as shown in Figure 9.3 (Atkinson and Shiffrin, 1968). First it enters a sensory register, where it is stored very briefly (less than 1 second for visual information). Whatever information is consciously noted moves to short-term or working memory, which is of more limited capacity than a sensory register but holds information longer (usually 10 to 20 seconds). Some of the information in working memory then moves to long-term memory, which has a very large capacity and can hold information for a very long time. Using memory strategies (such as rehearsing material, organizing it into categories, or relating it to other things) tends to increase the likelihood that information will be stored in long-term memory.

The information-processing model in Figure 9.3 can be used to help define attention and memory skills. Attention skills are the processes that control the transfer of information from the sensory register to working memory, while memory skills are the processes that retain information in working memory (short-term storage), transfer it to long-term memory, or both. Attention skills and memory skills may have a central role in cognitive development, as we saw in our discussion of working memory in Chapter 5.

In this section we focus on the development of attention and memory skills in preschoolers. Keep in mind that information-processing theorists believe that changes in attention and memory skills help to explain the changes in thinking and reasoning we have already discussed. For example, acquiring concepts of conservation can be explained in terms of developmental changes in what information is attended to and how that information is processed.
Deploying Attention

In Maggie’s kindergarten class the teacher is talking about the names of different shapes. Maggie is paying no attention to the teacher but instead is watching a red-tailed hawk that is hunting in a field outside the window. The teacher notices that Maggie is looking out the window and says gently, “Maggie, pay attention.”

Maggie, of course, has been paying attention, but to the hawk, not to her teacher. Her problem is failure to focus on the right thing. Maggie is not alone in experiencing this problem. The tasks of selecting information to attend to, staying focused on it, and ignoring irrelevant stimuli all pose challenges to preschoolers because their attentional systems are not yet fully developed.

In a classic study, Elaine Vurpillot (1968) showed children pairs of houses like those in Figure 9.4 and asked them to determine if the two houses were the same. Half the house pairs were identical, while the other half differed in the way the windows looked. The children’s eye movements were filmed as they made their judgments so that the researchers could tell what parts of the houses they looked at. The preschoolers in this study made more errors than older children because they did not use systematic, organized strategies in their scanning. As a result, they sometimes missed important information—in this case, some of the windows.

In other situations young children scan more information than they need to (Miller, 1990). In one study, children were shown twelve pictures, six of animals and six of household objects. The pictures were arranged on a board with twelve windows, one picture inside each window. The researcher asked the children to remember only the animal pictures and told them they could open each window as often as they wanted to memorize the picture inside it. The most efficient strategy, after finding the six animal pictures, would be to open only the windows covering those pictures. But preschoolers, unlike older children, did not use this selective behavior. They continued to open all twelve windows during the entire time they had for memorizing the pictures. As in Vurpillot’s study, the preschoolers failed to direct their attention in an organized and effective way.
Although preschoolers seem less advanced than older children in focusing their attention, they have made progress compared with toddlers. When Daniel Anderson and Stephen Levin (1976) observed 2- to 4-year-olds watching *Sesame Street*, they found that the youngest children spent the least amount of time viewing the TV screen. This was especially true when toys were placed in the room. The younger children often wandered around, playing with the toys and talking with other people, while the older children were more likely to divide their attention between the television and the toys.

Preschoolers generally lack understanding of the nature of attention and strategies for maintaining attention and shutting out distractions (Flavell and Miller, 1998). For example, 4-year-olds do not usually recognize that focusing attention on one thing, such as trying to identify the people in a group picture or listening to a friend talk, means they will not be able to attend simultaneously to something else, such as the characteristics of the picture frame or instructions being given by the teacher. During the preschool years, children become increasingly skilled at deploying their attention, but not until middle childhood do they conceive of attention as a limited resource that must be deployed selectively (Miller, 1985; Miller and Harris, 1990).

**Preschoolers' Memory**

One Friday evening when Mikey was 3, his parents decided to go to the beach the next day. Mikey was very excited but did little planning for the trip. If Christine hadn’t made a list of what to take along, Mikey would have forgotten most of his favorite toys. Three years later, when Mikey was 6, another trip to the beach was planned. This time Mikey thought about what he wanted to take and hoped he wouldn’t forget anything. When he saw Christine putting together a number of things to take, he gathered his toys and added them to the pile. Three years later,
when Mikey was 9, he often went to the beach on summer days. At this age, Mikey was much more organized in his efforts to remember. The night before, on his own, he would place his kite and fishing gear at the front door to make sure he would see them on his way out.

This example illustrates many key features of memory development. Young preschoolers are often oblivious to the memory demands of a situation. Thinking about the need to remember doesn’t occur to them, even though they may be devastated if they forget something important to them. By the end of the preschool years, children are often aware that a particular task requires remembering, but they are not very good at generating a plan to facilitate memory. Mikey at age 6 simply copied his mother’s strategy by adding to her pile. Although Mikey didn’t generate his own plan, he at least recognized his mother’s plan was effective. Finally, by age 9, Mikey spontaneously used intentional memory strategies: he put the things he wanted to take in a place where he knew he’d see them. In this section we focus on the aspects of memory development that occur during the preschool years.

**Abilities and Limitations**

In their daily activities preschoolers demonstrate both **recognition memory** (the ability to perceive a particular stimulus as familiar) and **free recall** (the ability to spontaneously pull information out of long-term memory for current use). Sometimes preschoolers’ skills at recognition and recall are quite impressive. For example, at age 3 Mikey could recognize a wide variety of construction vehicles and equipment, from backhoes to stone crushers to excavators and road rollers. Malcolm at 5 could rattle off the names and home cities of basketball teams that his mother had trouble recalling. Studies verify that preschoolers often absorb a tremendous amount of information in the course of normal activities, such as a trip to an amusement park (Hamond and Fivush, 1991). As we mentioned in Chapter 5, it is during the preschool years that **autobiographical memory** emerges, and most people’s earliest memories date from around age 3½ or 4.

In laboratory settings, preschoolers do best on recognition memory tasks, particularly those involving memory for spatial location, such as games like *Concentration and Memory* (Schneider and Bjorklund, 1998). One reason for their strong performance on these tasks is that visual/spatial memory skills are more highly developed than verbal memory skills in early childhood (Schumann-Hengsteler, 1992).

However, preschoolers usually perform poorly compared with older children and adults when asked to recall things like a set of pictures or numbers (Flavell, Miller, and Miller, 1993). Consider how they do on a digit span test, in which numbers of increasing length are read at a rate of one digit per second and they must repeat the numbers out loud. The longest number preschoolers can remember averages only four digits, compared with five digits for 6- to 8-year-olds, six digits for 9- to 12-year-olds, and eight digits for college students (Chi, 1978).

There are several explanations for this poor performance. There is some evidence that speed of information processing—and therefore the amount of information that makes it from the sensory register into short-term memory—increases throughout childhood and into adulthood (Schneider and Bjorklund, 1998). In addition, preschoolers may be less familiar with the number names they are asked to remember, and they may be less able to use intentional memory strategies. When preschoolers know as much about a topic as older children do, and when the task prevents the use of memory-enhancing strategies, preschoolers sometimes remember as well as older children. For example, in one study people were asked if they recognized pictures of cartoon characters viewed the previous day, when they had not been told they would be given a memory test. In this situation,
In the summer of 1983 a bizarre story of child abuse unfolded in Manhattan Beach, California. A mother accused a male teacher at the McMartin Preschool of sexually molesting her son. Seven months later the accused teacher and six female teachers were indicted. In seven years of legal proceedings, nearly 400 children were interviewed, and 369 reported sexual abuse by school employees, including genital fondling, oral sex, rape, sodomy, and being photographed nude. There were also reports of satanic rituals and animal mutilations (Sauer, 1993). Charges were eventually dropped against five of the female teachers; the sixth was later found not guilty. Twice, juries deadlocked on twelve counts of molestation against the male teacher, and jurors said they doubted the children's credibility because of the suggestive ways they had been questioned.

This highly publicized case rested on the reliability of young children's memories. Were the children recalling events that had really happened to them, or were they recalling events interviewers had put into their heads? Asking a leading question just isn't usually enough to change a young child's memory (Saywitz et al., 1991); but repeatedly asking suggestive questions can be influential, especially when the questioning occurs some time after the actual event.

This was shown in a study by Stephen Ceci and colleagues (Ceci, Leichtman, and White, in press). Preschool children witnessed a game and were questioned about it a month later by two adults who had not seen it. The adults were told to use whatever strategies they thought would elicit accurate reports. Before questioning the children, they were told some things that might have happened in the game, but this information was true only half the time. When the adults were correctly informed, the children accurately reported 93 percent of the events from the game. But when the adults were incorrectly informed, 34 percent of 3- and 4-year-olds and 18 percent of 5- and 6-year-olds claimed to recall one or more pieces of false information. Apparently, the adults formed hypotheses about what had happened, these influenced the way they said what they said in the interviews, to the point that they sometimes got children to corroborate false information.

This study suggests that adults with hypotheses about what a child experienced sometimes make inadvertent suggestions when questioning the child. Reviewing highly publicized cases, Ceci found that interviewers often pursue their suspicions about a child's experiences, even when the child initially denies them (Ceci and Bruck, 1998). If an interviewer makes a suggestion repeatedly, a young child can be swayed to believe it, even if it isn't true.

Research on young children's suggestibility has important policy implications. Adults must be careful how they interview child witnesses. When interviewers believe an accused person is guilty, they may convey that belief in their questions and may get children to corroborate it, even if it is false. More an interviewer persists in suggesting events, the more credible and less hesitant the child's cooperation becomes (Ceci, Leichtman, and White, in press). Interviewers often praise children for reporting events that match their own beliefs and reprimand them for sticking to another story. They may also tell young witnesses that other children have already confirmed their suspicions, creating additional pressure (Ceci and Bruck, 1998). Stricter guidelines for interviewing child witnesses are needed to prevent inappropriate questioning.

The susceptibility of preschoolers to repeated suggestions does not mean their testimony is always suspect. Young children's testimony is most likely to be accurate if they are asked very specific, concrete questions that do not suggest a certain answer, and if the questions concern things that happened to them, rather than events they merely observed (Goodman, 1991).

Preschoolers remembered just as well as older children and even adults (Chi and Ceci, 1987). But when people are instructed to remember material, older children and adults almost always perform better than preschoolers, partly because they know better how to go about remembering (Flavell, Miller, and Miller, 1993).

Sometimes young children do use memory strategies, especially when simple strategies are fairly obvious (Schneider and Bjorklund, 1998). In one study, researchers hid a toy dog under one of several containers, asked preschoolers to remember where the toy was, and then left the room and observed the children through a one-way mirror (Wellman, Ritter, and Flavell, 1975). Even 3-year-olds sometimes used memory strategies, such as staring at the correct container, moving it away from the others so it was easy to recognize, or resting their hand on it. Many 3-year-olds also showed use of memory strategies in a study in which children were asked to find a camera that had recently been used to take their pictures in several locations (Wellman, Somerville, and Haake, 1979). Children 3-1/2 years and older tended to begin their search at the last location where their picture had been taken.
demonstrating that they made use of logical constraints on where the object might be, rather than simply looking in places where they had seen it.

But preschoolers' occasional active efforts to memorize information or to search systematically for something lost are the exceptions rather than the rule. They depend either on a situation that fosters simple memory-related activities or on guidance from adults. (The susceptibility of young children to adult suggestion has implications for their reliability as witnesses, as the box on page 324 explains.)

In most cases, preschoolers perform significantly worse on memory tasks than older children because their memory strategies are still so limited (Schneider and Bjorklund, 1998). Most children younger than 5 do not spontaneously rehearse information—that is, they don't go over it several times in their minds to encourage retention. Whatever memory strategies preschoolers initially use tend to be limited, context-specific, and inconsistently applied. With further development, these strategies become more general and more consistent, and memory performance improves.

**Encouraging Improved Performance**

Vygotsky's concept of the zone of proximal development, introduced in Chapter 1, provides a perspective for viewing the memory performance of preschoolers and how it can be improved (Vygotsky, 1978). Recall that the zone of proximal development focused on the gap between a particular child's current performance and that child's potential performance with guidance by someone more skilled. Vygotsky emphasized the role of more knowledgeable others in helping children make progress within their zones of proximal development by building on skills they already have. For example, a preschool child who is asked to remember the pictures in a set may simply look at the pictures and do nothing else. It is not that the child is totally unaware that there are things that can be done to improve memory. It is usually just that he or she doesn't know what to do. However, if an adult helps by suggesting the child repeatedly go through the set and say the name of each picture out loud several times, the child will exhibit a higher level of competence on the memory task.

**SOCIAL COGNITION**

The improvements in memory skills and other aspects of thinking that occur during the preschool years have an impact on children's understanding of the social world, or social cognition. During the preschool period children start to learn how other people think and feel, what their motives and intentions are, and what they are likely to do. They begin to understand that other people's perspectives sometimes differ from their own, which helps them communicate more effectively. Also aiding communication is the general understanding preschoolers acquire about how various social exchanges are supposed to be carried out. All this new knowledge about the social world enables children to respond more appropriately to other people and to relate to them in more mature ways. More mature social relationships, in turn, provide children with additional knowledge that fosters their cognitive growth. Thus, the development of social cognition is an excellent example of how cognitive and social development are interdependent, constantly influencing each other.

**Egocentrism in Preschoolers**

As we mentioned in the introduction to this chapter, Piaget believed that preschoolers' thought was characterized by egocentrism, the inability to understand others' perspectives. Egocentrism is a cognitive limitation that appears at all levels of development (Elkind, 1978), but it is most obvious and most often studied during the preschool years. One of the authors of this book once saw a 4-year-old girl put her fingers in her ears and then ask her father, "Can you hear me?" When he responded "No," she raised her voice and asked, "Can you hear me now?" There are two illustrations of egocentrism in this
example. First, the little girl apparently believed that because she put her fingers in her
own ears she made it hard for her father to hear. She was demonstrating perceptual egocen-
trism by not differentiating her own perceptual experience from that of her father. Sec-
ond, when the father answered "No" to the child's first question, she repeated the
question, only louder, showing lack of awareness that his no meant her father must have
heard her. Here the little girl demonstrated cognitive egocentrism by failing to take into
account her father's cognitive perspective and realize that in this situation he was only
teasing her. Examples of perceptual egocentrism abound in the preschool period. One day
4-year-old Maggie asked Christine if she could call her grandmother to tell her about her
new shoes. "Look, Grandma," Maggie said into the receiver, as she held up one foot.
"Aren't they beautiful?"

Piaget used an ingenious research technique called the Three-Mountain Task to study
perceptual egocentrism. In this task, children were first allowed to inspect all sides of a
large model of a mountain range (see Figure 9.5). Then they were asked to pick out a pic-
ture of the model that showed it as viewed by a person sitting on the model's opposite side.
Four-year-olds had trouble with this task, and it was not until age 9 to 10 that children reli-
ably picked the correct picture. However, the Three-Mountain Task is complex and places
considerable memory demands on children. On simpler tasks, preschoolers give indica-
tions that their perceptual egocentrism is not complete. For example, when shown a block
that is red on one side and white on the other, they can often correctly identify the color
viewed by a person looking at the opposite side.

Cognitive egocentrism is also common in preschoolers. Young children assume, for
example, that others have the same knowledge and beliefs that they do. Suppose a young
preschooler sees cookies being hidden in a crayon box, and then a second child enters the
room (Moses and Flavell, 1990). When asked what the second child thinks is in the box,
the first child will answer "cookies," not "crayons." Apparently, a young preschooler can't
adopt the other child's perspective. Because the first child knows there are cookies in the
box, he or she can't imagine another person answering anything else. This egocentrism
may be closely connected to difficulties with the appearance-reality distinction. Preschoo-
lers behave as if the way the world appears to them is reality, and so their own perspective
must be shared by everyone else.

Cognitive egocentrism also includes knowledge about others' desires and wishes. It
can be seen in a study by John Flavell conducted by asking children ages 3 to 6 to select gifts
for various people—their mother, their father, a brother or a sister if they had one, their
teacher, and themselves (Flavell et al., 1968). The gifts to choose from included silk stock-
ings, a necktie, a toy truck, a doll, and an adult book. Three-year-olds showed clear egocen-
trism by often selecting dolls and trucks for their mothers and fathers. They failed to
differentiate their own desires from those of adults. If they wanted a doll or a truck, they
presumed everyone else wanted one too.

But this study also showed the gradual progress older preschoolers make in overcom-
ing egocentrism. Unlike the 3-year-olds, the 4-year-olds seemed aware that everyone in the
world might not want what they want, although they still had trouble taking an adult's per-
spective and picking an appropriate gift. Interestingly, the 4-year-olds were more egocen-
tric in making a gift choice for a teacher than for a parent, perhaps because they knew more

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**Figure 9.5**

**PIAGET'S THREE-MOUNTAIN TASK**

In this task, a child sits in position 1 (in the overhead view) looking at this three-mountain display.
When asked which picture, (A), (B), or (C), demonstrates how the display would look to a child
sitting in position 4, preschoolers often incorrectly select their own view (C) rather than correctly
choosing (A).
about what parents buy for themselves. It was not until age 5 that 50 percent of the children chose appropriate gifts for everyone on the list; and it was not until age 6 that all the children chose appropriately. Thus, during the preschool period, children come to realize others may have desires different from their own, and they begin to take another person’s perspective in trying to determine what that person’s wishes might be.

Flavell has analyzed the cognitive components needed to overcome egocentrism and to take another’s perspective (Flavell, Miller, and Miller, 1993). First, children must realize that other people have thoughts, viewpoints, and desires that may differ from their own. Flavell calls this a knowledge of existence. Second, children must realize it can be useful to consider another’s perspective, that doing so can facilitate social interaction and communication. Flavell calls this an awareness of need. Finally, children must become skilled at social inference. They must be able to read another person’s actions and imagine that person’s point of view.

The same cognitive components enable children to understand the feelings and emotions of others. Very early signs of sensitivity to other people’s feelings are not indications the child truly comprehends what others feel. For instance, the social referencing of early toddlerhood, in which the child takes cues from the caregiver’s face in a novel situation, involves only a primitive awareness of the caregiver’s feelings. Not until about age 4 is there strong evidence that children interpret facial expressions as belonging to general categories, such as “feels good” and “feels bad” (Shantz, 1975). More finely tuned interpretations of other people’s feelings take substantially longer to develop. Even adults often have trouble with the inference part of this process. They recognize the existence of other people’s feelings and the need to assess them, but they aren’t always correct in deducing what those feelings are. In preschoolers, the emerging ability to grasp other people’s feelings does not mean this new skill is regularly used. Its use is still quite limited (Flavell, 1985). We will return to the topic of understanding others’ feelings when we discuss the development of empathy in Chapter 10.

The Child’s Theory of Mind

During the preschool years children are constructing an understanding not only of physical reality but also of the human mind and such concepts as knowing, wanting, thinking, remembering, and intending. This understanding of the mind and mental operations constitutes the child’s theory of mind. The term theory may seem excessive when referring to preschoolers’ understanding of the mind, but it really is appropriate here. Young children’s grasp of the mind goes beyond empirical knowledge (knowledge based on experience and observation in the physical world) to include theoretical knowledge (explanations based on constructs that cannot be directly observed).

In developing a theory of mind, children come to understand five fundamental principles, according to developmental psychologist John Flavell (Flavell, Miller, and Miller, 1993). The first principle is simply that minds exist. Babies do not understand the existence of minds, even though they may be able to distinguish things that have minds (living things capable of moving and experiencing the world) from things without minds (inanimate objects) (Wellman and Gelman, 1992). During the toddler period children start referring to mental states such as feelings and desires, which tells us they have begun to grasp the notion that minds exist. Thus, this important first principle is established even before the preschool years.

The second principle in the child’s theory of mind is that minds have connections to the physical world. That is, what people think, feel, know, and want is linked to the objects and events around them. Substantial improvement in this understanding occurs between the ages of 2 and 3. For example, 3-year-olds (but not 2-year-olds) know that if something is hidden in a container, someone who has looked in the container knows it is there, whereas someone who hasn’t looked doesn’t know (unless that person saw the object being hidden or has been told where it is) (Pratt and Bryant, 1990). But though 3- and 4-year-olds know that what is in the mind has connections to the physical world, their understanding of the nature of those connections is very limited. They still make mistakes in
predicting the kind of experiences needed to know certain things, and they also make errors in predicting how particular kinds of knowledge will influence behavior (Flavell, Miller, and Miller, 1993).

The third principle that children come to understand is that minds are separate and different from the physical world. For example, 3-year-olds know the mind can fantasize about things that don’t really exist (Wellman and Estes, 1986). They know that if one child has a cookie and another is thinking about a cookie, only one of those cookies can be actually seen and touched. This new understanding of mental events makes children less fearful of imagined ghosts and monsters, although such fears are not entirely gone. Even adults, after all, are often apprehensive after seeing ghosts and monsters in a horror film (Flavell, Miller, and Miller, 1993).

Fourth, children come to understand the principle that minds can represent objects and events accurately or inaccurately. Understanding this idea requires that children reflect on mental representations, so it is not usually grasped by 2- and 3-year-olds. Four- and 5-year-olds, however, clearly exhibit some understanding of it. In one study, children heard a story about a child who put some candy in a blue cabinet, and while he was out playing his mother moved it to a green cupboard (Wimmer and Perner, 1983). The children were asked where the boy would look for the candy when he came back. Three-year-olds predicted the green cupboard (where they knew the candy really was), but 4- and 5-year-olds predicted the blue cabinet (where they knew the boy thought it was). Apparently, 4- and 5-year-olds are able to reflect on the accuracy of the boy’s beliefs and predict how a false belief will affect his behavior. Notice that the belief-reality distinction involved in this example is very similar to the appearance-reality distinction discussed earlier. The two show similar developmental patterns, although the belief-reality distinction emerges somewhat sooner.

Finally, children come to understand a fifth principle: that minds actively interpret reality and emotional experiences. The beginnings of this understanding are revealed in success on tasks that involve false beliefs, like the one in the study just described. Preschoolers are very limited in this understanding, however. They tend to treat mental representations as passively acquired copies of real events, not as actively constructed ideas about reality. Even children as old as 8 believe everyone who hears the same message, regardless of their ages, will understand it in the same way (Montgomery, 1991). Similarly, it is not until well into middle childhood that children become aware that emotional responses are influenced not just by what happens but also by a person’s prior feelings and expectations (Gnepp, 1989).

Developmental psychologists widely agree that children acquire a theory of mind from their experiences in the world, especially their social experiences. In the next section you will see how social experiences help preschoolers overcome egocentrism, in a process closely linked to developing a more mature theory of mind.

Communication and the Decline of Egocentrism

Communicating with others involves more than simply having a vocabulary and knowing how to put words together. It also involves an understanding of how to participate in conversations. How much information do others require to understand your meaning? Which of your ideas must you spell out in detail and which can your listeners infer? How do you know when clarifications are needed? Children start to understand these aspects of communication during the preschool period. One way to conceptualize their progress in this area is to think of it as part of a general decline in egocentrism.

Of course, how egocentric a young child’s speech is often depends on the complexity of the communication task. This was demonstrated in a study by Sam Glucksberg and Robert Krauss (1967), who had two children sit on opposite sides of a screen, with identical sets of blocks in front of them. Each block had on it one of the abstract designs shown in Figure 9.6. The children’s task was to stack the blocks in exactly the same order without either of them seeing what the other was doing. One of the children was given the job of describing each block to the other so that the second child could pick it out of the pile and
add it to his or her stack. Four- and 5-year-olds performed very poorly on this task because they gave so many egocentric and uninformative descriptions: “A curved part of a pipe,” the child might say, or simply “The first one.” Often, the children seemed to ignore the fact that neither of them could see what the other was talking about, as in the following exchange:

Speaker: It's a bird.
Listener: Is this it?
Speaker: No.

(GLucksberg, Krauss, and Higgins, 1975, p. 321)

These results do not mean preschoolers can never analyze what a listener needs to know to understand their meaning. In more conducive circumstances they can convey their ideas to others in ways that are understood. For instance, when the abstract figures on the blocks in Glucksberg and Krauss’s study were replaced with simple geometric shapes in different colors (a yellow circle, a blue square, etc.), preschoolers were much more successful at describing them to another child. In another study, preschoolers spontaneously adapted the amount of detail in their explanations to suit the knowledge of particular listeners. This study involved exposing 4-year-olds to a staged accident in which an adult spilled a cup of punch. When asked a week later why the empty cup was in the room, the children varied their answers depending on whether they were speaking to the adult who had knocked the cup over or to another person who knew nothing about the previous accident (Menig-Peterson, 1975). As we mentioned in Chapter 7, 4-year-olds simplify their speech when they are talking to younger children or infants (Dunn and Kendrick, 1982b; Shatz and Gelman, 1973). Preschoolers also spontaneously vary their clarifications of something they have said depending on the age of their listener (Warren-Leubeker and Bohannon, 1983). They clarify one way if talking to an adult and another way if talking to another child, again showing an awareness of the listener’s needs.

If preschoolers do have some ability to vary what they say in accordance with a listener’s needs, why did they perform so poorly in early experiments like that of Glucksberg and Krauss? The answer, as we've suggested, may lie in the difficulty of the task. The figures on the blocks in the Glucksberg and Krauss experiment were abstract and hard to describe. Such a task may use all the cognitive capacity of a young child, leaving nothing for use in determining an appropriate wording. As a result, the child lapses into egocentric wording that does not take into account the listener’s needs (Shatz, 1978).

The idea that performing a task consumes cognitive resources suggests something important about how children’s abilities should be studied. To determine a child’s maximum
Preschoolers adjust their speech to their conversation partner. For example, they use simpler terms when talking to younger children than with peers or adults.

skill at a particular task, it is best to limit all other cognitive demands as much as possible. However, to find out how children typically perform, it is better to make sure they are in an environment with all the demands and distractions usually found in a natural setting. For example, in a laboratory task Malcolm might be able to settle a disagreement with a peer more maturely than he settled the disagreement with April. But in a natural setting like a playground, where many cognitive demands are simultaneously occurring (the argument itself, shouted suggestions from friends, the perceptual distraction of other children at play), resorting to force is a course of action that many 5-year-olds would take.

**Limited Cognitive Resources and Communication**

One of the ways preschoolers are able to communicate and interact with others effectively, despite their limited cognitive resources, is through the use of scripts for common routines (Myles-Worsley, Cromer, and Dodd, 1986; Nelson and Gruendel, 1979; Schank and Abelson, 1977). A **script** is an abstract representation of a sequence of actions needed to accomplish some goal. Most preschoolers have scripts for a variety of routines they experience in their daily lives, such as eating at a fast-food restaurant, going to a birthday party, or shopping in a supermarket. Here is a conversation between two 4-year-olds that shows they have acquired the basics of a “talking on the phone” script:

Gay: Hi.
Daniel: Hi.
Gay: How are you?
Daniel: Fine.
Gay: Who am I speaking to?
Daniel: This is your daddy. I need to speak to you.
Gay: All right.
Daniel: When I come tonight, we’re gonna have peanut butter and jelly sandwich, uh. at dinner time.
Gay: Ummm. Where’re we going at dinner time?
Daniel: Nowhere. But we’re just gonna have dinner at 11 o’clock.
Gay: Well, I made a plan of going out tonight.
Daniel: We’re going out.
(Nelson and Gruendel, 1979, p. 76)

Katherine Nelson, one of the researchers who recorded this conversation, believes such scripts can be learned either by firsthand experience or by observation of others. Meryl’s “going shopping” script, seen in the story that precedes this chapter, was probably acquired by watching her mother and checkout clerks at the supermarket. Notice that a script only occasionally involves specific words or actions (such as singing “Happy Birthday”). More often, what is acquired is a general idea of the appropriate things to say and do; learning a script is more complex than just memorizing exactly what one saw or did.

When young children communicate with adults instead of with peers, a knowledge of scripts is probably less essential. Usually the adult ensures that the dialogue progresses smoothly, that intended meanings are understood, and that confusions are clarified (Ellis and Rogoff, 1986). This is another example of the role of more knowledgeable others within the zone of proximal development. In peer interactions, in contrast, children must monitor and coordinate their own conversations. A shared understanding of the scripts for various activities can greatly facilitate communication.

AN OVERVIEW OF PRESCHOOL COGNITIVE DEVELOPMENT

As we suggested at the beginning of the chapter, children enter the preschool period with a number of cognitive advantages over infants and toddlers, as well as several important cognitive limitations. Building on the sensorimotor abilities they acquired in infancy and the mental representation skills that emerged during toddlerhood, they begin to reason in ways that are qualitatively different from the ones they used earlier. The cognitive advances children make during the preschool years include:

• emerging understanding of causation, especially in simple or familiar systems;
• an ability to make clear distinctions between living and nonliving things;
• a qualitative understanding of many concepts related to quantity and an ability to reason about small numbers;
• a beginning understanding of classification and other logical relations;
• gradual development of the ability to distinguish between appearance and reality;
• expanding attention and memory skills; and
• steadily increasing understanding of others' perspectives and thoughts.

By the end of the preschool years, children have overcome some of the cognitive constraints that were present at the beginning of the period. They are no longer greatly affected by the appearance-reality problem, and their tendency toward centration has greatly declined. They are still hampered by their relative lack of strategies for effective deployment of attentional and memory resources. However, most of the abilities that will continue to develop during middle childhood are present in at least primitive form.

Chapter Summary

Introduction
Preschoolers' thinking differs in fundamental ways from that of infants and toddlers, but they still have three main cognitive limitations:

• difficulty integrating multiple pieces of information;
• difficulty distinguishing between appearance and reality; and
• difficulty managing attentional and memory processes.

General Characteristics of Preschoolers' Thought
Piaget characterized the period from ages 2 to 7 as the preoperational period. The issues he explored set an agenda for much of the research on cognitive development that has followed.

• Piaget did not find mature reasoning about causation until middle childhood, but more recent research suggests preschoolers can understand causation in simple systems and familiar processes.
• Piaget believed preschoolers tended to attribute life to nonliving things; more recent research shows that children begin to make clear distinctions between living and nonliving things by age 3.
• A mature understanding of conservation does not emerge until middle childhood. For each type of conservation, children pass through a nonconserver stage and a transitional stage on the way to mature conservation.
• New cognitive skills can sometimes be taught to children sooner than they would otherwise acquire them, but only if they already have a cognitive framework into which the new skills can be integrated.
• Preschoolers have some understanding of the effects of addition and subtraction on small numbers, but they do not develop quantitative rules for carrying out these processes until ages 6 to 7.

• Learning to count depends on mastering the one-to-one principle, the stable-order principle, the cardinal principle, the abstraction principle, and the order-irrelevant principle.
• Preschoolers have an intuitive, qualitative concept of measurement, but they cannot yet make precise, truly quantitative measurements.
• Piaget originally underestimated preschoolers' classification, seriation, and transitive inference skills; more recent research gives us a more complete picture of their abilities in these areas.
• Preschoolers gradually develop the ability to distinguish between appearance and reality; early on, their problems in this area are not as pervasive as was once thought, and by age 6 they have largely overcome this limitation.

Preschoolers' Attention and Memory Abilities
Preschoolers have a number of attentional and memory limitations, but they gradually develop attention and memory skills that help them master a variety of other cognitive tasks.

• Preschoolers use fewer strategies for deploying their attentional resources than older children do; they scan less systematically and are more distracted by irrelevant information.
• In everyday life, preschoolers exhibit good recognition memory and free recall. In laboratory settings, they do best on recognition tasks, especially those involving spatial location.
• Preschoolers' memory limitations can be explained by their slow information-processing speed, their limited knowledge base, and their lack of memory strategies.

Social Cognition
Improvements in memory and other cognitive skills during the preschool years increase children's understanding of the social world.