

Young Children's Understanding of Intention

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Three studies were done to determine when children begin to understand people's intentions as mental-representational states (Searle's prior intentions) and as instantiated in purposive, goal-directed behaviors (Searle's intentions-in-action) that are distinguishable both from the people's desires or preferences and from the outcomes of the actions their intentions engender. Three- and four-year-olds were presented with stories in which the story characters' intentions differed both from their desires or preferences and from the outcomes of their efforts to carry out their intentions. The 3-year-olds, especially the younger ones, showed little ability to distinguish intentions from desires and outcomes. In contrast, most of the 4-year-olds were able to make these distinctions consistently. These and other recent differential studies suggest that children begin to develop a differentiated conception of intention at around 3 1/2 or 4 years of age.

Acquiring an understanding of intention is an important development for children for at least four reasons (cf. Flavell, Miller, & Miller, 1993). First, it helps them understand how people and other animates differ from objects. Unlike the case with objects, much of the behavior of persons is caused by their intentions. Many of their actions are voluntary and willed, generated and impelled by their intentions. Second, an understanding of intentions is necessary for understanding morality and responsibility (Shantz, 1983). Children must learn that people merit praise or blame in good part as a function of whether what they did was intentional or unintentional. Third, some understanding of intention would appear necessary for an understanding of plans and planning, because plans consist of intentions (Bratman, 1987); such understanding may also help children formulate and carry out plans. Finally, learning about intentions and how they are causally

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related to other mental states and to behavior is a significant part of their general theory-of-mind development, an area of cognitive development that is currently of great interest to developmental psychologists, philosophers of mind, and others; for reviews of work in this area, see, for example, Astington (1993), Flavell and Miller (1998), Lewis and Mitchell (1994), Moses and Chandler (1992), Perner (1991), Wellman (1990), and Wellman and Gelman (1992). The purpose of the studies reported in this article was to find out when children begin to acquire this understanding.

Until fairly recently, most research on children's knowledge about intentions focused on their use/nonuse of intention information in making moral judgments rather than on their understanding of intentions as such (Shultz, 1980). This earlier work was stimulated by Piaget's (1932) finding, subsequently confirmed by others, that younger children differ from older children and adults in that they tend to weigh the amount of damage caused by a wrongful act more heavily than the actor's intentions when assessing blameworthiness. For a long time researchers tended to interpret the results of such research as suggesting that children below 8 or 9 years are either unaware of intentions or fail to see their relevance to judgments of moral responsibility. However, it gradually became clear that these studies have serious methodological flaws that preclude drawing such strong conclusions. For example, subsequent studies have demonstrated that even preschoolers seem to be capable under some circumstances of recognizing that the person who did the damage intentionally deserves the most blame (Nelson, 1980).

More recently, investigators have tried to assess children's understanding of intentions more directly rather than inferring it from research on moral judgments. What understanding should we expect children eventually to develop; that is, what do most adults know about intentions? The informal account presented here owes much to previous analyses by Astington (1991, 1993; Astington & Lee, 1991) and Moses (1990, 1993), although differing from them in certain respects. The following sequence of mental and physical events frequently occurs when people form and act upon an intention:

1. They mentally represent a goal and decide upon a plan of action that they are resolved to take to achieve that goal.
2. They believe that they will carry out the actions they are resolving to carry out (Moses, 1990, 1993)—another closely related mental representation.
3. They translate the mental intention that 1 and 2 comprise into an intentional action or series of actions; that is, they take the further step of actually trying to achieve through action what they had previously formed the mental intention to achieve.
4. The outcome of their actions is as intended; that is, most intentional acts lead to their intended outcomes.
5. They like rather than dislike this intended outcome; that is, the outcomes of most intentional actions are liked and desired by the intender.

Of these five components, the first and second most clearly entail mental representation. It is their presence that allow us to classify an intention as a mental state. However, the third component—the intentional action—may also be judged to have some accompanying intention-relevant cognition, although this could be minimal, as in the case of near-automatic, highly practiced intentional actions. Importantly, not all five of these components need be present for us to say that a person had an intention (Astington, 1991, pp. 161–162). The fifth component need not obtain, because one can intend to bring about outcomes that one does not like or approve of (although, of course, one can be said to “desire” to bring them about in the weak sense that one does try to do so). This situation occurs when one is compelled by other people or by circumstances to do something that one personally dislikes or regards as undesirable. Although desires and intentions are closely related mental states, this example shows that they are not identical. Just as one can desire an outcome but not intend to do anything to bring it about, so one can intend to bring about an outcome one does not desire. The fourth component may also be absent, as in the not infrequent cases where one’s intentional actions fail, leading to unintended outcomes. Even the third component is inessential. One is said to have an intention at the point when one resolves and plans to do something and believes that one will do it, that is, prior to initiating any relevant action. Indeed, even if one never initiates such action, one would still be said to have had an intention at that point. This distinction is roughly what John Searle and other philosophers have made between what Searle calls a *prior intention* (the purely mental-representational components 1 and 2) and what he refers to as an *intention-in-action* (component 3) (Searle, 1983).

Previous studies have not clearly established when children acquire the foregoing understanding of intentions. More specifically, it is not clear when they understand that an intention is a mental-representational state that (a) is not identical to a desire and therefore may not match the intender’s desire; (b) can occur without any subsequent intentional action (Searle’s prior intention); and (c) may not match the outcome of whatever intentional action may follow (an unintended outcome), in much the same way that a belief may not match reality (a false belief). The following is a brief review of the most pertinent of these studies.

Shultz (1980) conducted studies in which 3-year-olds were caused to make errors (e.g., in trying to repeat tongue twisters) and then were asked whether or not their erroneous action was intended (e.g., “Did you mean to say it like that?”). He found that 3-year-olds could usually answer such questions correctly. As Astington (1991, 1993) has correctly pointed out, however, the children could have succeeded merely by noting whether outcomes matched desires or goals: if so, one “meant to” do what one did; if not, one did not. That is, children would have responded the same way if they were simply deciding whether or not they had done what they had wanted to do in these tasks. Thus, there is no guarantee that Shultz’s participants made any distinction between intentions and desires, let alone construed intentions as mental representations.

Somewhat similarly, Moses (1990, 1993) showed 3-year-olds videotapes in which, for example, a protagonist picks up a pile of books from the floor, states that he is “gonna put the books on the table,” and then accidentally drops them on the floor instead. Participants were very good at saying that the protagonist was “trying” to put the books on the table rather than on the floor and also fairly good at saying that he “thought” he was going to do so (thus, a false belief about the outcome of an intentional action). Not all of the outcomes in Moses’s tasks were intrinsically undesirable, such as dropping the books obviously was; however, the protagonist acted as if they all were disappointing and undesirable from his point of view. Thus, it seems possible, as in Shultz’s tasks, that participants could have been responding correctly simply by noting that the outcomes did not match the protagonist’s desire.

To avoid confounding intentions with desires and outcomes, Astington and Lee (1991) presented 3-, 4-, and 5-year-olds with depicted situations in which the outcomes of an intentional and an unintentional act were the same and in which explicit information as to the actors’ desires and goals was not provided. For instance, in one of a pair of stories a girl takes some bread outside, throws crumbs down, and birds peck them up. In the other story another girl takes bread outside, some crumbs just happen to drop behind her, and the birds peck them up. The participants were then asked, “Which girl meant the birds to eat the crumbs?” Astington and Lee (1991) found a regular increase with age in correct responses on these tasks, with the 3-year-olds performing only at chance levels, the 4-year-olds not doing much better, and the 5-year-olds performing quite well. The interpretation of these results may also be problematic, however. The older children may have been better than the younger ones at inferring which girl wanted to feed the birds from the verbal and visual clues provided. If they then interpreted “meant” as “wanted to” rather than “intended to” in this context, which certainly seems possible, they would have been able to solve these tasks simply by matching desires with outcomes. Or conversely, the younger children might have had an adequate concept of intention but have been unable to determine which feeding-the-birds action was intentional from the available clues.

Astington (1991, 1993) has also made what appears to have been the only experimental attempt to assess young children’s understanding of Searles’s prior intention, the purely mental-representational, nonbehavioral aspect of intention situations. She presented 3-, 4-, and 5-year-olds with pictures of children either preparing to participate in activities or actively engaging in them. She asked the participants questions about the actions (e.g., “Which boy is swinging?”) and about the prior intentions to perform the actions (e.g., “Which girl is gonna paint?”). The questions about intentions used the terms *gonna*, *thinks she’ll*, *wants to*, and *would like to*. Three-year-olds, unlike 5-year-olds, generally chose the action picture in response to the intention question. They seemed to confuse the intention with the outcome. However, as Astington acknowledges, sometimes the action picture is not an incorrect choice for an intention question. For exam-

ple, it is not incorrect to say that the girl who is in the sandbox “wants to play in a sandbox.” Also, the 5-year-olds may have had a better understanding than the 3-year-olds of the distinction between present and future tense. And finally, there is once again the possibility that the tasks could be solved without distinguishing between prior intentions and prior desires (note the *wants to* and *would like to* expressions).

Finally, in a doctoral dissertation that only came to our attention after our first two studies were completed, Schult (1996) reported two interesting studies that tested young children's ability to differentiate intentions from desires and outcomes. In one of her studies, 3-, 4-, and 5-year-olds first explicitly indicated which of three adjacent targets they were going to try to hit with a bean bag and were given a visual reminder of this intention. Some of the targets contained hidden prizes, some did not. After each throw and its double outcome—hit the intended target or not, obtain a prize or not—the children were asked, “Which one were you trying to hit?” On those trials in which children accidentally hit an unintended target that happened to contain a prize, the 3-year-olds tended to say that that target was the one they had tried to hit, thereby confusing desire with intention. In contrast, most of the 4- and 5-year-olds correctly reported their original intention, regardless of which target they hit and whether or not that target yielded a prize. Four- and 5-year-olds also showed some ability to distinguish intentions and desires in Schult's (1996) other study, which used a more heavily verbal testing procedure. She concluded that, whereas 4-year-olds have some limited understanding of intention as differentiated from desire, “none of the research that has directly contrasted intentions and desires has found that 3-year-olds are aware of the distinction” (Schult, 1996, p. 128).

Thus, the foregoing investigations do not permit a clear and definite conclusion as to when children begin to acquire a genuine, differentiated conception of intention. In the studies reported here we attempted to provide additional, better tests for such a conception in 3- and 4-year-olds. We did this by presenting situations in which a character's intention differed from his or her desire or preference and from the outcome. In Studies 1–3 we present the details of the research with minimal discussion of the findings. In the General Discussion we examine the results of all three studies for the developmental story that they appear to tell.

STUDY 1

In this study, 3- and 4-year-olds were told stories about characters who wanted to go to location A but decided to go to a place they disliked (B) because their mothers wanted them to go there. However, they unintentionally ended up at location A, which is where they really wanted to go. In this situation there was a match between desire and outcome, but both differed from the intention. Thus, if the children confused intention with either outcome or desire, they would fail the intention task. The children's understanding was assessed by asking them about

where the character thought he was going to go, where he tried to go, and where he liked to go. To answer correctly, the children must be knowledgeable about the mental-representational aspects of intention. First, they must understand that intention differs from desire in that it contains mental-representational components of resolve, action plan, and belief that one will carry out the plan. If they confuse intention with desire, they will get the questions wrong. Likewise, if they try to label matches between desire and outcome as intentional, they will also fail. Second, they must recognize that intentions are mental states that exist independently of subsequent outcomes. In these tasks, characters' intentions are unfulfilled, so if the children answer the intention questions based on the outcome, they will also be incorrect.

Method

Participants. The participants were 40 nursery school children of largely upper middle-class background: 10 male and 10 female 3-year-olds (mean age 3 years 6 months, range 3 years 1 month to 3 years 9 months) and 11 male and 9 female 4-year-olds (mean age 4 years 8 months, range 4 years 5 months to 4 years 11 months). A few of the participants were Asian American or Hispanic; the rest were Caucasian. The children were all tested by the same female experimenter.

Materials. The test materials included an introductory picture of a child with a thought bubble above her head as well as four sets of pictures, with each set depicting a story. In each story, a character wants to go to a particular location (A); however, he ends up deciding to go to a location he dislikes (B) because his mother wants him to go there. On the way to location B, the bus driver gets lost and stops at location A. Thus, he intends to go to one place (B), although he wants to go and, in fact, does go to another place (A); desire and outcome are different from intention.

Procedure. To familiarize the child with thought bubbles, he or she was shown a picture of a girl and a thought bubble. Inside the bubble was a picture of the girl getting on a bus and going to the zoo. The experimenter explained that the girl was thinking and deciding where to go and then asked the subject to say where she decided to go.

Following this introduction, the four stories were administered. One story is depicted in Figure 1; the other three were of the same type. In one of the stories, the intended destination was the ice skating rink, and the desired and achieved destination was the character's friend's house. In the other two, the former were the swimming pool and the baseball field, and the latter were the playground and the beach. There were six pictures for each story. After the first four pictures, the child was given a memory check consisting of two questions, always asked in the same order. The first question was, "Where does X decide to go—location A or B?" If the child answered correctly, the experimenter said, "That's right," and repeated the answer. If he or she responded incorrectly, the experimenter said, "Ac-

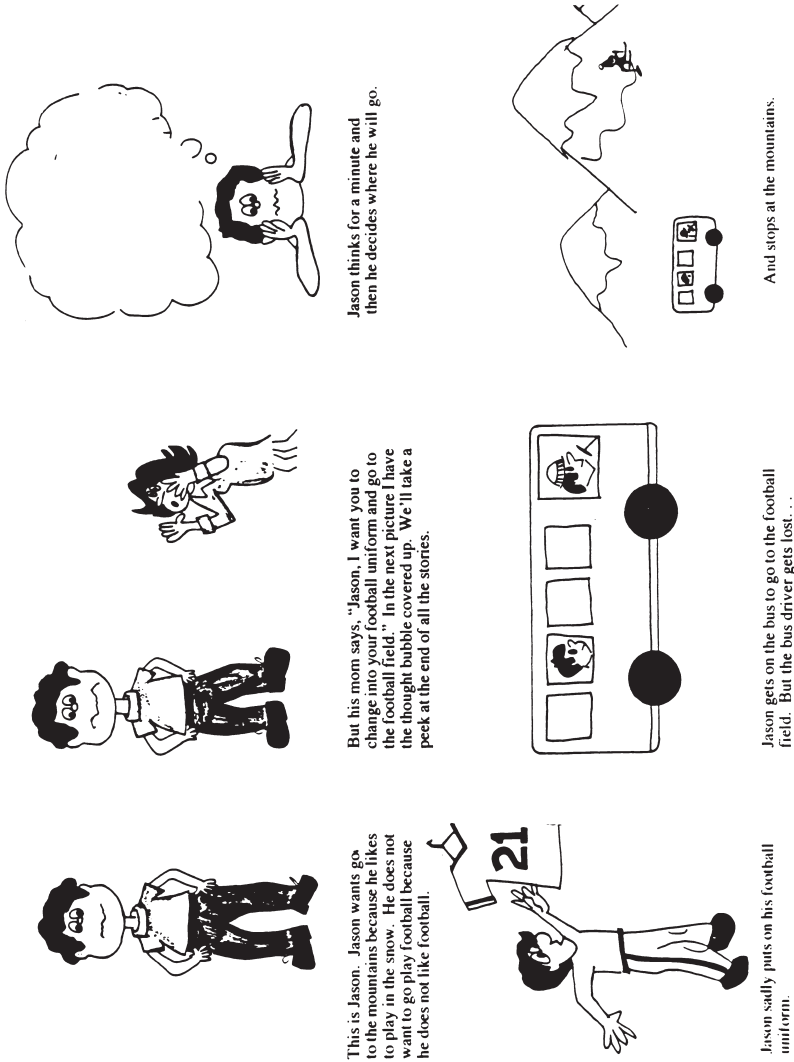


Figure 1. One of the four illustrated intention stories used in Study 1.

tually, X thought for a minute and then he put on his B [e.g., football] uniform to go to location B.” The second question was, “Where does X like to go—location A or B?” Depending on the child’s response, the experimenter either corrected him or her or repeated the correct answer. Then the last two pictures, which illustrated the action and the outcome, were shown, and the three test questions were given, always in the following order:

1. Where did X try to go—location B or A? (Try question)
2. Remember when X was deciding where to go? Where did he think he was gonna go—location A or B? (Think question)
3. Where does X like to go—location B or A? (Like question)

One order of the answer choices (the two possible locations) for a given question was used in two of the stories, and the other order was used in the other two stories. Thus, for each of the three questions the first choice presented was correct half the time and incorrect half the time. All six pictures were visible when the three test questions were asked.

Scoring. Children’s understanding of intention was assessed by their pattern of answers to the Try, Think, and Like questions. Both Think and Try questions were included in case children could reveal their understanding only in response to a particular way of phrasing the question. These two questions might well be construed differently, the first as referring more to a prior, purely mental intention (or more precisely, the belief or expectation component thereof—see Moses 1993)—and the second more to an intention-in-action.

For certain analyses, judgment of the children’s performance on the intention questions was based on a specific criterion: for a child to pass any given story, he or she had to answer correctly not only one or both intention questions (Try and Think) but also the accompanying Like question. If children answered the Try and/or Think questions correctly but the Like question incorrectly (i.e., answered them the same way as the Try and Think questions), one would have no grounds for believing that they were making any distinction between the story character’s intentions and his desires or the story’s outcome.

Results

An age (3- vs. 4-year-olds) \times question type (Try vs. Think vs. Like) mixed analysis of variance (ANOVA) was performed on children’s responses to the three types of questions. Significant main effects were found for age, $F(1, 38) = 12.30$, $p < .001$, and for question type, $F(2, 76) = 19.81$, $p < .001$; there was no significant interaction. Table 1 shows the mean percentages of correct scores for the younger versus older groups in response to the different question types. Between-group t -tests showed that the 4-year-olds performed significantly better than the 3-year-olds on the Try questions, $t(37) = 2.91$, $p < .01$, and the Think questions,

Table 1. Mean Percentage of Correct Responses to Each Type of Question in Study 1

	Question Type		
	Try	Think	Like
3-year-olds	39	36	83
4-year-olds	74	66	94

$t(37) = 2.59, p < .05$, and also near significantly better on the Like questions, $t(37) = 1.74, p < .10$. Tukey tests showed that the Like question was significantly easier than the Try and Think questions. In addition to the latter two questions being of approximately equal difficulty, individual children tended to answer them the same way, especially in the younger group: for 3-year-olds, $r(19) = .47, p < .05$; for 4-year-olds, $r(19) = .34, n.s.$; for all subjects, $r = .54, p < .01$.

Table 2 shows the number of children per age group answering 0, 1, 2, 3, or all 4 questions correctly for each type of question. Inspection of Table 2 suggests that few children in either age group were responding to these questions by just guessing. Consistent with this interpretation, binomial tests showed that the 3-year-olds performed significantly worse than chance on the Try and Think questions, that the 4-year-olds performed significantly better than chance on those two questions, and that both groups performed significantly better than chance on the Like questions.

As explained in the Scoring section, children's understanding of intention was also assessed by analyzing their performance on Try and Think questions on stories for which they answered the Like question correctly (see Table 3). Using this presumably more sensitive measure of understanding, the 4-year-olds were significantly more often correct than the 3-year-olds on the Try questions, $\chi^2(1, N = 40) = 8.12, p < .01$, on the Think questions, $\chi^2(1, N = 40) = 8.12, p < .01$, and on both questions, $\chi^2(1, N = 40) = 4.9, p < .05$. As Table 3 shows, more than half of the 4-year-olds met these more demanding criteria on at least three of the four stories.

Table 2. Number of Children Who Responded Correctly to 0, 1, 2, 3, or All 4 Questions of Each Question Type in Study 1

Question	Age	Number of Correct Questions				
		0	1	2	3	4
Try	3	8	2	3	5	2
	4	3	1	2	2	12
Think	3	8	2	5	3	2
	4	3	2	2	5	8
Like	3	1	0	3	4	12
	4	0	1	1	0	18

Table 3. Number of Children Who Responded Correctly to Try and Think Questions Given Correct Responses to Like Questions in Study 1

Question	Age	Number of Correct Questions				
		0	1	2	3	4
Try	3	13	1	1	3	2
	4	3	2	1	3	11
Think	3	10	4	2	2	2
	4	4	1	2	6	7
Both Try and Think	3	14	2	3	0	1
	4	7	1	1	6	5

It might be argued that the 3-year-olds' poor performance on the intention question was due solely to memory problems. However, two analyses suggest that this probably was not the case. For the first analysis, the children's ability to recall the answer to the Like question at the end of each story was used as a crude memory test (crude, because children could have answered it correctly simply by looking at the picture that was in front of them). Children who correctly answered three or more Like questions were said to have passed this memory test, and those who correctly answered three or more Try questions were said to have passed the intention test. Of the 16 3-year-olds who passed the memory test, only 31% of them passed the intention test. In contrast, of the 19 4-year-olds who passed the former test, 74% also passed the latter. The same analysis was done for the Think question, with similar results (25% for the 3-year-olds vs. 68% for the 4-year-olds).

A second memory check was conducted that utilized the data from the Decide and Like questions asked after the fourth picture in each story. Children who answered both of these questions correctly were judged to have adequately recalled the character's desire and intention, at least up to that point in the story. If they later answered the Try and Think questions incorrectly, one would expect that their errors were probably due to misconceptions about intention rather than an inability to recall the story's details. To compare the 3-year-olds to the 4-year-olds, a score in the form of a proportion was assigned to each child. The denominator was the number of stories in which they answered both of these early Like and Decide questions correctly. The numerator was the number of Try questions answered correctly on those same stories. Thus, the children's answers to the Try questions were included in the analysis only if the children seemed to understand and remember the stories, at least to the extent of being able to answer these earlier questions correctly. The proportions ranged from 0 to 1. The means of the 3-year-olds' and 4-year-olds' proportions were 0.40 and 0.82, respectively, a significant difference, $t(29) = 2.86, p < .01$. Similar results were seen when the numerator consisted of the number of correct Think questions, $t(29) = 2.88, p <$

.01, with the younger group averaging 0.35 and the older group averaging 0.79. Seven 3-year-olds and two 4-year-olds were not included in this analysis because they failed to correctly answer both the early Like and Decide questions for any of the stories. Finally, it could be argued that the task did not pose difficult memory demands, because the earlier pictures continued to be visible when the test questions were asked.

STUDY 2

The purpose of this study was to make a second, methodologically improved test of 3- and 4-year-olds' understanding of intention as distinguished from desire and outcome. Participants were shown sequences of three pictures in which a mother tells a child to find or get an object (first picture), the child goes to the anticipated location of that object (second picture), and the child finds there a different, more desirable object than the one initially sought (third picture). Unlike the case in Study 1, questions were asked at each point during the story narration to ensure understanding and memory of the events. As in Study 1, understanding of intention was assessed by asking what the child was trying to get (intention-in-action) and what the child thought he or she was going to get (the belief component of prior intention).

The procedures used in this study were designed to be more sensitive to early signs of competence than those used in Study 1. Accordingly, the children were pretrained on the distinction between intention-in-action (denoted by the verb "try"), on the one hand, and desire and outcome, on the other. We reasoned that if young children could profit from this brief pretraining they probably already possessed at least a minimal understanding of the intention-in-action concept. In addition, the stories were designed to be briefer, simpler, and more realistic than those used in Study 1.

Method

Participants. Forty nursery school children of mainly upper middle-class background were tested in this study. The sample included 11 male and 9 female 3-year-olds (mean age 3 years 6 months, range 3 years 1 month to 3 years 11 months) and 8 male and 12 female 4-year-olds (mean age 4 years 4 months, range 4 years 0 month to 4 years 10 months). The majority of the children were Caucasian; a few were Asian American, African-American, or Hispanic. The children were all tested by the same female experimenter.

Materials. Hand-drawn pictures were used to depict children engaged in different scenarios during pretraining and test. Those used for pretraining consisted of two scenes: a before and after illustration of a child "trying" to do something that did not match the initial desire or the final outcome. In each of the four sets of pictures used for the subsequent test phase, a child is asked by his or her

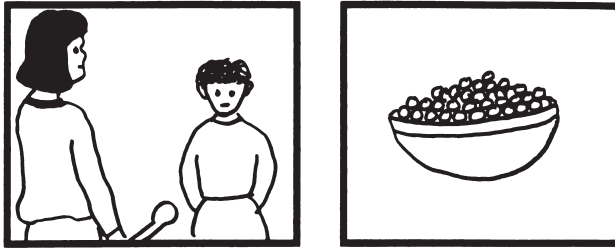
mother to find a particular object (A) in the first picture. The second picture then illustrates the child in the process of searching for object A in its anticipated location. In the final picture, the child is shown discovering a different, more desirable object (B) instead. Thus, in each story the character intends to find a particular object (A) and instead finds a different, more desirable object (B); the outcome is different from the intention and is also more desirable.

Procedure. The session began with some brief pretraining on the meaning of “try” (intention-in-action) as distinguished from outcome and desire. Two scenarios were presented. In the first, the child was shown a picture of a girl reaching for a teddy bear high on a bookshelf. The experimenter explained that the girl was trying to get her teddy bear from the shelf. The second picture was then presented, which showed the same girl with her arms down at her sides and a frown on her face, along with the teddy bear still high on the shelf. The experimenter then explained that the girl did not get her teddy bear but that she had tried to. The second scenario illustrated a boy sitting at a table upon which was a puddle of milk and a glass lying on its side. The boy’s mother is shown pointing to the puddle, and the experimenter explained that the boy’s mother is telling him to try to wipe up the milk he just spilled. The next picture then shows the boy wiping up the milk, but with a frown on his face. The experimenter further explained that the boy is not happy and that he doesn’t want to clean up the milk, but that he is trying to.

Immediately following this pretraining the four test stories were presented. Figure 2 depicts one of the story sequences; the other three were of the same type. In the first picture, the child is asked by his or her mother to go get a bowl of peas that she is planning to cook for dinner. The second picture illustrates the child in the process of reaching for the refrigerator door. In the final picture, the child is shown with a smile on his face, holding a chocolate cake instead. In the other three stories, the intended objects (A) were a Popsicle, a pair of dirty, torn pants, and a pair of rain boots, while the objects (B) that were obtained were an ice cream sundae, a brand new teddy bear, and a bag of favorite candy, respectively.

Immediately after presentation of each picture, the child was asked open-ended memory questions to ensure understanding of the story events. Following the first picture, the child was asked, “So, what does X’s mom want him or her to go find [or get]?” If the child answered correctly, the experimenter said, “That’s right,” and repeated the answer. If he or she responded incorrectly, the experimenter would respond with, “Well, remember his mom just asked him [or her] to go get [or find] [object A].” Similarly, the child was asked, “So, what is X looking for?” or “What is X going to get?” after the second picture, and “So, what did X find in [location]?” after the final picture. The pictures were all left in front of the child throughout the presentation of the story and during the subsequent test questions. The two intention questions were always presented first, in counter-balanced order:

This is Jeff. His mom just asked him to get a bowl of peas because she's cooking them for dinner.
So, what does Jeff's mom want him to get?



Well, here's Jeff again and he's going to the refrigerator right now.
What is Jeff/he going to get from the refrigerator?



Wow, when Jeff looked in the refrigerator, he found a big chocolate cake instead!
So, what did Jeff find in the refrigerator?



Figure 2. One of the four illustrated intention stories used in Study 2.

1. Try question: "Now, when X first went to [location] right here, what was he or she trying to get?"
2. Think question: "When X went to [location], what did he or she think he or she was going to get?"

The experimenter would point to the second picture while asking the key Try and Think questions to draw the child's attention to the intention-in-action illustration and thus allow equal salience to the two object illustrations (the first and third pictures, representing the prior intention and the outcome, respectively). Then the child was asked another question to assess understanding of the distinction between intention and outcome: "Now, did X find [or get] what he or she was looking for?" (Understanding question). This question was followed by one assessing the desirability of the objects: "Which one do you think X likes better?" with the experimenter pointing to both objects (Desirability question). At the end of the testing session, the child was asked a final question about the most recently experienced story whose Try question had been answered correctly: "Remember when you told me that X was trying to find [object A]? Was he or she also trying to find/get [object B]?" This question should, of course, receive a negative answer. All the children were asked this final question, because all answered at least one "try" question correctly.

Results

The mean percentages of correct scores for each major question type are presented in Table 4 by age group. These data were analyzed by a mixed ANOVA, with age group (3- vs. 4-year-olds) and intention question type (Try vs. Think) as independent variables. Significant main effects were found for age, $F(1, 38) = 9.74$, $p < .01$, and for question type, $F(1, 38) = 19.64$, $p < .001$. That is, the 4-year-olds performed significantly better ($M = 88\%$) than the 3-year-olds ($M = 68\%$), and the Try (intention-in-action) questions were significantly easier ($M = 89\%$) than the Think (prior intention) questions ($M = 67\%$). There was also a marginally significant interaction, $F(1, 38) = 2.97$, $p = .09$, with the difference between the two groups being more pronounced for the Think questions than for the Try questions.

Between-group t -tests revealed that the 4-year-olds performed significantly better than the 3-year-olds on the Think questions, $t(35) = 2.96$, $p < .01$, on the Understanding questions, $t(25) = 2.76$, $p < .05$, and on the Desirability questions, $t(26) = 3.83$, $p < .001$. Performance on the Try questions was slightly better for the 4-year-olds as well, $t(36) = 1.80$, $p < .10$. The 4-year-olds also performed significantly better than the 3-year-olds on the final, "was-she-also-trying-to-get-B" question: 17 of 20 4-year-olds correct vs. only 7 of 20 3-year-olds correct, $\chi^2(1) = 10.42$, $p < .01$.

Table 4. Mean Percentage of Correct Responses to Each Type of Question in Study 2

	Question Type			
	Try	Think	Understanding	Desirability
3-year-olds	83	52	68	67
4-year-olds	95	81	96	95

Correlations among the question types showed that the 4-year-olds tended to answer the two intention questions the same way, $r(19) = .44, p < .03$, whereas the 3-year-olds did not, $r(19) = .07$, n.s. However, the 3-year-olds' performance on the Try questions was significantly correlated with their performance on the Understanding questions, $r(19) = .50, p < .03$.

Table 5 shows the number of children per age group who answered 0, 1, 2, 3, or all 4 questions correctly for each type of question. Binomial tests showed that the 4-year-olds performed significantly better than chance on both types of intention questions, as well as on the Understanding and Desirability questions ($p < .01$). However, the 3-year-olds' performance was less consistent. Although they performed significantly above chance on the Try questions ($p < .01$) and the Desirability questions ($p < .02$), they were only marginally better than chance on the Understanding questions ($p < .10$) and were at chance on the Think questions.

As in Study 1, it seems unlikely that memory problems were responsible for the uneven performance of the 3-year-olds, because most of the children demonstrated no problems with the memory questions asked after each picture was displayed. No child responded incorrectly to more than one of the 12 memory questions, and only five children erred on one. In addition, the fact that both objects were clearly visible to the children when they made their choices should have minimized memory problems.

STUDY 3

The purpose of this study was to make additional, more adequate assessments of 3-year-olds' understanding of prior intention and intention-in-action. It is possible that our previous tests of their understanding of prior intention, especially, underestimated their knowledge of that concept. Those tests assessed only the be-

Table 5. Number of Children Who Responded Correctly to 0, 1, 2, 3, or All 4 Questions of Each Question Type in Study 2

Question	Age	Number of Correct Questions				
		0	1	2	3	4
Try	3	0	1	2	6	11
	4	0	1	0	1	18
Think	3	1	5	7	5	2
	4	2	1	1	2	14
Understanding	3	4	1	2	2	11
	4	0	1	0	0	19
Desirability	3	2	0	5	8	5
	4	0	0	1	2	17
All 4 questions	3	10	7	3	0	0
	4	3	2	1	4	10
Both Try and Think	3	2	7	5	4	2
	4	3	1	0	2	14

lief component of a prior intention that was not subsequently fulfilled and, thus, tested understanding of a belief that later proved false. Given young preschoolers' well-known difficulties with belief tasks, a number of our 3-year-olds may not have understood the intended meaning of "think" (= "believe that"), may not have possessed the concept of a false belief, or both. Consequently, in this study we substituted "decided to" for "think" in some of the prior-intention tasks used, hoping thereby to convey the idea of a prior mental resolve or plan rather than a prior belief about an outcome. In the first part of the testing session, prior-intention and intention-in-action versions of the same Study 2-like tasks were given to different groups of 3-year-olds to find out whether children of this age understand either of these two concepts better than the other when prior intention is conveyed by "decided to" rather than "think." These tasks also represented improvements over their counterparts in Study 2 in three other ways. First, in Study 2 we provided brief pretraining on the intention-in-action concept only; in this study brief pretraining on both concepts was given to children in both groups. Second, in Study 2 the child story characters' intentions were engendered by their mothers' requests. This may have made the participants uncertain as to whether the intentions were the story characters' own or their mothers'. In this study we made it clear that the story characters' intentions were entirely their own. Third, in Study 2 the actual outcome was different from the intended outcome and was implied to be more desirable; in Study 3 it was also different but its greater desirability was explicitly stated rather than merely implied.

After two tasks of each kind had been administered (two prior-intention tasks to one group of 3-year-olds and two intention-in-action tasks to the other group), half the children in each group were given two more brief tasks of a third type, and the other half were given two more brief tasks of a fourth type. In one type (Decide-Like tasks), participants needed to distinguish between a story character's prior intention and desire with no subsequent intentional action described. In the other type (Thinking tasks), they needed to distinguish between a character's initial, prior-intention thinking and his or her subsequent, outcome-relevant thinking. Thus the Decide-Like stories described prior intentions and (conflicting) desires but no outcomes, whereas the Thinking stories described prior-intention thinking and (conflicting) outcomes but no desires. Our purpose in adding these two types of tasks was to provide converging evidence regarding 3-year-olds' understanding of prior mental intention.

Method

Participants. The participants were 40 nursery school children of primarily upper middle-class background. There were 10 girls and 10 boys in the prior-intention group (mean age 3 years 6 months, range 3 years 0 months to 3 years 11 months) and 10 girls and 10 boys in the intention-in-action group (mean age also 3 years 6 months, range 3 years 1 month to 3 years 11 months). Most of the chil-

dren were Caucasian; the remainder were Asian American, African-American, Hispanic, or East Indian. All were tested by the same female experimenter.

Materials. Pictures were used in all the tasks to illustrate the stories (1 to 4 pictures per task), much as in Studies 1 and 2.

Procedure. The testing session began with two pretraining scenarios very similar to those used in the Study 2 pretraining, except that in each scenario information was provided about the story character's prior intention (e.g., "She *decides* to get her teddy bear . . .") as well as the character's subsequent intention-in-action (" . . . and that's what she is *trying to do* in this picture"). In the pairs of tasks that followed, task orders were counterbalanced within each pair.

Prior-intention tasks: The two prior-intention tasks (one group) or the two intention-in-action tasks (other group) came next. One of the prior-intention tasks is described here to illustrate the basic procedure of all four tasks.

"I'm going to tell you a story, and then you can help me tell the story again. Here is a boy named Jeff [for male participants; for female participants, a girl named Janie]." The experimenter puts a picture of Jeff on the table in clockwise position 12 o'clock. "Jeff *decided* to try to find some peas for his dinner." A picture of peas is placed below and to the left of the first picture, i.e., at 9 o'clock from it. "What did he *decide* to try to find for his dinner?" The correct response is repeated; the incorrect response, corrected. "So he goes to the refrigerator [a picture showing Jeff with his hand extended towards a refrigerator is placed below the first picture, in 6 o'clock position] and he opens the door. He says, 'Hey, there are no peas in there!' He finds a big cake instead." A picture of a cake is placed at 3 o'clock across from the picture of the peas. "He says, 'Wow! I like cake even better than peas.' What did he find in the refrigerator?" The response is repeated or corrected. "Which does he like better?" Experimenter points to both; the response is repeated or corrected. "So, Jeff *decided* to try to find some peas, but when he looked in the refrigerator he found a big cake instead. Now let's go back to the beginning of the story. Here is a boy named Jeff." Experimenter points to Jeff's picture. "Jeff *decided* to look for something for his dinner."

The test questions were then asked in the order given below. No feedback was provided:

1. "What did he *decide* to look for [pointing to the picture of Jeff alone]?"
2. "So he went to the refrigerator and opened the refrigerator door. What did he find?"
3. "Was he looking for . . . [whatever the child said Jeff found]?"
4. "Which one does Jeff like better [pointing back and forth between pictures of cake and peas]?"
5. If the child answered Question 1 correctly on his or her second (last) prior-intention task, the experimenter said (to continue with the Jeff example):

“Remember when you told me that Jeff decided to look for peas? Did he also decide to look for cake?”

The other prior-intention task involved a story about a child who decided to find a pencil to make a picture but instead found a big box of crayons he or she liked better.

Intention-in-action tasks: The two intention-in-action tasks had exactly the same form and content as the two prior-intention tasks, except they emphasized intention-in-action terms instead of prior-intention ones in all the appropriate places. As examples: “Jeff is going to *try to find* [versus *decided to try to find*] some peas for his dinner.” “What was he *looking for* [pointing to the Jeff-at-refrigerator picture]?” versus “What did he *decide to look for* [pointing at the picture of Jeff alone]?” Thus, although the wording was similar in the two types of stories, in the prior-intention stories the focus was on the character’s stated mental intention prior to the action it instigated, whereas in the intention-in-action stories it was on the goal-directed physical action itself.

Decide-Like tasks: In one of these tasks (Billy), the experimenter shows the child a picture of a sad-looking boy viewing a mess on the floor and says: “This is Billy. Billy just spilled some really yukky garbage all over the floor! He said, ‘Oh, that stuff smells awful. I wish I could leave it here. But I can’t. I have to clean it up.’ Did Billy *decide* to clean up that smelly stuff? Does Billy *like* cleaning up smelly stuff?” In the other task (Jill), a sad-looking girl gazes at a beautiful doll in a store window, expresses her wish to buy it, but then says she can’t because she doesn’t have any money. Participants were then asked, first, if she decided to buy that doll today and, second, if she likes beautiful dolls. Thus, in each task there is an expressed desire, an expressed or strongly implied intention contrary to that desire, and no ensuing behavioral outcome described.

Thinking tasks: In one of these tasks (Juice), a depicted girl (or boy), Dotty, “said to herself, ‘Boy am I thirsty! I know what to do when I am thirsty like this.’ So she goes to the kitchen and gets a bottle of juice [bottle depicted]. But, guess what happens? She can’t get the lid off the bottle. She tries and tries, but the top just won’t come off. Let’s go back to the beginning of the story. Here is a girl named Dotty [first picture]. What was Dotty *thinking* at the *beginning* of this story? Was she *thinking*, ‘I’m going to get something to drink?’ or was she *thinking*, ‘The top won’t come off the juice bottle’ [order of choices counterbalanced]?” In the other task (Band-Aid), a boy (or girl) cuts himself, says he knows what to do when this happens (first picture), gets a Band-Aid box, but finds that it is empty. The question to the children then was whether the boy was initially thinking (first picture), “I’m going to get a Band-Aid for this cut,” or “The Band-Aid box is empty.” We thought it might be easier for 3-year-olds to infer the conscious thought that might accompany a prior intention that was not subsequently fulfilled than to infer the tacit belief (later proved false) that accompanied that intention, as was required in the Study 1 and 2 tasks.

Results

We had expected that the prior-intention tasks might prove to be harder for young children than the intention-in-action tasks. Although there was no evidence for this in Study 1, in Study 2 children performed more poorly on the Think (prior-intention) questions than on the Try (intention-in-action) questions. Also suggesting this possibility was the more mental versus behavioral focus of the prior-intention questions and their use of the possibly less familiar “decide” versus “try.” Contrary to expectations, however, there was no evidence for such a difference in the Study 3 data; if anything, there was a small and nonsignificant tendency for children to perform better on the prior-intention questions. To illustrate the similarity of performance, 5 of 20 children answered all the prior-intention task questions correctly, and 4 of 20 did so on the intention-in-action questions. It may be that using an intention term (“decide”) rather than a belief term (“think”) made prior intentions as accessible to the children as intentions-in-action. Alternatively, the extreme similarity between the two forms of the tasks may have obscured real differences in understanding of prior mental intention versus subsequent intention-in-action.

Whatever its cause, this similarity of performance permitted us to pool the prior-intention and intention-in-action subgroups and, with the larger sample thus constituted ($n = 40$ rather than 20), look for age differences in performance between younger and older 3-year-olds. The 20 youngest children ranged in age from 3 years 0 months to 3 years 6 months (mean age 3 years 4 months), the 20 oldest from 3 years 6 months to 3 years 11 months (mean age 3 years 9 months). The mean percentages of correct responses to each type of question for the younger and older 3-year-olds are shown in Table 6. These data were analyzed by a mixed ANOVA, with age group (younger vs. older 3-year-olds) and question type (questions 1–4) as independent variables; question 5 was not included in this analysis because children were asked it only once, and then only if they had answered the most recently given question 1 correctly. This analysis yielded significant main effects for age, $F(1, 38) = 15.05, p < .001$, and for question type, $F(3, 114) = 10.56, p < .001$, with no significant interaction. Between-group t -tests showed that the older 3-year-olds performed significantly better than the younger 3-year-olds on question 1, $t(28) = 2.35, p < .05$, and question 3, $t(37) = 2.21, p < .05$. Tukey tests showed that question 3 was significantly harder than questions 2 and 4. The t -tests completed showed that the older group performed significantly better than chance on each of these four questions and that the younger group did so only on questions 2 and 4. As is apparent from Table 6, neither group performed very well on question 5: 10 of 18 older children were correct; 3 of 12 younger ones were correct. The age difference here was not significant by Fischer's Exact Test. Note that children could have answered questions 1, 2, and 4 correctly simply by recalling information that had been stated and restated moments before; namely, that the protagonist intended to find X,

Table 6. Mean Percentage of Correct Responses to Each Type of Question on the Prior-Intention and Intention-in-Action Tasks in Study 3

Question Type	Age	
	Younger 3-year-olds	Older 3-year-olds
1. What decide to look for?	65	93
2. What object found?	88	100
3. Looking for object found?	38	70
4. Which object liked better?	83	93
5. Also look for other object?	25	56

found Y instead, and likes Y better than X. In contrast, they had not been told explicitly that the protagonist did not intend to find Y (questions 3 and 5). Rather, they had to infer this fact from what had been said, and to infer it may have required at least some understanding of intention as differentiated from desire and outcome—the recognition that although Y was preferred and was the outcome, it was not intended. This may explain why the children had more difficulty with questions 3 and 5 than with questions 1, 2, and 4.

In each prior-intention and intention-in-action task, the children's memory for what the experimenter had just said was tested right after she said it, and the children were corrected if they erred. The children erred on only 15% of these memory probes. Furthermore, only 17% of these errors were followed by errors on the corresponding three test questions (questions 1, 2, and 4). These results, taken together with the brevity of the stories and the fact that the experimenter repeated them once again just before asking the test questions, suggest that poor performance on these tasks was not primarily due to simple memory problems.

Both the older and the younger 3-year-olds performed poorly on the Decide-Like and Thinking tasks that concluded the testing session, with no marked differences between the two age groups. Of the 10 younger children who received the two Decide-Like tasks, only one got them both right, and none of the 10 older children did. Similarly, only 1 of the 10 younger and 4 of the 10 older children responded correctly on both Thinking tasks. In the total sample of 40 3-year-olds, 18 either responded correctly to both Thinking tasks or responded correctly to at least one of the two Decide-Like tasks. These 18 children were correct significantly more often on the preceding intention tasks' question 3 than were the 22 who did not reach this criterion: $t(37) = 2.05, p < .05$. This supports our impression, mentioned earlier, that question 3 was a better measure of children's differentiated understanding of intention than questions 1 and 2. The experimenter had the sense that the test questions in the Thinking tasks ("Was she thinking . . . or was she thinking . . . ?") may have been too long and complicated for many of the 3-year-olds, and we are therefore unwilling to place too much credence in the results for those particular tasks. Question length and complexity did not appear to be a problem on the Decide-Like tasks, however. Nevertheless, the children did

not perform well on those tasks either, often seemingly confusing the story character's desires with his or her intentions.

GENERAL DISCUSSION

The purpose of these three studies was to obtain a clearer picture of preschoolers' understanding of prior intention and intention-in-action than has been provided by previous investigations. In Studies 1 and 2 we tried to assess this understanding by presenting 3- and 4-year-old participants with illustrated stories in which a story character, to satisfy the wishes of another person, initially intends to and tries to achieve an outcome that he or she either clearly does not desire (Study 1) or is not positively known to desire (Study 2). Then, by accident, the character actually achieves a different, more desirable outcome. To identify the character's intention in these stories, the children had to distinguish it from his or her desire and from the actual outcome, both of which were different from his or her intention.

The 4-year-olds performed quite well in both Study 1 and Study 2. They frequently answered both the Try (intention-in-action) and the Think (prior-intention) questions correctly, especially in Study 2—probably the better study of the two. Moreover, in Study 2 they almost always stated correctly that the story character did not get what he or she tried to get (Understanding questions) and also that he or she was not trying to get object B as well as object A (final question). They seemed able to grasp the concepts of both prior intention and intention-in-action quite easily, with no tendency to confuse either with desire or outcome. Given the frequency with which intentions, desires, and outcomes are consistent with one another in everyday life, and therefore potentially confusable, this is a remarkable intellectual accomplishment. Our results thus strongly support Astington's conclusion (1991; Astington & Lee, 1991) that older preschoolers understand intentions as mental-representational states that are not identical to desires and that may precede as well as accompany the intentional actions they engender. Although both knowledge about people's intentions and the ability to use that knowledge in social situations will undoubtedly increase in subsequent years (Schult, 1996), these studies clearly indicate that a solid foundation for such development is in place around the age of 4 years.

In contrast, the 3-year-olds' performance in Studies 1 and 2 was mixed at best. In Study 1, they performed worse than would be expected by chance on the Try (intention-in-action) questions. Although they performed better than chance on the Study 2 Try questions, there are two reasons to be cautious in interpreting this achievement. First, unlike the case in Study 1, the participants in Study 2 were pretrained on the distinction between "trying," on the one hand, and "getting" and "wanting," on the other—the very distinction they were subsequently tested for in the main tasks. Second, 13 of the 20 3-year-olds in Study 2 "spoiled" a previous correct Try answer by subsequently saying, incorrectly, that the story character also tried to get the other, unintended object. Finally, 3-year-olds were either at chance (Study 2) or below chance (Study 1) in their responses to the prior-intention Think questions.

At the same time, there is no denying the fact that 3-year-olds did perform quite well on the Study 2 Try questions, whether with the help of the pretraining or not. Object A (intended outcome) and object B (actual outcome) were equally available perceptually (see Fig. 2); moreover, object B comprised the “reality” so often chosen by 3-year-olds in false-belief tests, and also appeared more desirable. Nevertheless, the 3-year-olds chose object A 83% of the time in Study 2. In addition, 68% of the time they also said, correctly, that the story character did not get what he or she was looking for (Understanding questions).

Study 3 provided additional evidence concerning 3-year-olds’ understanding of intention. The main tasks in this study were designed to be methodologically improved versions of the simple tasks used in Study 2. Half of a group of 3-year-olds were tested for an understanding of the concept of intention-in-action, the other half for that of prior intention (in this study, unlike Studies 1 and 2, prior intention was conveyed by “decided to” rather than “think”). Performance on the two versions was quite similar, suggesting that neither concept may be acquired appreciably earlier than the other. Given this result, we combined the two groups and compared the performance of the younger half of the sample with that of the older half. The older 3-year-olds showed significantly more understanding on these tasks than the younger ones. Nevertheless, as in Study 2 they often “spoiled” a correct intention answer by subsequently saying that the story character also intended to get the other, unintended but more desirable object. In addition, like the younger 3-year-olds they also performed poorly on two other simple tests that required them to differentiate prior intention from desire or outcome.

We conclude from these three studies that most children probably begin to acquire conceptions of prior mental intention and intention-in-action *per se*—that is, as differentiated from desire and outcome—some time between the ages of 3 1/2 and 4 years. Even the older 3-year-olds in Study 3 gave only partial or ambiguous evidence for such conceptions in the easiest, most helpful task conditions we could devise, and the younger 3-year-olds showed virtually no evidence for them even in these conditions. The 3-year-olds in Studies 1 and 2 also showed only very limited evidence of understanding. In contrast, the results of our first two studies together with those of Schult (1996) show that these differentiated conceptions are definitely taking shape between the ages of 4 and 5.

We are not, of course, claiming that young 3-year-olds have no knowledge relevant to people’s intentions. On the contrary, there is evidence (see Flavell & Miller, 1998) that they are likely to know that people want things (desires), like things (preferences), try to obtain or achieve things (goal-directed actions), sometimes do things they do not want to do (compelled actions) or did not mean to do (accidents), and sometimes do not get what they wanted to get (unfulfilled desires). Moreover, because intentions, desires, and outcomes are often congruent, they may well be able to make reasonable sense of most intentional actions most of the time using only this knowledge. Our only claim is that most children of this age have not yet formed a conception of “pure intention,” a mental state different from desire that instigates and guides actions.

Why might children first show evidence of possessing this conception of "pure intention" at about 3 1/2 or 4 years of age rather than earlier or later? Moses (1993) has argued that such a conception should be closely linked to some understanding of true and false beliefs (see also Bratman, 1987). For example, an intention to do something implies the belief that one probably can do that thing. Similarly, an intention that one tried but failed to fulfill implies a belief that eventually proved false—namely, the belief that one could and would fulfill that intention. It is this close connection between belief and intention that justified our use in Studies 1 and 2 of Think (i.e., belief) questions to test children's understanding of prior intention. Perhaps, then, intention begins to be understood at this age because the supporting concept of belief begins to be understood at this same age. Our results and those of Moses (1993) are at least consistent with this conclusion, as well as with the broader conclusion that children have acquired a number of important mental-state concepts by the end of the preschool period.

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