

Do Preschoolers Appreciate That Identical Actions May Be Motivated by Different Intentions?

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Four studies investigated whether 4- and 5-year-olds recognize the potential for diversity in the intentions that motivate a given action. Children heard stories in which 2 characters performed the same action (e.g., running) yet had different desires (e.g., to be home for dinner vs. to be healthy and strong). Children were asked to determine what each character was trying to do (e.g., get somewhere fast vs. get some exercise). Five-year-olds successfully assigned different intentions to the characters, despite the fact that their actions were identical. Four-year-olds, in contrast, tended to attribute the same intention to characters performing the same action, even though their desires clearly differed. Children of this age were, nevertheless, capable of attributing different intentions to characters performing different actions (Study 2). Four-year-olds' difficulty differentiating two intentions for a given action persisted despite several task simplifications (Studies 3 and 4), suggesting that children's early concept of intention may be intimately tied to action.

In explaining actions, adults utilize a rich network of mental states, such as beliefs, desires, and intentions (e.g., Malle, 1999; Wellman, 1990). Mere physical descriptions rarely enter into these explanations; rather, adults appeal to the psychological underpinnings of actions. Within this mentalistic framework, the concept of intention is central. Intentions bring structure to human behavior, helping observers to derive meaning from complex streams of physical movement (e.g., Baldwin & Baird, 1999; Malle, Moses, & Baldwin, 2001). Moreover, intention has as its constituent components core mental states, such as beliefs and desires, which are themselves at the hub of the network of concepts used to describe and explain hu-

man behavior (e.g., Olson, Astington, & Zelazo, 1999). Finally, the concept of intention plays a normative role in adults' evaluations of behavior, influencing their moral and legal judgments of responsibility and blame (e.g., Malle et al., 2001). Hence, it is of great importance to investigate children's developing appreciation of intention. In what follows, we report research that examined preschoolers' understanding of intention as it relates to and differs from action. In particular, our studies investigated whether children recognize that identical actions may be motivated by different intentions.

The relation between intentions and actions is complex. On the one hand, intentions are mental representations that motivate actions in the world. For example, having formed an intention to kill Jason, Anthony will initiate a course of action aimed at securing Jason's death. Moreover, Anthony's intention will not be fulfilled unless he acts on that intention and murders Jason. Should Jason die quietly in his sleep before Anthony has the chance to act, his intention will forever remain unfulfilled. Searle (1983) designated this the *causal self-reference* of intention: Intentions cause the actions they represent.

On the other hand, despite their causal role in motivating actions, intentions are not isomorphic with actions. That is, one and the same action may be motivated by very different intentions. For example, the act of administering a drug may result from an intention to kill or an intention to restore health. Likewise, one and the same intention may engender any number of actions. For instance, an intention to kill may lead to actions as different as administering a drug or shooting a firearm. As a consequence of this many-to-many relation between intentions and actions, intentions cannot be extracted directly from the behavior stream; too many possible intentions are consistent with any given action. Instead, intentions must be inferred from contextual information (e.g., time and place) and knowledge about the agent (e.g., beliefs and desires) in addition to action information (Malle et al., 2001). Hence, a full appreciation of intention requires much more than merely understanding that intentions cause actions. As well, it is essential to recognize the many-to-many relation between intentions and actions.

In addition to its theoretical significance, children's understanding of the potential for diversity in the intentions motivating a given action has practical importance for many aspects of development, including moral reasoning and social competence. For example, the ability to differentiate the intentions motivating others' actions is critical for judgments of moral responsibility and for attributions of praise or blame. Moreover, appropriate attributions of intention are crucial for the successful interpretation of and participation in social interaction. Thus, an understanding of action-intention relations has significant implications for children's everyday social functioning.

Whether young children appreciate the many-to-many relation between intentions and actions is not known. There are reasons to suspect, however, that they may not grasp such matters. First and most generally, young children frequently

fail to appreciate that one and the same stimulus can be interpreted in different ways. For example, even when an object inherently supports two interpretations (e.g., ambiguous figures), preschool children frequently assume that only one interpretation is justified (e.g., Carpendale & Chandler, 1996; Chandler & Helm, 1984; Taylor, 1988). Many other aspects of young children's cognition, including word learning (e.g., Markman & Wachtel, 1988; Woodward & Markman, 1998), class inclusion (e.g., Inhelder & Piaget, 1964; Winer, 1980), and problem solving (e.g., Acredolo & Horobin, 1987), similarly appear to reflect an implicit belief that things in the world can only be characterized in one way (see Flavell, 1988, for a review; but see also Deák & Maratsos, 1998). If children hold such a belief, it is unlikely that they would appreciate the potential for diversity in the intentions motivating a single action.

Second, representational understanding is thought to be a prerequisite for the understanding of intentions as distinct from the actions they generate (Astington, 2001). If children are to appreciate the many-to-many relation between intentions and actions, they must recognize that an agent's mental states are, to some degree, independent of the external world they represent (and, of course, that world includes physical actions generated by agents themselves). However, young preschoolers frequently fail to recognize that mental states are representations that mediate actions in the world (e.g., Flavell, 1999; Flavell & Miller, 1998; Taylor, 1996; Wellman, *in press*). For example, before 4 or 5 years of age, children have difficulty appreciating that beliefs can misrepresent reality (e.g., Wellman, Cross, & Watson, 2001; Wimmer & Perner, 1983). Such children may also have difficulty recognizing that different intentions may motivate a given action.

Third, before age 5, children have difficulty using information about an observer's preexisting beliefs to distinguish two possible interpretations of an ambiguous action. In a study by Pillow (1991, Experiment 2), for example, children heard a story in which one character, Sarah, was holding a toy near a donation box, but her specific intent was unknown. When asked to predict whether Joan, an observer who thought Sarah always did bad things, would interpret Sarah's action as stealing the toy or donating the toy, 4-year-olds scored no better than chance at selecting the correct response. Young children's inability to recognize the relevance of mental states to the interpretation of an ambiguous action suggests that they may not appreciate the potential for different intentions to generate one and the same action.

Finally, in the realm of pretense, Lillard (1993, 1998) argued that young preschoolers do not recognize the mentalistic underpinnings of pretense. Instead, they view pretense merely as a special form of action. Of particular relevance here is her finding (Lillard, 1998) that 4-year-olds tend to infer that an agent is pretending to be something (e.g., a worm) simply on the basis of the agent's actions (e.g., wiggling); strikingly, they ignore information about the intentions underlying the actions (e.g., that the agent is not trying to be like a worm). Although not Lillard's in-

terpretation, it is possible that 4-year-olds' difficulty stems in part from a failure to appreciate that a single action could be motivated by different intentions. On viewing an action, children may quickly arrive at a particular intentional interpretation and find it very difficult to conceive of alternative interpretations (despite being presented with evidence inconsistent with their initial interpretation). In short, they may not appreciate that actions alone do not determine intentions.

For all that, a few findings from the theories-of-mind literature at least leave open the possibility that young preschoolers may recognize that a given action may be motivated by different intentions. First, Bruell and Woolley (1998) found that 3- and 4-year-olds can assign different pretend representations to characters performing the same action. Children watched videos in which two characters performed the same action on a common object (e.g., touching a box), yet each character pretended the object was a different thing (e.g., a television vs. a spaceship). A thought bubble was superimposed over each character's head depicting the pretend representation. Children were asked what each character was pretending the object was. Both 3- and 4-year-olds accurately assigned different pretend representations to the two characters, despite the fact that their actions were the same. However, children may have succeeded on Bruell and Woolley's task simply by matching the contents of each character's thought bubble with the corresponding pretend representation. When the thought bubble showed a spaceship, children inferred that the character was pretending the box was a spaceship; when it showed a television, they inferred that the character was pretending the box was a television. Moreover, even if we assume that children's success reflects genuine understanding of diversity in pretense, it is not clear whether children of the same age would appreciate diversity in intention. As Bruell and Woolley pointed out, children may appreciate diversity in pretense before they recognize diversity in other mental states.

Second, Wellman and Woolley (1990) found that children as young as age 2½ can interpret the same action-outcome differently depending on the actors' desires. Children in their study recognized, for instance, that if Joe wanted a bunny and found it, he would cease his search, whereas if Bill wanted a dog but found a bunny, he would continue looking, even though his action and the resulting outcome were the same as Joe's. Similarly, Yuill (1984) found that 3-year-olds can attribute different emotional reactions to characters performing the same action, depending on the characters' desires. For example, children in her study recognized that a boy who wanted to throw a ball to person X would be happy if X caught the ball, whereas a boy who wanted to throw a ball to person Y would be sad if X caught the ball. In both studies, children may have tacitly recognized that even though two individuals performed the same action and achieved the same outcome, they nevertheless were motivated by different desires. If so, children of this age might also understand that individuals performing identical actions can have different intentions. For several reasons, however, the findings from Wellman and Woolley (1990) and Yuill (1984) did not warrant conclusions of this kind. Children

in both studies were asked only to predict how the individuals would either act or react after discovering the outcomes of their initial actions; children were not questioned directly about the individuals' desires and their relations to those initial actions. For all we know, children may have attended more to the outcomes of the actions (e.g., which person caught the ball) than to the actions themselves (e.g., throwing the ball); they may have merely recognized that one and the same outcome could coexist with different desires. Moreover, although the individuals' actions were the same, they were presented on different trials. A more stringent test of children's understanding that different mental states may motivate the same action would require the juxtaposition of two people performing identical actions in one and the same trial. This was the method used in this investigation.

Finally, Joseph and Tager-Flusberg (1999; see also Shultz & Wells, 1985) found that 3-year-olds can use information about desires to distinguish a behavior performed intentionally from one performed unintentionally. In their study, preschoolers heard stories in which two individuals performed the same action (e.g., throwing a ball over a fence), but one individual wanted to do it, whereas the other did not. Children were asked, "Who was trying to throw the ball over the fence?" Even 3-year-olds identified the individual who wanted to perform the action as the one who was trying to do so. Using a similar methodology, Joseph (1998) found that 4-year-olds and, to a certain extent, 3-year-olds can distinguish between a behavior performed involuntarily and the same behavior performed intentionally as an act of pretense. When presented with two characters, one who was really sneezing and one who was pretending to sneeze, children identified the character who pretended to sneeze as the one who was trying to do so. Children's apparent recognition in these studies that one and the same action may be intentional or unintentional raises the possibility that they might similarly appreciate the potential for one and the same intentional action to be motivated by different specific intentions. However, a simple matching strategy may have accounted for children's success in both studies. For example, children in Joseph and Tager-Flusberg's study may not have attended to the actions at all but rather to whether the individual's desire matched the outcome. When the desire for the outcome was present, they inferred intent; when it was absent, they did not. A similar strategy could also explain children's success in Joseph's study. Children simply may have equated "pretending to" with "trying to," which led them to infer intent when the behavior was marked as pretense. In addition, the use of a forced-choice question in these two studies leaves open the possibility that children may have attributed intent to both individuals if given the opportunity. Finally, even if children do recognize that identical actions can be either intentional or unintentional, they might or might not appreciate that identical intentional actions can be generated by quite different specific intentions. This was the issue addressed in this investigation.

In sum, whether preschoolers recognize that one and the same intentional action may be motivated by different intentions is entirely unknown. The aim of this

research, therefore, was to investigate directly children's understanding of this aspect of the many-to-many relation between intentions and actions. To achieve this aim, the following four studies examined 4- and 5-year-olds' ability to use information about desires to ascribe different intentions to characters performing identical actions.

STUDY 1

In this study, 4- and 5-year-olds heard stories (accompanied by pictures) in which two characters performed the same action yet had markedly different desires and intentions (*same action–different intention* condition). In the running story, for example, Michael wanted to be home for dinner in just a few minutes, whereas Christopher wanted to be healthy and strong when he grew up. Both boys started running. Children were asked to determine what each character was trying to do (e.g., get somewhere fast vs. get some exercise). The action information in these stories was not sufficient to determine the relevant intention because each character's action was compatible with both intention alternatives. Thus, children had to look beyond the action itself to infer the appropriate intentions from the characters' desires.

Two control conditions were also included. The *different action–different intention* condition assessed whether children (a) could make the requisite links between desire and intention and (b) would be willing to attribute different intentions to the two characters under at least some circumstances. The characters in this condition had different desires (e.g., to be home for dinner vs. to be healthy and strong) and intentions (e.g., to get somewhere fast vs. to get some exercise), but they performed different actions (e.g., running vs. riding a bike) rather than the same action. Success in this condition thus depended on the ability to infer intentions from desires but did not require an understanding that the same specific action may result from different intentions. The *same action–same intention* condition controlled for the possibility that children would automatically attribute different intentions when given different desire information. The characters in this condition had different desires (e.g., to be home for dinner vs. to be home for a party), but their actions (e.g., running) and intentions (e.g., to get somewhere fast) were the same.

To prevent children from successfully inferring the characters' intentions on the basis of low-level associative cues (rather than genuine understanding), three precautions were taken. First, each character's desire and intention were worded very differently to reduce the possibility that children could make the necessary desire–intention links via a simple lexical matching strategy. In keeping with the conceptual distinction between intentions and desires (see Malle & Knobe, 2001), the characters' intentions represented actions (e.g., trying to get some exercise), whereas their desires represented outcomes (e.g., wanting to be healthy and

strong). Second, the pictorial representation of each character's desire offered no visual cues to the relevant intention. Finally, the desires of both characters were always of the same valence (either neutral or positive) to prevent children from linking desires and intentions merely on the basis of a valence-matching strategy.

If children appreciated the many-to-many relation between intentions and actions, they should have performed well across the three conditions. Alternatively, if children specifically failed to recognize that different intentions may motivate any given action, they should have had greater difficulty in the same action–different intention condition than in either control condition.

Method

Participants

Twenty-four 4-year-olds (age range = 4 years 0 months–4 years 11 months, $M = 4$ years 6 months; 13 girls and 11 boys) and twenty-four 5-year-olds (age range = 5 years 1 month–5 years 9 months, $M = 5$ years 6 months; 11 girls and 13 boys) participated. Data from an additional 5 children (three 4-year-olds and two 5-year-olds) were excluded due to language delay ($n = 1$), failure to complete the procedure ($n = 2$), or consistent failure on control questions ($n = 2$). In this and the following studies, children were recruited from a database of families interested in research participation (Studies 1–4) or from a preschool (Study 3) in a predominantly Caucasian, middle-class community.

Materials

The test materials included 54 pictures (9 for each of six stories).¹ The pictures (10.2 × 10.2 cm) were laminated color drawings of children either engaging in a particular action or desiring a particular outcome. The pictures could be attached with velcro to a large felt-covered storyboard, which was bisected horizontally by a white line to help children distinguish the two characters within each story. Eight additional pictures were used in the warm-up. Finally, to motivate children and maintain their interest, all studies utilized stickers that children could place on a picture of an elephant holding several balloons.

Procedure

Children were tested individually by the same female experimenter (E) in a university laboratory (Studies 1–4) or in a quiet area of their preschool (Study 3). Each

¹Each child saw only six pictures for a given story. However, nine pictures were needed to depict a given story across conditions

session was videotaped (in the laboratory) or audiotaped (at the preschool) and lasted approximately 20 min.

Warm-up. The warm-up (identical across studies) included three types of questions presented in the following fixed order. E first asked children whether two pictured characters were performing the same or different actions (e.g., “Is Sam flying a kite, is Kevin flying a kite, or are they both flying a kite?”). Two questions of this kind were asked, one in which the actions of the pictured characters differed (flying a kite vs. walking a dog) and one in which their actions were the same (reading a book). After asking these two action questions, E showed children a picture of a girl putting her shoes on and asked them to identify her intention (“Is Kristen trying to get ready for school, or is she trying to get ready for bed?”). Finally, E asked children to identify the desires of the pictured characters. To introduce the idea of a “desire bubble,” she showed children a picture of a girl, Tara, with a cat at her feet and a bubble above her head depicting Tara dressed as a queen. E gestured to the bubble and said, “This shows us what Tara wants. Tara wants to be a queen.” She then asked, “What else is in the picture with Tara?” and “What does Tara want?” After this training, E showed children a pair of pictures depicting two characters and their different desires (wanting to be in a sailboat vs. wanting to be at the mountains) and asked, “Which boy wants to be in a sailboat?” and “Which boy wants to be at the mountains?”

In all studies, children were given feedback regarding their responses to the warm-up questions. If they answered correctly, E offered approval; if they erred, she either provided corrective feedback or rephrased the question. Two 4-year-olds erred on the second action question, two 4-year-olds and one 5-year-old erred on the intention question, and four 4-year-olds and one 5-year-old erred on the desire bubble training question.

Test phase. All children then participated in each of the three conditions described earlier. Six stories were written such that each could be adapted to meet the specifications of all three conditions (see Appendix A for story summaries). For each story in each condition, the procedure was as follows (see Design section for counterbalancing): E placed a picture of the first character on the upper left of the storyboard, noting the character’s name and setting (e.g., in the running story, “This is Michael. Michael is on his way home from school.”). To the right of this picture, she placed a second picture of the same character with a desire bubble above his or her head depicting the desired state of affairs. As she did so, E both stated the character’s desire (e.g., “Michael wants to be home for dinner in just a few minutes.”) and referred to the character’s plan for action (e.g., “Michael knows just what to do.”). The third picture, placed to the right of the second, showed the character performing a particular action. E commented on this picture without specifying the character’s action (e.g., “Now Michael is doing something.”).

Below these three pictures, she placed and described a second set of pictures in the same manner as the first set to illustrate the paired character's setting, desire, and action.

After placing all six pictures, E pointed to the third picture in each set and asked, for example, "Is Michael running, is Christopher running, or are they both running?" (action question). Following a correct response, she commented on the similarity of or difference between the characters' actions (depending on condition). Eight 4-year-olds and eight 5-year-olds incorrectly stated that the two characters were performing the same action in the different action–different intention condition. In these cases, E either provided corrective feedback or rephrased the question as a forced choice between the two characters. E next questioned children about the desire and intention of each character in turn (e.g., "Which boy wants to be home for dinner in just a few minutes? [desire question 1] That's right. Michael wants to be home for dinner in just a few minutes, so he is running. What is Michael trying to do? Is Michael trying to get some exercise or is he trying to get somewhere fast? [intention question 1] Which boy wants to be healthy and strong when he grows up? [desire question 2] That's right. Christopher wants to be healthy and strong when he grows up, so he is running. What is Christopher trying to do? Is Christopher trying to get some exercise or is he trying to get somewhere fast? [intention question 2]"). The desire questions were included to ensure that children understood the story details. Seven 4-year-olds and four 5-year-olds erred on either one or two desire questions, in which case E pointed directly to the two desire pictures and reasked the question or provided corrective feedback. Children who initially erred on 25% (i.e., 3) or more of the desire questions were excluded from the final sample ($n = 1$ at each age). Because responses to the intention questions were of central interest, feedback was not provided.

Design. All children heard six stories, two in each condition. Three stories involved girl characters, and three involved boy characters. Stories within condition were blocked, and the order of conditions was counterbalanced. Half of the children at each age received the stories in one order (randomly selected with the constraint that one "girl" story and one "boy" story appeared in each condition); the other children received the reverse order. The order in which the two characters were presented was randomly determined and fixed for each story, but whether children were first questioned about the desire and intention of the first or second character was counterbalanced and alternated across stories. Which of the two intention alternatives was offered first in a given story was randomly determined and fixed across the six stories. Because children were first questioned about each character equally often, the first intention alternative was correct for each character equally often. Finally, which of the two actions (e.g., running vs. riding a bike) was referenced in the action question in the different action–different intention condition was randomly determined with the constraint that each action was mentioned equally often.

TABLE 1
Percentage Correct Trials by Study, Age, and Condition

Age Group	Condition		
	Same Action– Different Intention	Different Action– Different Intention	Same Action– Same Intention
Study 1			
5-year-olds	71***	73***	69***
4-year-olds	40	50*	71***
Study 2			
4-year-olds	53**	78***	—
Study 3			
4-year-olds	58***	100***	68***

Note. Asterisks (*) indicate above-chance (25%) performance.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Results and Discussion

For each story, children scored 1 if they correctly stated both characters' intentions. Possible scores thus ranged from 0 to 2 in each condition. Preliminary analyses revealed no differences based on sex, story, story order, or condition order. Thus, these factors were not included in the main analyses.

Table 1 summarizes children's performance in each condition of Study 1 (as well as their performance in two of the subsequent studies). All analyses were based on raw scores; however, the tables list percentage correct trials for ease of comprehension. An Age (4-Year-Olds vs. 5-Year-Olds) \times Condition (Same Action–Different Intention vs. Different Action–Different Intention vs. Same Action–Same Intention) mixed analysis of variance (ANOVA) on children's intention scores revealed a significant main effect for age, $F(1, 46) = 7.63, p < .01$. As is clear from Table 1, 5-year-olds ($M = 4.25$ out of 6, $SD = 1.36$) generally outperformed 4-year-olds ($M = 3.21, SD = 1.25$) overall. However, the ANOVA also indicated a marginally significant interaction between age and condition, $F(2, 92) = 2.82, p = .06$. To investigate this interaction further, we explored performance in each condition separately for 4- and 5-year-olds.

5-Year-Olds

In the case of 5-year-olds, no significant condition effects were found, $F(2, 92) = .08, p > .90$. Children of this age performed uniformly well, scoring significantly above chance (0.5 out of a possible score of 2; i.e., 25%)² in all three conditions,

²For each story, children needed to answer two forced-choice questions correctly to score 1 point. Hence, the likelihood of being correct by chance on a particular story was 25%, and the mean to be expected by chance across the two stories in each condition was 0.5.

$ts(23) \geq 6.03, ps < .001$. Although they certainly made some errors, 5-year-olds' overall success in the same action–different intention condition suggests that they recognized the potential for diversity in the intentions that motivated a given action. Moreover, their comparable success in the same action–same intention condition indicates that they were not simply biased to attribute different intentions to two characters in any circumstance.

4-Year-Olds

In contrast to 5-year-olds' even performance, 4-year-olds' success differed across conditions, $F(2, 92) = 4.76, p < .02$. We discuss 4-year-olds' performance in each condition in turn, making comparisons across conditions where appropriate.

Same action–different intention condition. Four-year-olds performed at chance in this condition, which revealed their difficulty in correctly ascribing different intentions to characters performing the same action. When children erred, they could have done so either by assigning the same intention to both characters or by assigning different intentions but the wrong ones (perhaps indicating confusion). Cases in which children mistakenly ascribed the same intention to both characters are of special theoretical interest because such errors suggest that children may in fact believe that intentions are isomorphic with actions. Consistent with this hypothesis, the overwhelming majority of children's errors in this condition (28 out of 29, 97%) were of this kind.

An alternative explanation for 4-year-olds' difficulties might be that they were incapable of inferring intentions from the available desire information. To explore this possibility, we compared the frequency of correct responses to the second intention question after a correct response to the first intention question with the corresponding frequency following an incorrect response to that question. If an inability to infer intentions from desires was uniquely responsible for 4-year-olds' difficulty, their performance on the second intention question after a correct response to the first should be quite good relative to when they erred on that question. That is, if children were able to make the appropriate desire–intention link for the first character, they should be able to do so for the second character as well. If, on the other hand, 4-year-olds' performance on the second intention question was not systematically enhanced by correct performance on the first, it would suggest that an inability to differentiate two intentions for the same action was responsible for their overall difficulty. Children's performance on the first intention question (63%) in the same action–different intention condition did not surpass chance, providing at least suggestive evidence that they found it difficult to make desire–intention links in this condition. However, their performance on the second intention question after success on the first (63% correct) did not exceed their performance following failure (94%). Thus, no evidence emerged that successfully inferring the

first character's intention gave children any advantage on the second intention question (in fact, quite the opposite). Hence, it is unlikely that their overall difficulty in the same action–different intention condition was simply due to an inability to make the requisite desire–intention links.

Same action–same intention condition. In this condition, 4-year-olds scored significantly above chance, $t(23) = 8.92, p < .001$, and significantly better than in the same action–different intention condition, $t(92) = 3.05, p < .01$.³ They were more likely to appropriately assign the same intention to characters in the same action–same intention condition than to appropriately assign different intentions in the same action–different intention condition. More important, 4-year-olds' good performance in the same action–same intention condition clarifies that they understood the story scenarios and could infer intentions from desires in circumstances where the need to ascribe different intentions for the same action did not arise.

Children's predominant error in the same action–different intention condition was to assign the same intention to both characters. To assess the extent of their difficulties, we examined whether they were just as likely to assign identical intentions in the same action–different intention condition as in the same action–same intention condition. This was not the case. Four-year-olds assigned the same intention to both characters significantly more often in the same action–same intention condition (83%) than in the same action–different intention condition (58%), $t(46) = 2.38, p < .03$. Hence, despite their difficulties in the same action–different intention condition, it was not the case that 4-year-olds always assigned the same intention to the two characters.

Different action–different intention condition. In contrast to the same action–different intention condition, 4-year-olds' performance in the different action–different intention condition surpassed chance, $t(23) = 2.63, p < .02$. However, their performance in this condition did not differ significantly from performance in the same action–different intention condition, $t(92) = 1.01, p > .30$ (see Table 1). Moreover, the pattern of errors in the different action–different intention condition was very similar to that in the same action–different intention condition. In 23 of the 24 trials in which they erred (96%), 4-year-olds attributed the same intention to both characters. Surprisingly, young children's problems ascribing different intentions often persisted even when the characters' actions were not the same.

The finding that 4-year-olds had almost as much difficulty in the different action–different intention condition as in the same action–different intention condition raises the possibility that their responses were affected by a widespread reluctance

³Across all studies, we used the pooled variance from the omnibus ANOVA to construct the appropriate error terms for follow-up statistical tests such as these.

tance to attribute different intentions to the two characters rather than by an assumption that intentions and actions are isomorphic. Alternatively, however, 4-year-olds may have failed to recognize that the actions of the two characters in the different action–different intention condition were in fact different. These actions were, after all, functionally the same (e.g., putting toys in a box vs. putting toys in a bag, opening a closet vs. opening a drawer), and their physical differences may not have been salient or meaningful to children. In fact, in response to the action questions in the different action–different intention condition, a full third of children mistakenly stated that the two characters were performing the same action when in fact their actions differed (these errors occurred most often when the actions were very similar, as in the examples just given). Although E corrected these errors, children may have continued to view the actions as essentially the same. If so, the different action–different intention condition would be conceptually indistinguishable from the same action–different intention condition. Hence, it would not be surprising that 4-year-olds had trouble assigning different intentions in this condition. In support of this possibility, children who failed to distinguish the actions of the characters in the different action–different intention condition were less successful in their intention attributions (38% correct) than those who did distinguish them (56%). A second study was, therefore, conducted to assess whether 4-year-olds' difficulties resulted from a general bias to assign the same intention to both characters as opposed to a specific conceptual limitation.

STUDY 2

In light of the possibility that 4-year-olds' difficulty in the different action–different intention condition stemmed from a failure to recognize that the characters' actions differed, their actions were modified to be strikingly distinct in Study 2. Rather than create entirely new stories to achieve this, we mixed and matched characters and actions from the original Study 1 stories. For example, a boy from the running story was paired with a boy from the wood story. The result was a story about two boys, one who was running because he wanted to be home for dinner and the other who was chopping wood because he wanted his house to be warm. Children were asked what each character was trying to do: get somewhere fast or make a fire. The two characters' actions, running and chopping wood, were notably different in this case. Moreover, in contrast to Study 1, each action was compatible with only one of the intentions offered in the test question. It was expected that under these circumstances, 4-year-olds would be capable of attributing different intentions to the two characters. If they were not capable of doing so, however, it would indicate the operation of a more general bias toward assigning the same intention to both characters, regardless of their desires or actions.

The same action–same intention condition was dropped from this study because 4-year-olds had performed well in this condition in Study 1. The same action–different intention condition was retained for comparison purposes. Given 5-year-olds' success in all three conditions of Study 1, this and the subsequent studies focused only on 4-year-olds. Aside from these changes, Study 2 followed the same procedure as Study 1.

Method

Participants and Materials

Eighteen 4-year-olds (age range = 4 years 2 months–4 years 10 months, $M = 4$ years 6 months; 9 girls and 9 boys) participated. One additional child was excluded due to reluctance to answer test questions. Materials included 36 of the 54 pictures from Study 1 (6 for each of six stories).

Procedure

Warm-up and testing. In the warm-up, three children erred on the desire bubble training question but answered correctly in response to retraining. In the test phase, children heard four stories, two in the same action–different intention condition and two in the different action–different intention condition. Story pictures and test questions were presented in the same manner as in Study 1. One child incorrectly stated that the two characters were doing the same thing in response to an action question in the different action–different intention condition but answered correctly when E reasked the question. Four children erred on one desire question, and E provided corrective feedback. No child met the exclusion criterion (errors on 25% or more of the desire questions).

Design. The two stories within each condition were blocked, and the condition order was counterbalanced. Of the three original girl stories (bucket, toy, and hat), two were paired to appear as one story in the different action–different intention condition (e.g., bucket and toy), and the remaining story (e.g., hat) appeared in the same action–different intention condition for a given child. The same method was adopted for the three original boy stories (wood, running, and closet). Each girl story pairing was randomly combined with one boy story pairing to form three fixed sets of story pairings for the different action–different intention condition (i.e., bucket–toy and running–closet, bucket–hat and closet–wood, toy–hat and wood–running). All possible story pairings appeared equally often in the different action–different intention condition, and the six original stories appeared equally often in the same action–different intention condition. All other design features were identical to the comparable elements in Study 1.

Results and Discussion

Preliminary analyses revealed no differences based on sex, story, or condition order. Thus, these factors were not included in the main analyses.

A paired *t* test revealed that 4-year-olds performed significantly better in the different action–different intention condition ($M = 1.56$ out of 2, $SD = 0.51$) than in the same action–different intention condition ($M = 1.06$, $SD = 0.80$), $t(17) = 2.70$, $p < .02$ (see Table 1). Children found it much easier to attribute different intentions to characters performing different actions than to characters performing the same action. That said, in contrast to Study 1, 4-year-olds performed significantly above chance (25%) in the same action–different intention condition, $t(17) = 2.94$, $p < .01$, as well as in the different action–different intention condition, $t(17) = 8.76$, $p < .001$, indicating some ability to attribute different intentions to characters performing the same action. As in Study 1, however, when children erred in the same action–different intention condition, they almost always did so by assigning the same intention to both characters (16 out of 17, 94%).

To explore whether children's difficulty in the same action–different intention condition was independent of their ability to make appropriate desire–intention inferences, we again compared the frequency of correct responses to the second intention question after correct and incorrect performance on the first. In contrast to Study 1, children's performance on the first intention question (81%) was significantly above chance, $t(17) = 4.27$, $p < .001$, suggesting that children were indeed capable of inferring intentions from desires. Their overall difficulty in the same action–different intention condition, thus, can be explained by their reluctance to assign a different intention to a second character performing the same action. Moreover, as in Study 1, performance on the second intention question after success on the first (66% correct) was no better than that after failure (86%). Thus, it is again unlikely that an inability to make desire–intention links was responsible for children's difficulties in the same action–different intention condition.

In sum, in contrast to Study 1, 4-year-olds in this study had little difficulty assigning different intentions to characters performing different actions. Their difficulty in the different action–different intention condition in Study 1, thus, seems likely to have stemmed from a failure to fully differentiate the actions of the two characters. When their actions clearly differed, as they did in this study, 4-year-olds readily assigned different intentions. Despite 4-year-olds' success at attributing different intentions to characters performing different actions, they continued to have difficulty assigning different intentions to characters performing the same action. Children's difficulties in the same action–different intention condition in Studies 1 and 2, thus, could not be due to a general bias to attribute the same intention to two characters. Moreover, it is unlikely that 4-year-olds' relatively poor performance in this condition resulted from an inability to make desire–intention links: Correctly mapping the appropriate intention onto the desire for the first char-

acter (an index of inferential ability) did not improve children's chances of correctly assigning a different intention to the second character. Taken together, these findings strongly suggest that many 4-year-olds have genuine difficulty recognizing that one action may be motivated by different intentions. Nevertheless, they appeared to perform somewhat better than the 4-year-olds in Study 1. Performance in the same action–different intention condition now surpassed chance. Studies 3 and 4 were thus designed to assess whether 4-year-olds might show even greater improvement when the task was simplified in a number of ways.

STUDY 3

In Studies 1 and 2, children needed to hold in mind considerable visual and verbal information. For each story, they had to keep track of two characters' desires and actions across six different pictures. Moreover, the story narration included some nonessential statements about the characters that may have distracted children from the information of greatest significance. Therefore, we modified the procedure in Study 3 in an effort to reduce the processing load and foster the emergence of whatever conceptual understanding 4-year-olds might possess. First, the number of pictures in each story was reduced from six to two. Rather than charting each character's setting, desire, and action across three different pictures, each character's desire (again depicted in a bubble) and action were illustrated simultaneously in one somewhat larger picture. Second, we simplified the narration of each story by eliminating the description of each character's setting and stating explicitly each character's action. Both modifications aimed to focus children on the most critical information about each character (i.e., desire and action) when answering the test questions.

Three other changes were made. First, the same action–same intention condition was reintroduced. In the event that children might now succeed at assigning different intentions to characters performing the same action, we needed reassurance that they could also attribute the same intention when appropriate. Second, as a result of this reintroduction, there were not enough stories in the original pool to allow for the mixing and matching of different story characters in the different action–different intention condition (as in Study 2). Therefore, two new characters (one girl and one boy) were created, each with a desire, action, and intention that clearly differed from those of the original characters. Each of the new characters was then paired with an existing character of the same sex to form the stories in the different action–different intention condition. Finally, we added two measures of false-belief understanding: unexpected contents (e.g., Hogrefe, Wimmer, & Perner, 1986) and unexpected location (e.g., Wimmer & Perner, 1983). If, as Astington (2001) suggested, representational understanding is prerequisite for recognizing intentions as distinct from the actions they generate, children's ability to

appreciate that beliefs can misrepresent reality may be related to their understanding that different intentions can motivate the same action.

Method

Participants

Twenty-four 4-year-olds (age range = 4 years 1 month–4 years 11 months, $M = 4$ years 6 months; 13 girls and 11 boys) participated. Data from an additional 6 children were excluded because of refusal to answer test questions ($n = 4$) and failure on control questions ($n = 2$).

Materials

Test materials for the intention task included 20 pictures (3 for each of the six original stories⁴ plus 2 additional pictures for the new characters in the different action–different intention condition). The pictures were 15.2 × 15.2-cm laminated color drawings of children desiring a particular outcome while engaging in a particular action. The false-belief tasks called for a crayon box, toy horse, rubber ball, two opaque containers (one blue and one yellow), and three different puppets (Bert, Ernie, and Grover).

Procedure

Intention task: Warm-up and testing. In the warm-up, two children erred on the intention question, and six children erred on the desire bubble training question. In the test phase, children heard six stories, two in each condition. Stories were narrated in the following way: E placed the picture of the first character on the upper portion of the storyboard and stated, for example, “This is Michael. Michael wants to be home for dinner in just a few minutes, so he is running.” Below this picture, E placed the picture of the second character and stated, for example, “This is Christopher. Christopher wants to be healthy and strong when he grows up, so he is running.” The wording and presentation of the test questions themselves remained the same. One child incorrectly stated that the two characters were doing the same thing in response to an action question in the different action–different intention condition but answered correctly when E reasked the question. Seven children erred on either one or two desire questions, and E provided corrective feedback, reasked the question, or did both. Two children were excluded from the final sample due to initial failure on 25% or more of the desire questions.

⁴Each child saw only two pictures for a given story. However, three pictures were needed to depict a given story across conditions.

False-belief tasks. In the unexpected contents task, children were shown a crayon box and asked what they thought was inside. After they reported “crayons,” E revealed that the box actually contained a toy horse. The horse was placed back inside the crayon box, and the lid was closed. E then told children that Grover had never looked inside the box before and asked, “What does he think is inside, crayons or a horse?” and “What’s really inside this box, crayons or a horse?” In the unexpected location task, two puppets (Bert and Ernie) played with a ball, and then, Bert placed the ball in the blue container and left. Ernie retrieved the ball, played with it briefly, and placed it in the yellow container on leaving. Finally, Bert returned, wanting to play with the ball, and E asked, “Where does Bert think the ball is?” and “Where is the ball really?” No child erred on the reality question of either task.

Design. Half of the children received the false-belief tasks first (before the warm-up and six stories), and half received them last. The order of the two false-belief tasks, the order in which “crayons” and “horse” were offered in the contents task, and the left–right placement of the blue and yellow containers in the location task were counterbalanced. The design features of the intention task were the same as in Study 1.

Results and Discussion

Intention Task

Preliminary analyses revealed no differences based on sex, story order, or condition order. Thus, these factors were not included in the main analyses. A comparison of individual stories within each condition revealed that in the same action–same intention condition, the closet story was significantly more difficult than each of the other stories, $\chi^2s(1, N = 16) > 5.30, ps < .025$. Hence, children’s responses to this story were excluded from all three conditions in the analyses reported later (the pattern of findings remained the same whether or not the item was included). Because this item was excluded, proportions rather than raw scores were analyzed.

Children performed significantly worse in the same action–different intention condition ($M = .60, SD = .42$) than in the different action–different intention condition ($M = 1.00, SD = 0$), in which they were at ceiling (sign test, $p < .001$,⁵ see Table 1). As in Study 2, 4-year-olds found it harder to assign different intentions to characters performing the same as opposed to different actions. Their predominant error was the same as in Studies 1 and 2: They typically assigned the same intention to both characters (16 out of 17, 94%), suggesting a failure to recognize that identical actions may stem from different intentions. However, in contrast to Study

⁵Because of the lack of variability in children’s performance in the different action–different intention condition, a nonparametric test was used to compare this condition with the same action–different intention condition.

1, their performance in the same action–different intention condition did not differ from that in the same action–same intention condition ($M = .71$, $SD = .39$), $t(23) = .85$, $p > .40$. When faced with two characters performing the same action, 4-year-olds found it little more difficult to attribute different intentions (when appropriate) than to attribute the same intention (when appropriate). Moreover, children performed significantly above chance (.25 out of a possible proportion of 1; i.e., 25%) in both of these conditions, $t_s(23) = 4.17$ and 5.79 , respectively, $ps < .001$.

As in the earlier studies, we compared performance on the second intention question in the same action–different intention condition for those trials in which children were correct on the first question with performance for those trials in which they were incorrect. As in Study 2, performance on the first intention question (70%) was significantly above chance, $t(23) = 2.63$, $p < .02$, again suggesting an ability to make the requisite desire–intention links. Moreover, as in both of the previous studies, the frequency of correct responses to the second intention question was no greater after success on the first question (82%) than it was after failure (92%). Once again, these findings suggest that an inability to infer intentions from desires was not responsible for children's difficulties.

False-Belief Tasks

For each task, children scored 1 if they correctly inferred the false belief and 0 if they did not. Children's scores on the two tasks (contents $M = .54$, $SD = .51$; location $M = .50$, $SD = .51$) were correlated, $r(22) = .59$, $p < .01$, and so the scores were aggregated to yield a composite false-belief measure. Scores on this composite measure did not correlate with performance in any of the three intention conditions, $r_s(22) \leq .05$, $ps > .80$. Hence, at least in this small sample of 4-year-olds, no evidence emerged that children's ability to distinguish beliefs from reality was related to their understanding of action–intention relations.

Summary

As in Studies 1 and 2 and despite considerable reductions in task demands, 4-year-olds frequently erred in the same action–different intention condition (only 58% correct). Nevertheless, performance in this condition did surpass chance. There are reasons, however, to treat this improvement with caution. In particular, children's performance in the control conditions suggests that a bias against assigning the same intention to both characters may have been operating. Children often erred in the same action–same intention condition by inappropriately attributing different intentions to the characters, and in the different action–different intention condition, they never attributed the same intention to both characters. Despite this apparent bias, many children resisted assigning different intentions to the characters in the same action–different intention condition, which suggests the

presence of specific conceptual difficulties in that condition. Still, the findings left open the possibility that additional simplifications to the procedure might further promote 4-year-olds' chances of correctly assigning different intentions to characters performing identical actions. Study 4 was designed to explore this possibility.

STUDY 4

As noted earlier, one possible explanation for 4-year-olds' difficulties in the previous studies is that they were unable to infer the relevant intentions from the available desire information. On this inferential hypothesis, children may in fact understand the many-to-one relation between intentions and actions yet perform poorly because of an inability to compute the appropriate intentions in the specific stories presented. Very little evidence supporting this hypothesis emerged from the first three studies. In each of these studies, correct inference of the first character's intention entirely failed to enhance the likelihood that children would successfully infer the second character's intention. These findings support a conceptual hypothesis for 4-year-olds' difficulties, namely, that children had the necessary inferential skill to determine the appropriate intentions from desire information yet performed poorly because they lacked the conceptual insight that different intentions may motivate any given action. Nevertheless, we made one final attempt in Study 4 to assess whether children's difficulties might be inferential. In particular, we modified the procedure to guarantee success (via corrective feedback) on the first intention question. If an inability to make the requisite desire-intention inferences is responsible for children's difficulty, ensuring children's success at inferring the first character's intention should promote their chances of correctly inferring the second character's intention. For one, assisting children with the first character's intention by highlighting the relevant desire-intention link should focus them on the information most important for drawing the appropriate inference for the second character. Moreover, helping children with the first intention question should also reduce the processing requirements of the task. Knowing the correct answer to the first question should enable children to concentrate more effectively on the second intention question. In contrast, if 4-year-olds have genuine difficulty recognizing that one action may be motivated by different intentions, their performance likely would not benefit from guaranteed success at inferring the first character's intention.

Two additional changes were made. First, because of children's difficulty with the closet story in Study 3, this story was rewritten to clarify the relevant desire-intention relations (see Appendix B for the revised story). Second, children were asked to justify their responses to the second intention question of one story in each condition. Children who fail to understand the many-to-many relation between intentions and actions might tend to justify their intention inferences by citing the

characters' actions, whereas children who appreciate this relation might refer to desire information in their justifications.

Method

Participants and Materials

Twenty-four 4-year-olds (age range = 4 years 0 months–4 years 11 months, $M = 4$ years 5 months; 12 girls and 12 boys) participated. Data from three additional children were excluded because of failure to respond appropriately to feedback ($n = 2$) and E error ($n = 1$). The same materials were used as in Study 3 with the exception of the closet story, which was revised (see Appendix B).

Procedure

Intention task: Warm-up and testing. In the warm-up, three children erred on the intention question, and seven children erred on the desire bubble training question. The test phase was identical to that of Study 3 except for the addition of feedback following children's responses to the first intention question. If children answered this question correctly, E offered approval (e.g., "That's right. Christopher is trying to get some exercise because he wants to be healthy and strong when he grows up."). If children erred, she provided corrective feedback and reasked the question (e.g., "Actually, Christopher is trying to get some exercise because he wants to be healthy and strong when he grows up. So, what is he trying to do? Is he trying to get somewhere fast or is he trying to get some exercise?"). In response to the action questions, one child incorrectly stated that the two characters were doing the same thing in the different action–different intention condition, and one child incorrectly stated that the two characters were doing different things in the same action–different intention condition. E provided feedback in both cases. Six children erred on either one or two desire questions, and she provided corrective feedback, reasked the question, or did both. No child met the criterion for exclusion (errors on 25% or more of the desire questions). Children's performance on the second intention question after success on the first intention question was of primary interest in this study. Thus, children who initially erred on the first question and subsequently did not correct their answer in response to feedback were excluded from the final sample ($n = 2$). Finally, for the second story in each condition, children were asked to justify their response to the second intention question ("How do you know that?").

False-belief tasks. Children were given the same two false-belief tasks as in Study 3. One child erred on the reality question in the unexpected location task; thus, her response to the corresponding test question in this task was excluded from the main analysis.

Design. The design features were identical to those of Study 3 with two exceptions. First, to limit the sample size, condition order was determined using a Latin square design. Second, the order in which the two intention alternatives were presented in a given story was randomly determined and counterbalanced within each condition (rather than fixed).

Results and Discussion

Intention Task

In this study, successful performance on the first intention question of each story was guaranteed. Therefore, for each story, children scored 1 point if they correctly stated the second character's intention. Possible scores thus ranged from 0 to 2 in each condition. Preliminary analyses revealed no differences based on sex, story, story order, or condition order. Thus, these factors were not included in the main analyses.

Of central interest was how children would perform on the second intention question after feedback on the first. A one-way ANOVA with condition as a repeated measures factor was significant, $F(2, 46) = 5.42, p < .01$. Children performed significantly worse in the same action–different intention condition (63% correct) than in the different action–different intention condition (92%) and the same action–same intention condition (81%), $t_s(46) = 3.25$ and $2.09, p_s < .01$ and $.05$, respectively. Consistent with this analysis, 4-year-olds scored significantly above chance (1 out of a possible score of 2; i.e., 50%) in the latter two conditions, $t_s(23) = 10.72$ and 4.73 , respectively, $p_s < .001$, but not in the critical same action–different intention condition, $p > .10$. These findings clearly indicate that, even after feedback on the first intention question, 4-year-olds found it difficult to attribute a different intention to a second character performing the same action.

Of additional interest was whether, in the same action–different intention condition, children who independently succeeded at inferring the first character's intention performed better on the second intention question than children who required corrective feedback. After all, if E was ineffective in convincing children of the first character's intention, it might be expected that only those who spontaneously inferred the first intention would correctly infer the second. To investigate this possibility, we compared the proportion of correct responses to the second intention question after an initially correct response to the first question with the corresponding proportion after an initially incorrect response.⁶ In both cases, performance on the second intention question did not surpass chance (64 and 60% correct, respectively). Hence, no evidence emerged that arriving at a correct an-

⁶Proportions rather than raw scores were used for this analysis because not all children contributed equal numbers of trials to the two comparison groups.

swer to the first intention question spontaneously versus through feedback affected children's ability to infer the second character's intention.

Justifications. Two independent raters coded children's justifications into three categories with 100% agreement: desire (e.g., "How do you know he's trying to make a fire?" child: "Because he wants to make his house warm."), action (e.g., "Because he's chopping wood."), and uninformative ("I don't know," "because," and other nonexplanatory comments). Table 2 summarizes children's justifications after correct and incorrect intention attributions across the three conditions.

An interesting pattern emerged with respect to children's use of desire and action justifications. In the different action–different intention condition, children justified their correct attributions more often with appropriate references to action than with references to desire. In this condition, action information was sufficient to determine the relevant intention because the action being performed was compatible with only one intention alternative. In the same action–different intention and same action–same intention conditions, however, action information was not sufficient to determine the relevant intention because the action was compatible with both intention alternatives. In these two conditions, desires had to be considered to select the appropriate intention. In fact, children justified their correct intention attributions in these conditions more often with appropriate references to desires than with references to actions. Thus, although the sample of data was small (precluding formal analyses), 4-year-olds' informative justifications were generally appropriate after successful attributions of intention in all three conditions, which suggests that when they were correct, they were correct for the right reasons.

Of further interest was how children justified their incorrect intention attributions in the same action–different intention condition, in which the majority of errors occurred. In this case, they offered action justifications 40% of the time, whereas they never provided desire justifications. Although the sample of data was again very small, these findings are consistent with the hypothesis that children who fail to ascribe different intentions to characters doing the same thing believe that actions rather than desires determine intentions.

False-Belief Tasks

As in Study 3, children's scores on the two false-belief tasks (contents $M = .46$, $SD = .51$; location $M = .52$, $SD = .51$) were correlated, $r(21) = .49$, $p < .01$, and hence, were aggregated to yield a composite false-belief measure. Scores on this composite measure again did not correlate with performance in any of the three intention conditions, $r_s(21) \leq .16$, $p_s > .45$. These findings parallel those from Study 3, which suggests that children's ability to distinguish beliefs from reality is not related to their ability to differentiate two intentions for a given action.

TABLE 2
Justifications Following Correct and Incorrect Responses to Intention Questions in Study 4

<i>Justification Type</i>	<i>Condition</i>											
	<i>Same Action–Different Intention</i>				<i>Different Action–Different Intention</i>				<i>Same Action–Same Intention</i>			
	<i>Correct</i>		<i>Incorrect</i>		<i>Correct</i>		<i>Incorrect</i>		<i>Correct</i>		<i>Incorrect</i>	
	<i>%</i>	<i>Number</i>	<i>%</i>	<i>Number</i>	<i>%</i>	<i>Number</i>	<i>%</i>	<i>Number</i>	<i>%</i>	<i>Number</i>	<i>%</i>	<i>Number</i>
Desire	43	6	0	0	9	2	0	0	28	5	33	2
Action	14	2	40	4	36	8	0	0	11	2	17	1
Uninformative	43	6	60	6	55	12	100	2	61	11	50	3

GENERAL DISCUSSION

To successfully interpret and evaluate behavior, intentions must be understood as related to, yet different from, the actions they engender. This research investigated preschoolers' developing appreciation of the many-to-many relation between intentions and actions by assessing their ability to differentiate two intentions for one and the same action. In Study 1, 5-year-olds demonstrated a solid understanding of action–intention relations. Whether two characters performed the same or different actions, children of this age successfully inferred their intentions from desire information. Four-year-olds, in contrast, tended to attribute the same intention to characters performing the same action. Curiously, however, even when the two characters performed different actions, 4-year-olds assigned the same intention, which raised the concern that their difficulties stemmed from a superficial bias rather than from a genuine conceptual limitation. Study 2 clarified that 4-year-olds could assign different intentions to characters performing different actions when these actions were notably different, thus ruling out the operation of a general bias to assign the same intention to both characters. Despite 4-year-olds' difficulty in assigning different intentions to characters performing the same action, their performance did surpass chance in Study 2, which suggests that some kernel of understanding may have been present. However, even when the processing demands of the task were greatly reduced in Study 3 through the reduction of the number of pictures in each story and a shortening of the narration, 4-year-olds were again less successful at assigning different intentions to characters performing the same as opposed to different actions. Moreover, in Study 4 when the task was further simplified by effectively guaranteeing children's success on the first intention question, many 4-year-olds continued to have difficulty assigning a different intention to a second character performing the same action.

5-Year-Olds' Success: Low-Level Association or Genuine Understanding?

Five-year-olds' success in all three conditions of Study 1 suggests that they had little difficulty understanding that different intentions can motivate one and the same action. A low-level alternative, however, is that children of this age may have succeeded via simple associative connections between desires and intentions. That is, 5-year-olds could have linked, for example, a desire to be healthy with an intention to get exercise based on similarity in content rather than genuine conceptual understanding. Although this is certainly possible, we have reasons to think that associative strategies do not account for the 5-year-olds' success. First, explicit steps were taken to prevent the use of such strategies (i.e., each character's desire and intention were worded very differently, the desire picture offered no visual cues to the relevant intention, and both characters' desires were of the same valence). Second,

4-year-olds, who might otherwise have been more likely than their older counterparts to rely on simple associative strategies, very often failed to make different intention attributions to characters performing the same action. Moreover, 4-year-olds who did make correct attributions of intention in the same action–different intention condition of Study 4 tended to justify their responses appropriately. These factors lend support to the conclusion that 5-year-olds very likely understand that a given action may be motivated by different intentions.

4-Year-Olds' Difficulties: Processing Limitations or Conceptual Deficits?

Four-year-olds' difficulty in these studies was both robust and task specific. In all four studies, they had greater difficulty attributing different intentions to characters performing the same action as opposed to different actions (this difference was significant in Studies 2, 3, and 4). Moreover, in all three studies in which the same action–same intention condition was included, they had greater difficulty ascribing two intentions for the same action (when appropriate) than ascribing the same intention for the same action (significant in Studies 1 and 4). This is not to say that 4-year-olds were wholly incapable of differentiating two intentions for a given action: They did, after all, perform at above-chance levels in Studies 2 and 3, which suggests that some fledgling competence was present. Still, across the full series of studies and despite several modifications aimed at helping children succeed, the presence of two intentions for the same action consistently impaired 4-year-olds' performance relative to the control conditions.

Processing Limitations

As discussed throughout, one possible explanation for 4-year-olds' difficulties in these studies is that they could not make the appropriate desire–intention inferences. Several findings speak against this inferential account. First, children consistently assigned the correct intentions to characters in the same action–same intention condition at above-chance levels. Second, children successfully inferred the first character's intention at above-chance levels (70–80% correct) in the same action–different intention condition in Studies 2 and 3 (although not in Study 1). Together, these findings clarify that the story scenarios we presented were readily understood by children, which rules out the possibility that their difficulties in the same action–different intention condition were somehow a result of factors idiosyncratic to the content of the particular tasks they were given. More specific, the findings indicate an ability to infer intentions from desires in cases where the issue of assigning different intentions to the same action either did not arise (same action–same intention condition) or had not yet arisen (first intention question in the same action–different intention condition). Third, no evidence emerged that suc-

cessfully inferring the first character's intention from desire information gave children any advantage on the second intention question. In all of the studies, children's performance on the second intention question was no better after success on the first question than after failure. Fourth, the inferential hypothesis alone cannot account for 4-year-olds' error patterns in the same action–different intention condition. If children's difficulties stemmed from an inability to infer intentions from desires, they should have been just as likely to err by assigning different intentions (but the wrong ones) as to err by assigning the same intention to both characters. However, across studies, the overwhelming majority of children's errors in the same action–different intention condition were of the latter kind. Finally, the most compelling evidence against a purely inferential account comes from the Study 4 finding that despite guaranteed success at inferring the first character's intention, 4-year-olds continued to have difficulty assigning a different intention to the second character. That is, they were not helped even when the link between the first character's desire and intention was made entirely explicit. All in all, these findings suggest that although inferential difficulties may have played some role in 4-year-olds' consistently mediocre performance, they were not the primary source of children's difficulty.

A rather different processing explanation for 4-year-olds' difficulties is that their reluctance to entertain two intentions for a single action may have stemmed from deficits in inhibitory control, which are quite pronounced in the preschool period (e.g., Carlson & Moses, 2001; Kochanska, Murray, Jacques, Koenig, & Vandegest, 1996; Reed, Pien, & Rothbart, 1984). Suppose, for instance, that the actions in our stories strongly suggested a particular intentional construal (e.g., perhaps the action "running" is most naturally construed as "trying to get somewhere fast"). If so, that interpretation would be prepotent, and children with relatively weak inhibitory skills might be inclined to offer it for both characters, notwithstanding the incompatible desire information we presented. To explore this possibility, we examined whether, across studies, children did in fact consistently choose one intention alternative over the other when assigning the same intention to both characters in the same action–different intention condition. This was not the case. With the exception of the bucket story, the stories appeared not to generate a favored interpretation; on the whole, children selected both intention alternatives roughly equally in each story. Still, the absence of a canonical interpretation of the characters' actions does not entirely rule out the inhibitory account. Clearly, in the same action–different intention condition, children needed to inhibit their interpretation of the first character's intention (irrespective of whether it was a canonical interpretation) to attribute a different intention to a second character performing the same action. Doing so may have been especially difficult for children with poor inhibitory skills because the second character's action was entirely compatible with the first character's intention. However, another finding from these studies speaks against both this and the original version of the inhibitory account.

Specifically, children's performance on the false-belief task, which is highly correlated with inhibitory control (e.g., Carlson & Moses, 2001; Perner & Lang, 1999), did not correlate with their performance on the intention task in Studies 3 and 4. Although the sample sizes were small and the age range somewhat restricted, this finding suggests that inhibitory deficits were not largely responsible for children's reluctance to consider two intentions for a given action.

Conceptual Deficits

More likely, 4-year-olds' difficulties in these studies resulted from conceptual limitations. There are a number of possibilities in this regard. First, children's errors may have had their source in general cognitive biases. As mentioned in the introduction, many aspects of young children's cognition appear to be dominated by a belief that each object or event in the world has one and only one characterization (Flavell, 1988). For example, children often reject two category names for one and the same object (e.g., Markman & Wachtel, 1988) or assume that for every problem there is one and only one solution (e.g., Acredolo & Horobin, 1987). Moreover, preschoolers frequently fail to recognize that two people may generate different interpretations of one and the same thing (e.g., Carpendale & Chandler, 1996). This is not to say that young children are never able to represent a single object or event in different ways (see Deák & Maratsos, 1998); rather, they may have a general bias to assume one-to-one mappings between objects and representations. Such an assumption may underlie young children's reluctance to assign different intentions to characters performing the same action.

Second, 4-year-olds' difficulties may have stemmed from an inability to appreciate the representational nature of mental states. As discussed earlier, to entertain multiple intentions for one and the same action, intentions must be understood as mental states that represent the actions they engender. For this reason, we included two false-belief tasks in Studies 3 and 4 as measures of representational understanding but found no evidence of a relation between 4-year-olds' appreciation of false belief and their ability to differentiate two intentions for the same action. Likewise, Lee (1995) found no correlation between children's performance on the false-belief task and their understanding of prior intentions. In contrast, however, Phillips, Baron-Cohen, and Rutter (1998) found that 4-year-olds who understood false belief were more likely to succeed at differentiating intention from desire, and Perner, Stummer, and Lang (1999) found a significant correlation between 3- to 5-year-olds' false-belief performance and their understanding that reflex movements are unintentional. For reasons that remain unclear, representational understanding appears to relate to some aspects of the intention concept but not to others.

Third, it is possible that children's difficulties are specific to their theories of mind but apply to motivational states in general rather than to intentions in particular. That is, young children may have just as much difficulty recognizing that dif-

ferent desires can underlie the same action as appreciating that different intentions may do so. As discussed in the introduction, there is some evidence that young preschoolers can interpret identical action-outcomes differently depending on the actors' desires (Wellman & Woolley, 1990). For reasons given earlier, however, this evidence does not convincingly demonstrate that children understand the potential for diversity in the desires underlying a given action. With respect to the studies reported here, we do not know for sure whether our 4-year-olds distinguished intentions from desires at all, although this is an age at which such a distinction is beginning to emerge (e.g., Feinfield, Lee, Flavell, Green, & Flavell, 1999; Phillips et al., 1998; Schult, 1996). Despite our best efforts to make the characters' desires and intentions markedly different, children may have interpreted the descriptions of these mental states simply as restatements of the same thing. Against this, 4-year-olds generally had little difficulty differentiating the characters' desires (as reflected in their near-perfect performance on the desire control questions), which suggests that they could in fact ascribe different desires for the same action. They did not, however, go on to attribute different intentions to the two characters, which leaves open the possibility that any conceptual deficit may be specific to intention.

A final explanation for 4-year-olds' difficulties in these studies, and one that we especially favor, is that children's early concept of intention is intimately tied to action (Astington, 2001; Moses, 2001). For one, children's introduction to the world of intentions may be mediated by their perception and organization of action (Baird & Baldwin, 2001; Baldwin & Baird, 1999). For example, 10- to 11-month-old infants are capable of detecting structure in action that corresponds with the initiation and completion of intentions (Baldwin, Baird, Saylor, & Clark, 2001), and infants as young as 6 months of age selectively attend to aspects of action that are relevant to the actor's goals (e.g., Woodward, 1998; Woodward, Sommerville, & Guajardo, 2001). Children's initial concept of intention thus may be so action centered that an appreciation of the potential for diversity in the intentions motivating a given action develops only gradually. Furthermore, at one level, intentions are isomorphic with actions. For example, despite differences in their distal intentions (e.g., to get some exercise, to get somewhere fast) both characters in our stories shared the same proximal intention (e.g., to run). It may be the case that children understand proximal action-intention relations early on, but this knowledge later interferes with their developing appreciation of how more distal intentions differ from actions.

IMPLICATIONS AND CONCLUSIONS

Children's understanding of the potential for diversity in the intentions motivating a given action has theoretical and practical relevance to a variety of domains outside the theory-of-mind arena. For one, the ability to identify others' intentions is

essential for attributions of moral responsibility. Whereas previous literature on this topic centered on children's moral evaluations of intentional versus unintentional behavior (see Karniol, 1978, for a review), our methodology would enable researchers to investigate whether children recognize that even when two people perform the same action intentionally, they may be more or less praiseworthy depending on their specific intentions (Baird, 2001). For example, the act of turning on a hose may be rewarded if the actor intends to help her mother water the garden. However, the very same act may be condemned if the actor intends to ruin her brother's sand castle. Because of the relevance of intention information to judgments of morality, it seems likely that children's ability to determine the intentions motivating action will be related to the accuracy and sophistication of their moral reasoning (e.g., Chandler, Sokol, & Hallett, 2001; Helwig, Zelazo, & Wilson, 2001; Zelazo, Helwig, & Lau, 1996).

Children's understanding of action-intention relations is also relevant to the development of social competence. Relative to other children, aggressive and socially rejected children are less skilled at interpreting intentions in unambiguous situations and are more likely to attribute hostile intentions in ambiguous situations (e.g., Dodge, 1980; Dodge, Murphy, & Buchsbaum, 1984). As a result of their difficulty in interpreting others' intentions, these children retaliate with unwarranted aggression toward their peers, which perpetuates their status as socially deviant and may lead to subsequent provocations (Dodge, 1980). With an individual differences approach, the current paradigm could be adapted to examine the relation between developmental advances in children's understanding of intention and the achievement of social competence. Moreover, from a practical standpoint, it may be possible to train aggressive children to identify the intentions motivating others' actions with the types of scenarios developed here. For example, by highlighting the different ways in which two people might come to perform the same action, children may learn to recognize cues that are relevant for drawing inferences about others' intentions.

In conclusion, our findings reveal that in contrast to 5-year-olds, many 4-year-olds have difficulty recognizing that one and the same action may be motivated by different intentions. In our view, this difficulty stems from immaturities in children's conceptual understanding rather than from processing demands. Our findings suggest that young children may initially assume that intentions are isomorphic with actions, an assumption that has significant theoretical and practical implications for their developing theory of mind, moral reasoning, and social competence.

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APPENDIX A
Study 1 Story Summaries

<i>Condition</i>	<i>Desire</i>	<i>Action</i>	<i>Intention</i>
Running story			
Same action	To be home for dinner in just a few minutes	Run	To get somewhere fast
Different intention	To be healthy and strong when he grows up	Run	To get some exercise
Different action	To be home for dinner in just a few minutes	Run	To get somewhere fast
Different intention	To be healthy and strong when he grows up	Bike	To get some exercise
Same action	To be home for dinner in just a few minutes	Run	To get somewhere fast
Same intention	To be home early for his mom's surprise party	Run	To get somewhere fast
Wood story			
Same action	For his house to be warm tonight	Chop wood	To make a fire
Different intention	To have a new place to play	Chop wood	To build a treehouse
Different action	For his house to be warm tonight	Chop wood	To make a fire
Different intention	To have a new place to play	Collect sticks	To build a treehouse
Same action	For his house to be warm tonight	Chop wood	To make a fire
Same intention	To have a barbecue	Chop wood	To make a fire
Closet story			
Same action	To be done with all of his chores	Open closet	To put his clothes away
Different intention	To have fun at the beach	Open closet	To find his bathing suit
Different action	To be done with all of his chores	Open closet	To put his clothes away
Different intention	To have fun at the beach	Open drawer	To find his bathing suit
Same action	To be done with all of his chores	Open closet	To put his clothes away
Same intention	For his room to look nice	Open closet	To put his clothes away

Bucket story			
Same action	To have a beautiful backyard	Fill up bucket	To water the garden
Different intention	For her dog to look pretty	Fill up bucket	To prepare a bath
Different action	To have a beautiful backyard	Fill up bucket	To water the garden
Different intention	For her dog to look pretty	Turn on hose	To prepare a bath
Same action	To have a beautiful backyard	Fill up bucket	To water the garden
Same intention	To have fresh food everyday	Fill up bucket	To water the garden
Toy story			
Same action	To have toys when she's away on vacation	Put toys in box	To pack
Different intention	To have space on the floor for jumprope	Put toys in box	To clean up
Different action	To have toys when she's away on vacation	Put toys in box	To pack
Different intention	To have space on the floor for jumprope	Put toys in box	To clean up
Same action	To have toys when she's away on vacation	Put toys in box	To pack
Same intention	For her friend in California to have these toys	Put toys in box	To pack
Hat story			
Same action	To be outside playing in the snow	Put a hat on	To stay warm
Different intention	To look like a scarecrow	Put a hat on	To make a costume
Different action	To be outside playing in the snow	Put a hat on	To stay warm
Different intention	To look like a scarecrow	Put mittens on	To make a costume
Same action	To be outside playing in the snow	Put a hat on	To stay warm
Same intention	To be on a walk to the park	Put a hat on	To stay warm

APPENDIX B
Study 4: Revised Closet Story

<i>Condition</i>	<i>Desire</i>	<i>Action</i>	<i>Intention</i>
Same action	To dig a hole in his backyard	Open closet	To find a shovel
Different intention	For his room to be clean	Open closet	To find the vacuum
Different action	For his room to be clean	Open closet	To find the vacuum
Different intention	To have a birthday party	Mix chocolate	To make a cake
Same action	To dig a hole in his backyard	Open closet	To find a shovel
Same intention	To build a sandcastle at the beach	Open closet	To find a shovel

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