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Young children's reasoning about beliefs*

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Abstract

We present three investigations of children's early understanding of belief, that is, their knowledge of such internal mental attitudes as thinking, knowing, and guessing. The findings demonstrate that even quite young children, 3-year-olds, understand beliefs as internal mental states separate from desires but joined with desires in a larger belief–desire reasoning scheme. Such young children can appropriately predict actions given information as to a character's beliefs and desires, understand that information about beliefs is a necessary addition to information about desires to explain or predict actions, can appropriately infer the presence or absence of belief given information as to a character's seeing or not seeing a relevant situation, and can predict the appropriate emotional reaction to the outcomes of belief–desire caused actions. The results are situated in a larger description of young children's mentalistic naive psychology.

Our general focus is naive psychological explanation of action. By that phrase we mean people's everyday construal of human actions as resulting from such internal psychological states as the actor's hopes, wishes, beliefs, fears and doubts. Our question is not whether people truly possess beliefs, wishes, and so on, that is, whether such constructs constitute a good or valid scientific psychology (Churchland, 1981; Stitch, 1983). Instead, our question is how we ordinarily employ such constructs to understand everyday behavior. Our specific concern is whether young children understand actions in terms of beliefs. We assume, as a point for departure, that adult naive psychological

explanation encompasses something like a system of reasoning about beliefs and desires. We intend to examine whether young children, like adults, engage in belief–desire reasoning. We believe that there are large and important differences in children's versus adults' naive psychologies. However, in the end we will conclude that both child and adult systems are commensurate in several fashions, namely (1) in the conceiving of beliefs as internal mental states, and (2) in contrasting beliefs with desires, while at the same time (3) joining them in a causal reasoning scheme.

To flesh out these assumptions and to provide a rationale for our research, we begin with a description of belief–desire reasoning in adults. Our description is not meant to be a full or proper account of adult naive psychology; it is intended only to capture some aspects of that system that we feel are central in young children's thinking.
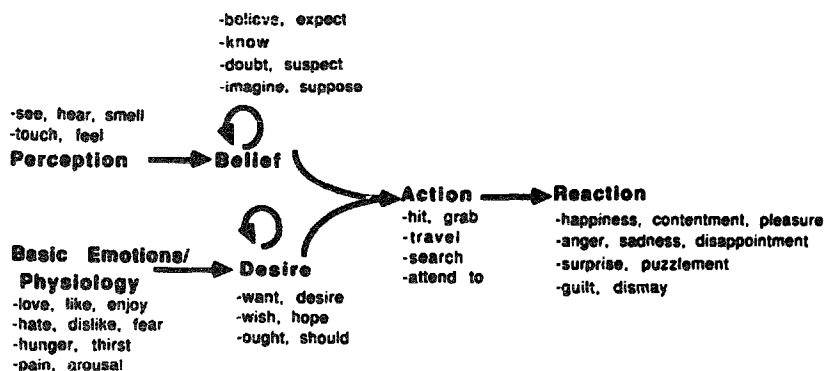
A simplified belief–desire reasoning scheme

Adults commonly explain what an actor does by invoking constructs such as the actor's hopes, wishes, fears, beliefs, expectations, and doubts. These constructs can be roughly divided into beliefs (the actor's knowledge, convictions, suppositions, ideas, and opinions) and desires (the actor's wants, wishes, goals, hopes, and aspirations). In order to explain intentional actions, it is necessary to appeal to beliefs and desires (see Davidson, 1963) because to do something intentionally is to have a *desire* and to engage in the act because you *believe* it will help satisfy your desire. An appeal to these constructs is revealed in the following examples of everyday explanation of action:

(1)   Why did Mary go to the car wash? She wanted her car cleaned and she thought the car wash would clean it.
(2)   Why did John buy a candy bar? He wanted a snack and thought that eating a candy bar would help him get through till dinner time.

In short, "we generally explain why people do what they do in terms of their desires, or goals, and their beliefs both about these goals and about various possible means to their goals" (Giere, 1985, p. 86).

The phrase "belief–desire reasoning" is a rough abbreviation. It is rough in that beliefs and desires are construed broadly. It is an abbreviation in that it highlights only two of a variety of interwoven factors. The scheme in Figure 1 outlines some critical aspects of everyday belief–desire reasoning by depicting both some core concepts and connections between them.

Figure 1.   *Scheme for depicting belief–desire reasoning.*

Actions

With regard to any reasoning scheme, a question of obvious importance is: What requires explanation? What domain of phenomena is belief–desire reasoning to explain? The answer is the domain of intentional human action. In examples (1) and (2) above, going to the car wash and buying a candy bar are actions to be explained. Such examples might lead to the conclusion (by analogy with traditional definitions of scientific psychology) that the phenomenon to be explained is behavior. This analogy should be resisted: The term "action" seems preferable to "behavior." First, the term "behavior" includes phenomena such as involuntary, automatic reflexes. Yet in everyday reasoning, the appropriate objects of belief–desire reasoning seem to be specifically intentional actions. Involuntary reflexes (e.g., sneezes, blinks), biological outcomes (e.g., fevers, muscle tremors), or bodily motions (e.g., being buffeted by the wind, run over by a car) are outside the domain of belief–desire explanation. Second, "behavior" is a misleading descriptor because it suggests that even the actions to be explained might best be described in terms of physical motions. However, in everyday language the appropriate level of description is not behavioral (the right hand raising the toothbrush to the mouth) but intentional (attempting to brush your teeth) and thus mentalistic – that is, actions are construed as the outward manifestations of internal mental states. This system of explaining human actions is sometimes called a folk or commonsense psychology (e.g., Stitch, 1983). It is not

psychology in the scientific sense of the study of behavior; it is a psychology that focuses on people's "mental lives" (James, 1890/1950).

Beliefs and desires

The sorts of explanations presented above invoke constructs of two general sorts: beliefs (including the actor's knowledge, convictions, suppositions, ideas, and opinions) and desires (including all the actor's pro- and con-attitudes, such as his or her wants, goals, and aspirations, as well as self-imposed obligations). Both types of constructs are essential in explaining every action. For example:

(3) Why did John go to the store? He *wanted* something to eat and *remembered* he could buy it at the store.
(4) Why did Joe hit Bill? He *thought* Bill was going to hit him and he *wished* to defend himself.
(5) Why did Sue put on her swimming suit? She *knew* it was time for swimming and she *hoped* to be the first one in the water.

Although both beliefs and desires are needed for the full commonsense explanation of action, one of the constructs is often especially informative in a given situation and thus the other may go unmentioned. For example:

(6) The kitten was under the chair but Jill was looking for it under the sofa. Why? She thought it was under the sofa.
(7) Why is Bill going to the dentist? He's afraid that he has a cavity.

In Example 6, Jill must want to find her kitten but that fact is not mentioned; in Example 7, Bill must believe that dentists can fix cavities, but that information is implicit. An acceptable explanation may simply presume common knowledge of certain beliefs or desires, according to the conversational maxim "be relevant" (Grice, 1975). Relevant explanations need not mention all pertinent facts if they can be assumed to be known or inferred.

While beliefs and desires are different sorts of mental states or attitudes, they similarly include both an attitude and a content. For this reason they are sometimes termed propositional attitudes. This terminology reflects the notion that beliefs are *about* some content, a content that can be stated as a proposition. For example, one might believe *that* "snow is cold" or guess *that* "Joe's birthday is Wednesday." Similarly, desires can be construed as propositional desires, fears, or wishes; that is, they are desires *that* a proposition be realized. For example, one might desire *that* "one will eat ice cream" or fear *that* "there will be a snowstorm." Although beliefs and desires can be termed propositional attitudes, the philosophical status of such "proposi-

tions" and the nature of such "attitudes" are controversial. By resorting to this terminology, we merely wish to capture the less controversial common-sense intuition that beliefs and desires involve two facets, namely (a) the nature of the mental attitude, state, or process (belief, hope, doubt, desire, etc.) and (b) the proposition or content to which the attitude pertains.

It is important to note that in our naive psychology beliefs can result from other beliefs and desires can cause other desires. This is depicted by the circular arrows in Figure 1 and is exemplified by the following:

(8) Why did he go to the store? He wanted to buy some string. Why? He wanted to wrap a package. Why? He wanted to send it to his mother. Why? He wanted to celebrate her birthday.

(9) Why did she go to college? She thought it would enhance her earning power (and she wants to make lots of money). Why? She thinks most high paying jobs require a college degree. Why? She knows that a degree is required to be a medical doctor and not to be a janitor and she thinks those sorts of examples are representative of lots of jobs.

These examples depict means-end chains: One action can be believed to be (or desired as) a subgoal to another (which may be only a means to another). Additionally, any one action can be described in several nested fashions (e.g., going to college, getting a degree, enhancing earning power). Appeals to one or another of the various chained or nested beliefs and desires can all provide an informative explanation for a specific action.

Perception, physiology and basic emotions

So far we have considered only beliefs, desires, and actions in the scheme in Figure 1. Even in its simple form, the relevant causal chain is longer than this. Specifically, perceptions cause beliefs; basic emotions and/or physiological states such as deprivation and arousal cause desires (and actions cause reactions).

Consider the following:

(10) Why did Jill think her kitten was under the sofa (when he was really under the chair)? She saw him go under the sofa (and didn't see him scoot from there over to the chair).

(11) Why did Joan want an ice cream? She hadn't eaten anything for days. Or, she loves sweets.

Perception as well as physiology and basic emotions provide input to the mind from extra-mental sources. Perception, according to naive psychology, tells us about the external world of real objects, spaces, and events. One's

knowledge (justified belief) is thus forged in part from perceptions, from seeing, hearing, or feeling various states of affairs (and in part, as described above, from one's other beliefs).

Physiology and basic emotions also provide inputs to the mind. In this case, however, the input, while external to the mind, is internal to the body. The inputs from these sources fuel desires, whereas perceptions fuel belief. The distinction between desires (want to X, wish that Y, would like to Z) and basic emotions (hate, love, anger, fear, anguish) is an important one but also an imprecise one. Potential confusion between specific desires and particular emotions is evident in everyday conception in the broad scope of the generic term "feeling." One can "feel that getting an award would be nice" (a desire) but also one can "feel hungry" (physiology) and "feel sad" (basic emotion), and so forth. "Feeling that something would be nice" counts as a desire because of its propositional-attitude nature. Emotions such as love, pleasure, sadness, and so forth cause and ground one's propositional desires but do not constitute such desires themselves. Thus, as is clear in Figure 1, emotions influence action through their role in forming desires. The role of emotions is further elucidated in considering reactions.

Reactions

Actions result in various outcomes and these outcomes give rise to various reactions by the actor. Within everyday psychology, the outcomes of interest, like the actions themselves, are not amenable to description in terms of observable behaviors or events. The outcomes are appropriately characterized instead in terms such as "success," that is, whether or not the outcomes match the actor's goals. Indeed, an initial categorization of relevant outcomes would seem to include the following three possibilities:

(1) The outcome of an action can satisfy or fail to satisfy the actor's desires, that is, achieve or fail to achieve his or her goals. If the actor desires something and his or her actions achieve that something (or desires to avoid something and successfully avoids it) then satisfaction results. Satisfaction encompasses such emotional reactions as happiness, pleasure, contentment, and relief. Or, if the actor desires something and fails to achieve it (or desires to avoid something and fails to avoid it) then dissatisfaction results. Dissatisfaction encompasses such reactions as anger, unhappiness, hurt, and disappointment.

(2) The outcomes of an action can also accord with or fail to accord with the actor's beliefs. The actor can believe something (e.g., expect something to occur), but that something does not occur (or expect the absence of some-

thing but it does occur), resulting in surprise. Surprise, generically consider-
ed, encompasses such reactions as puzzlement, curiosity, and so forth. Or,
the actor can believe something (expect something) and it does occur, result-
ing in a more neutral reaction to the outcome.

(3) Finally, the outcomes of an action can fall outside the scope of the actor's
intentions. If an action falls inside the scope of an actor's intentions, then the
outcomes are directly related to the actor's beliefs and desires. Thus, the
outcomes produce the sorts of reactions already explained under (1) and (2).
However, an action can also have unintended, unforeseen, outcomes. The
production of unintended outcomes can result in puzzlement, guilt, dismay,
or possibly even delight, depending on the type and severity of the unin-
tended result.

Research with children

Our description of this scheme obviously oversimplifies adult belief–desire
reasoning. It leaves unelaborated several concepts, such as intention (see
Bratman, 1984) and character traits. But given even this approximation, it is
clearly interesting to ask when and how children engage in reasoning of this
sort. The research that follows is designed to address this question. That is,
it is not designed to confirm the scheme as a precise description of belief–de-
sire reasoning but instead to ask: If everyday belief–desire reasoning is con-
strued as having something like the features and organization outlined here,
then when and in what ways do young children engage in it?

There are several reasons to be interested in this question. First, if anything
like our analysis is true, then such reasoning represents a common and funda-
mental form of (psychological) explanation. We use it for self and for others,
to explain trivial and momentous actions. For example, belief–desire reason-
ing seems essential for story understanding (Trabasso, Stein, & Johnson,
1981; Willensky, 1983). Stories tell of protagonists' actions, thus portraying
characters who have specific goals, who become aware of particular cir-
cumstances, who possess or achieve particular beliefs and who plan specific
actions in attempts to achieve specific ends. In a similar way, belief–desire
reasoning is central to understanding both ordinary and extraordinary be-
havior that occurs historically, contemporaneously, and in the future.

The development of belief–desire reasoning is of further interest because
it rests on a basic mentalism. Explaining behavior in belief–desire terms re-
flects a mentalistic interpretation of action rather than a behavioristic or a
physicalistic one. When and how children understand beliefs and desires is
thus central to whether they are ever childhood realists (Piaget, 1929) and

when they evidence a "theory of mind" (Wellman, 1985). These questions are of contemporary interest to many developmental psychologists (Astington, Harris, & Olson, in press). In this vein, for example, belief–desire reasoning figures centrally in moral judgments. Adults' moral evaluations typically involve appraising the actor's desires and intentions; in contrast, Piaget (1932) suggested that young children are "moral realists," judging acts only on their external, non-intentional features.

As these examples suggest, children's belief–desire reasoning is addressed by several different research literatures, including those of story comprehension, moral judgment, person perception, and metacognition. The topic is in need of further investigation, however, because empirical studies in these traditions rarely, if ever, examine children's belief–desire reasoning directly. One notable exception is the recent research on children's understanding of false beliefs. In a series of studies (beginning with Wimmer & Perner, 1983), Wimmer and Perner have examined young children's ability to use the information that a person has a false belief to predict the person's action. Children are told, for example: Maxi has some chocolate and puts it in a drawer. Without Maxi's knowledge, his mother switches the chocolate to the cupboard. When Maxi wants some chocolate, where will he look for it? Children 4½ years of age and older answer (correctly) that he will look in the drawer. This adult-like response indicates an appreciation of the links between beliefs, desires, and actions.

Children younger than 4 years, however, predict that Maxi will look in the cupboard. Perner, Leekham, and Wimmer (1987) show that this incorrect performance is not merely an artifact of several story and task factors, and that the same pattern of performance results when children are asked to make judgments about their peers. Thus, children's errors may well be a genuine prediction of the actor's behavior on the basis of reality rather than belief. What are we to make of this failure? One possibility is that young children do not engage in belief–desire reasoning at all. On this account, reasoning about false beliefs might be seen as being diagnostic of reasoning about beliefs in general (Dennett, 1978). Young children's prediction that Maxi's behavior will correspond to reality rather than to belief might be revealing their inability to understand the mental, subjective aspect of beliefs. An alternate possibility is that false-belief reasoning is a particularly difficult form of belief–desire reasoning (perhaps it is computationally complex in some way). In this case, young children might be capable of engaging in belief–desire reasoning, but still fail the especially difficult task of reasoning about false beliefs.

The dearth of data on children's belief–desire reasoning makes it impossible to decide between these positions. In the following studies, we investigate

the early development of belief–desire reasoning in an attempt to provide the needed data. This is an important endeavor; if young children's understanding of action honors a belief–desire framework, then we and they share at least a fundamental part of a common world view. If not, our world views are decidedly different. Such similarities or differences have profound implications for our theories of conceptual development, language acquisition, social development, and our treatment of and interaction with children (cf. Baron-Cohen, Leslie, & Frith, 1985).

Experiment 1

Note that belief–desire reasoning rests on a basic triad of independent constructs: beliefs, desires, and external reality. Beliefs and desires are internal mental states and in that sense are independent from external events and outcomes. One can believe that something is true or believe that something will occur, but that something can instead be false or fail to occur. Similarly, one can want something to happen (or hope or fear it will happen) but that something does not happen. Not only are beliefs and desires independent from reality but they are also distinct from each other. To believe that something will happen is vastly different from desiring that it will happen, as in the belief that death is inevitable.

These different sorts of independencies between beliefs, desires, and reality are indexed, according to our analysis, by actors' different reactions to the outcomes of their acts. Roughly, if you want something and get it, you are happy; whereas if you want it and fail to get it, you are unhappy. Happiness reactions thus reflect the independence of desires from reality. Similarly, if you believe something will happen and it does not, you are surprised; if you believe something will happen and it does, then you are not surprised. Surprise reactions thus reflect the independence of belief from reality. The differential reactions of happiness versus surprise serve to distinguish beliefs from desires. If young children engage in belief–desire reasoning, they should be able to judge desire-outcome and belief-outcome scenarios appropriately with respect to these reactions. In Experiment 1, we tested whether 4-year-olds could do this.

Method

Tasks
We used two sorts of simple stories: In Want stories, a protagonist either wanted or did not want something; in Think stories, a protagonist thought or

did not think he or she would get something. In each story, the protagonist either got or did not get that thing. As a result, there were eight types of stories: +Want+Get, +Want−Get, −Want+Get, −Want−Get, as well as +Think+Get, +Think−Get, −Think+Get, −Think−Get. An example of a +Want+Get story was: "Here's Mary. Mary drinks juice at snack time. Today she wants to have orange juice, because she didn't get orange juice for breakfast. Look, Mary gets orange juice for snack." For each story, the child was asked on separate occasions to rate the happiness and the surprise of the protagonist.

Want stories presented simple desires. The six desires used were: wants orange juice, wants to go to the park, wants a puppy, wants it to rain, wants blue gum, wants Dad to read a dinosaur book. Think stories presented beliefs in the form of simple expectations about the future, for example, thinking (believing) that some unidentified juice is orange juice, or thinking that an unidentified pet will be a puppy. There were six beliefs, each corresponding in content to the six desires listed above.

Subjects
Sixteen 4-year-olds (4:2 to 5:0, $M = 4$:8) participated. There were 11 boys, and 5 girls from a university preschool serving a predominantly white middle class clientele.

Materials and procedure
An example of a Want story was presented above. An example of a Think story, (−Think+Get), with the procedures for story presentation, is as follows: The child was shown a drawing of a story character's face. "This is Lisa. Lisa thinks it will not rain today. She likes it when it rains and she likes it when it doesn't rain, but she thinks it will not rain today." To be sure that the child understood the essential story information, he or she was asked, "So, what does Lisa think?" On rare occasions, children answered this question incorrectly, in which case the story was repeated. When the child answered correctly (requiring at most a single repetition), he or she was told, "That's right, Lisa thinks it will not rain today." At this point the drawing of the character's face was turned over and a picture of the outcome was presented. "Look, it rains."

Note in the above example that Think stories contain an explicit statement (absent in Want stories) that the protagonist would like either outcome. Often simply mentioning a personal expectation about the future (such as, "John thinks the postman will come at 2 o'clock") implies that John has some vested interest in the outcome, that in fact he desires the outcome. We added the statement that the character likes both outcomes to encourage children

to interpret the Think stories as specifying solely a belief (and not a belief plus a desire).

Each child heard eight stories, one of each of the eight story types (e.g., −Want+Get), twice. They heard the stories once in a session where they rated whether the protagonists felt happy, and once in a different session where they rated whether the protagonists felt surprised. To rate happiness, children were shown a scale with three faces – one happy, one neutral, and one sad – and asked, for example, "How does Lisa feel, happy, unhappy, or just OK?" To rate surprise, a scale depicting two faces – one surprised and one neutral – was used. Whether children rated the stories for happiness or for surprise in their first session was counterbalanced across children.

Each of the eight story types came in several versions, with different protagonists and different target objects. For each child, six stories in a session had unique protagonists and topics (e.g., Joe wants blue gum; Lisa thinks it will rain). Two protagonist–topic pairs were repeated in each session in two different stories (e.g., Lisa thinks it will rain and it does, and also, Lisa thinks it won't rain and it does). This arrangement allowed us to compare children's ratings of the same protagonist experiencing exactly the same outcome when having quite different desires (or beliefs). We reasoned that this would provide a precise test of whether individual children understood the independence of belief from reality and desires from reality.

Within each session, the four stories appropriate to the scale being used (that is, Want stories with the happy scale and Think stories with the surprise scale) were presented first, in order to avoid confusing the children. Otherwise, story presentation orders were counterbalanced across children. Children rated each story, and on every second story they were asked to explain their rating, for example, "Why does Lisa feel like that?"

Each session began with a warm-up task designed to familiarize children with whichever scale was being used. For the happiness scale, children were told about (a) a boy who on his birthday was given a big present and was very happy, (b) a girl who on her birthday got no present at all and was very unhappy, and (c) a child who was "not happy and not unhappy, but just okay." For the surprise scale, children were told of (a) a girl who thought her hat was in the closet but who upon looking found an elephant and so was very surprised, and (b) a boy who thought his toothbrush was in the bathroom and it was there. In every case children pointed to the appropriate faces.

Results

According to our analysis of belief–desire reasoning, happiness is especially linked with desire and surprise is especially linked with belief. The predicted ideal responses are thus those presented at the left of Figure 2.

Do children conform to these ideals? Specifically, do children evidence the ideal happiness pattern more for Want stories (where it is especially appropriate) than for Think stories, and also evidence the ideal surprise pattern more for Think stories than for Want stories? These predictions involve compari-

Figure 2.   *Ideal and observed responses for happiness and surprise ratings in Experiment 1. For happiness ratings a three-place scale was used (happy, neutral, unhappy). Data depicted are the percentages of happy or unhappy choices. Neutral choices are not directly depicted, but constitute the remainder (i.e., 100 – happy – unhappy). For this reason the percentages depicted are typically less than 100; total percentages can reach as high as 101 because of rounding errors. For surprise ratings only two choices were given (surprise, neutral); the data depicted are the percentage of surprise choices, neutral choices constitute the remainder.*
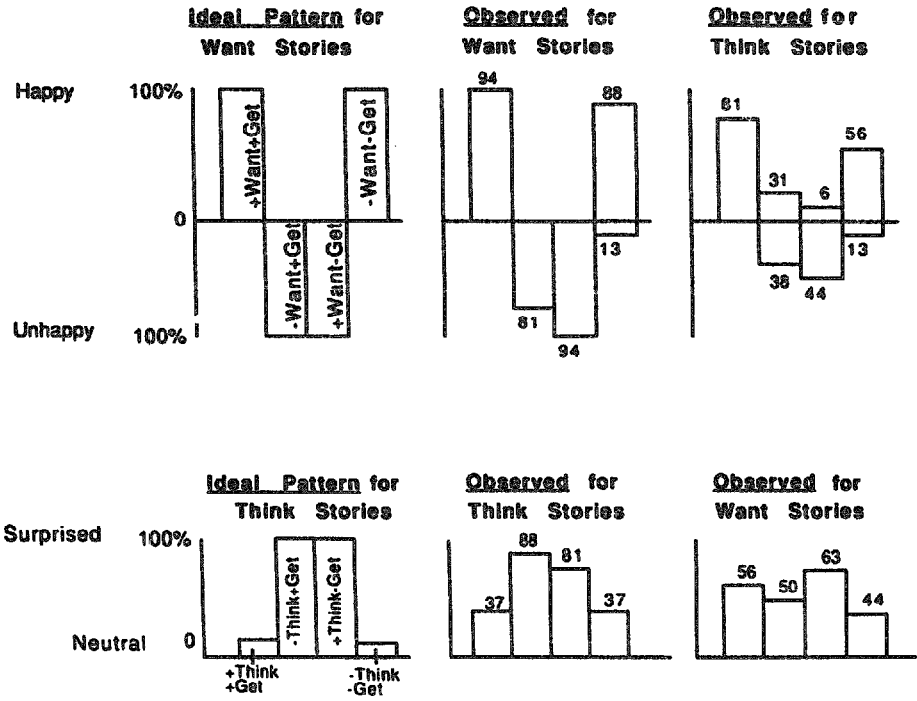
sons across stories (Think vs. Want) but within a response type (e.g., happiness). Given our procedures, it is inappropriate to make within story (e.g., Want) but across response type (happiness vs. surprise) comparisons. This is because, conceptually, the response types are different and thus, practically, we used different response scales: a 3-point response scale for happiness (happy, neutral, unhappy) and a 2-point scale for surprise (surprised, neutral).

Figure 2 also graphically presents our observed findings. The ideal happiness pattern was much more apparent for Want stories than for Think stories, and the ideal surprise pattern was more apparent for Think than for Want stories. Such data suggest that children understand the belief–desire specificity discussed earlier.

We will term the +Want+Get and −Want−Get stories the *concordant* Want stories (because of the concordance between desires and outcomes) and the +Want−Get and −Want+Get stories the *discordant* stories. Similarly, there are concordant and discordant Think stories. In accordance with the ideal patterns, Figure 2 shows that empirically, within a story type (Want or Think), the two concordant stories received comparable ratings, and similarly the two discordant stories received comparable ratings. Given these regularities, we summed children's responses across concordant versus discordant story pairs.

To compare children's happiness ratings of Want versus Think stories, happiness ratings were scored as unhappy = 0, neutral = 1, and happy = 2, and then summed over the two stories in a discordant or concordant story pair. Happiness scores could thus range from 0 to 4. A 2 (Concordance: concordant vs. discordant stories) × 2 (Mental state: want vs. think) analysis of variance (ANOVA) yielded main effects of concordance – $F(1, 15) = 108.03, p < .001$ – and of mental state – $F(1, 15) = 6.40, p < .05$ – subsumed under a significant interaction – $F(1, 15) = 18.58, p < .001$. Table 1 presents the relevant means. The predictions discussed earlier require that if subjects understand belief–desire reasoning, then they should evidence greater discrepancy in their happiness scores for concordant versus discordant Want stories than they evidence for concordant versus discordant Think stories. Therefore, we conducted a planned comparison between the difference scores shown in the top portion of Table 1 (i.e., a comparison between 3.45 and 1.65, the mean differences for Want vs. Think stories) – $t(15) = 4.31, p < .001$, one-tailed. In short, children's happiness ratings conformed to the predicted pattern.

A parallel analysis was conducted for children's surprise ratings. Surprise ratings were scored surprise = 2, neutral = 0, and were summed over discordant versus concordant story pairs. Surprise scores could thus range from 0

Table 1.   *Happiness and surprise ratings for children and adults in Experiment 1*

4-year-olds:

	Happiness Ratings (0–4)		
	Concordant	Discordant	Difference
Want stories	3.70	.25	3.45[a]
Think stories	3.25	1.60	1.65[a]

	Surprise Ratings (0–4)		
	Concordant	Discordant	Difference
Want stories	2.00	2.25	.25
Think stories	1.50	3.37	1.87[a]

Adults:

	Happiness Ratings (0–4)		
	Concordant	Discordant	Difference
Want stories	3.83	.42	3.41[a]
Think stories	3.08	2.58	.50

	Surprise Ratings (0–4)		
	Concordant	Discordant	Difference
Want stories	2.00	1.50	.50
Think stories	.67	3.00	2.33[a]

[a]Difference between concordant and discordant stories significant at $p < .05$ (one-tailed) or better, by *t*-tests for related samples with $df = 15$ for 4-year-olds and $df = 11$ for adults.

to 4. A 2(Concordance) × 2(Mental state) ANOVA yielded a significant effect for concordance – $F(1, 15) = 4.45$, $p = .05$. We again conducted a planned comparison between the difference scores shown in the middle portion of Table 1 (i.e., a comparison between .25 and 1.87, the mean differences for Want vs. Think stories) – $t(15) = 1.68$, $p = .058$, one-tailed. Children's surprise ratings approximated the predicted pattern.

As shown in the far right column of Table 1, the difference in happiness ratings for Want stories (across levels of concordance) and the difference in surprise ratings for Think stories were both significant, conforming to the ideal predicted pattern of responses. The significant difference in happiness

ratings for Think stories (albeit appropriately smaller than the happiness difference for Want stories) was not predicted by the ideal patterns. If subjects properly understood that the story character in Think stories thought that something would occur but did not desire it, then not getting that thing should have yielded surprise but not happiness. However, children rated such stories as yielding happiness as well as surprise. Our interpretation of this finding is that, in spite of the statement that the protagonist liked both outcomes in Think stories, children found it difficult to accept that a character with a definite belief about an object or event had no concomitant desire for it. They thus attributed an unmentioned desire to the character as well.

Children's explanations are consistent with this interpretation. Their explanations (e.g., in answer to "Why was he happy?") were typically brief (e.g., "He got what he wanted"). Substantively, children either mentioned the outcome ("He got blue gum"), a desire (typically by using the term *want*: "He wanted it"), or a belief (typically via the term *think:* "He thought it would be blue"). Children were asked to explain four situations: the character's state of happiness for (1) Want and (2) Think stories and the character's state of surprise for (3) Want and (4) Think stories. In all four cases, mentioning the actual outcome was appropriate, and outcome explanations were common (46% of all explanations mentioned the outcome). Ignoring outcome explanations for the moment, if children understand the stories as intended then they should give desire explanations in situations 1 and 3 enumerated above and belief explanations in situations 2 and 4. Confirming these expectations, the ratio of desire to belief explanations was 16:1, 11:3, and 1:12 in situations 1, 3 and 4 respectively. However, the ratio of desire to belief explanations was 13:4 in situation 2. That is, for example, when asked to explain their happiness rating of Think story characters (situation 2), children explained that the character *wanted* the outcome. Such data confirm that children misinterpreted the Think stories as presenting both a belief and a desire (he thought it and he wanted it).

Individual data

Analyses of individual performances confirm that the mean data represent most subjects. For example, Want stories presented clear cases of either wanting or not wanting something coupled with getting or not getting it. In such situations, characters should be rated as either happy or unhappy but not neutral. On happiness ratings of Want stories, only 3 of 16 children ever rated a character as neutral (doing so for a total of four stories). In contrast, when rating the happiness of the characters in Think stories (who were said to like both outcomes), 10 of 16 children rated a character as neutral (doing so a total of 19 times). Similarly, discordant Think stories represent clear

cases of a character's expectation failing to be true; these stories should thus result in surprise. Only 4 of 16 subjects ever rated these stories as neutral in surprise (doing so for a total of five stories). In contrast, 9 of 16 subjects rated the discordant Want stories as neutral in surprise (doing so for a total of 14 stories).

The most compelling individual data concern children's ratings of the responses of the same protagonist, getting identical outcomes but differing in mental state. Recall that each child received one story pair of this sort (e.g., was asked to rate Jane's happiness at getting a puppy when Jane was said to want a puppy *and* again when Jane was said not to want a puppy). Eight children received same-protagonist, same-outcome, different-desire pairs; seven of the eight children appropriately rated these different-desire pairs as different in happiness (with one tie) – $p < .01$, sign test. Eight children received same-protagonist, same-outcome, different-belief pairs; six of the eight appropriately rated these different-belief pairs as different in surprise (with one tie and one reversal) – $p = .062$, sign test.

Adult data

Since children deviated from the predicted ideal pattern by rating Think stories as yielding happiness, we wished to determine if the ideal pattern captured adult performance. We tested 12 adults, students or employees at the university – six men and six women ($M = 26$ years old; range $= 20$ to 29).

Table 1 shows that for these adults concordant versus discordant Want stories (but not Think stories) were rated very differently with respect to happiness. Discordant versus concordant Think stories (but not Want stories) were rated very differently with respect to surprise. Thus, although children rated Think stories as if they specified a definite desire, adults did not do so. Confirming these conclusions, two 2(Concordance) × 2(Mental state) ANOVAs, one for surprise ratings and one for happiness ratings, yielded the expected Concordance × Mental state interactions – $F(1, 11) = 34.11, p < .001$, for happiness ratings and, $F(1, 11) = 24.27, p < .001$ for surprise ratings. Means for these interactions are shown in Table 1.

Discussion

Experiment 1 demonstrated a reasonable degree of facility by 4-year-olds with a specific sort of belief–desire reasoning, namely predicting belief-outcome versus desire-outcome reactions. False belief studies (e.g., Wimmer & Perner, 1983) have shown that 4-year-olds can predict actions, given (false) belief and desire information. The data from Experiment 1 extend the scope of these empirically demonstrated belief–desire reasoning abilities in 4-year-

olds. Namely, the data show that 4-year-olds can utilize belief–desire reasoning not only to predict characters' overt actions but also to predict characters' internal emotional reactions. Note that in our study children could not correctly predict the protagonists' reactions simply by linking certain emotions with certain outcomes (e.g., by always predicting happiness to result from generally positive events, such as getting a puppy). Correct responses required considering the actors' individuating beliefs and desires. Correct performance (e.g., judging that getting a puppy leads to happiness if it is wanted but unhappiness if it is not) also showed that young children clearly recognized that internal states such as beliefs and desires are independent of outcomes, that is, from reality. Beliefs are different from reality in that the same event or outcome will produce quite different emotional reactions depending on one's belief. The same reasoning applies to desires. Children's differential rating of beliefs and desires, with respect to happiness and surprise, further shows that children differentiated these two different sorts of internal psychological states.

Experiment 2

As noted in the introduction, the status of belief–desire reasoning in children younger than 4 years old is unclear and largely unstudied. To study such young children, we utilized a different paradigm than that in Experiment 1. While Experiment 1 yielded novel and significant information, there was a definite tendency for children to rate belief-outcome mismatches as relevant to happiness. Since adults did not show this tendency, it is possible that 4-year-olds do not properly or fully appreciate the distinction between beliefs and desires. Moreover, if this deficiency characterizes 4-year-olds some of the time, then it may wholly characterize the conception of still younger children. Thus, a crucial issue is whether younger children will understand that beliefs provide needed additional information, beyond desires, for the explanation of action. In Experiment 2, we examined whether 3- and 4-year-olds understand beliefs in this fashion.

A focus on belief is needed for several reasons. On the one hand, the false-belief research seems to target young children's misunderstanding or ignorance of belief as being crucial in their developing belief–desire abilities. Three-year-olds predict the actor will search where the object really is rather than where the actor (falsely) believes the object to be. This is a failure to understand the difference between belief and reality and the role of belief in causing action. On the other hand, a recent study by Stein and Levine (1986) already demonstrates that 3-year-olds understand some of the essential work-

ings of desire. Stein and Levine used tasks similar to the Want stories of our Experiment 1. They presented 3- and 6-year-olds with four story types. The stories presented all combinations of a protagonist's wanting and not wanting an object crossed with obtaining or not obtaining it. After hearing such stories (e.g., Jimmy wants a toy car and gets one), children were asked to say how the protagonist would feel (happy, sad, or angry). Stein and Levine's data straightforwardly show that even 3-year-olds (age range 3:1 to 4:7, $M = 3:9$) predict the reactions appropriate to the various desire-outcome eventualities. Namely, they understand that wanting and obtaining leads to happiness; not wanting and avoiding (not obtaining) leads to happiness; and wanting and not obtaining, or not wanting and obtaining, lead to sadness and anger. The data thus show that 3-year-olds understand some essential relations between desire and action.

What about belief? In Experiment 2, we assess whether very young children engage not just in desire reasoning but in belief–desire reasoning. We ask, when do children understand that beliefs are independent from desires in the sense that the exact same desire will lead to quite different actions depending on the actor's beliefs. That is, when do children understand that beliefs are a necessary addition to information about desire to explain an actor's actions? To answer this question, we utilized stories in which characters were presented as having desires *and* beliefs, but different beliefs were coupled with the same desire. Then we assessed children's ability to predict the actor's consequent actions, given the various belief–desire antecedents.

Method

Tasks

Each child was told stories depicting a character's desire and belief. The child was then asked to predict the action of the character. An example is: "Sam *wants* to find his puppy. His puppy might be hiding in the garage or under the porch. Sam *thinks* his puppy is under the porch. Where will Sam look for his puppy, in the garage or under the porch?" Sensible prediction of the character's action can result from utilizing the information about his belief coupled with information about his desire.

We call stories such as this *Standard Belief* tasks, as shown in Table 2. Unfortunately, children might make accurate predictions on this Standard Belief task without really knowing much about beliefs and desires. For example, suppose the child just responds by predicting the last location mentioned. Since the last thing he or she was told was that "Sam thinks the puppy is under the porch," the child simply answers "The porch." To control for this possibility, we utilized a second version, called *Not Belief* tasks (see Table

2). In Not Belief tasks, the child is told, for example, "Sam thinks his puppy is *not* in the garage." The correct prediction is therefore the unmentioned location (the porch).

Suppose, by chance, that the protagonist's belief – "Sam thinks his puppy is under the porch" – consistently coincides with the child's own belief (the child thinks puppies really hide under porches, not in garages). In that case, the child might be correct not by understanding the belief–desire causation of action but simply by predicting what she herself would do – "The puppy is lost, *I'd* look under the porch." To control for this possibility, we constructed a third version of the task, *Not Own Belief* tasks. In Not Own Belief tasks (see Table 2), the child was told that Sam wants to find his puppy and that the puppy might be in the garage or under the porch. At this point the child was asked, "Where do you think the puppy is?" After the child stated his or her belief, he or she was told that the protagonist had the opposite belief. Thus, when children said they thought the puppy was under the porch, they were told, "Well, that's a good guess, but Sam thinks the puppy is in the garage." Then the child was asked to predict where Sam would look for the puppy.

Not Own Belief tasks share some important features with false-belief tasks, although the two are not identical. Not Own Belief tasks resemble false-belief tasks in that there is a conflict between two beliefs, the child's own and another's; the child must ignore his or her stated belief and predict the other's action on the basis of the other's belief.

Finally, we employed a fourth version of such belief–desire tasks, *Changed Belief* tasks (see Table 2). Changed Belief tasks always followed an initial Standard Belief task. So, for example, first the child was told about Sam's desire and Sam's belief and predicted Sam's action (a Standard Belief task). Then, the child was told that, "Before Sam looks for his puppy, his mom

Table 2.   *Critical features and example stories for the tasks used in Experiments 2 and 3*

Task	Critical features	Example
Standard Belief	Desire: Character's desire explicitly mentioned. Belief: Character's belief explicitly mentioned. Target: Actual location of object unknown.	Sam wants to find his puppy. It might be hiding in the garage or under the porch. Sam thinks his puppy is under the porch. Where will Sam look for his puppy (garage or porch)?
Not Belief	Desire: Character's desire explicitly mentioned. Belief: Character's belief that object is *not* in one location is explicitly mentioned. Target: Actual location of object unknown	Sam wants to find his puppy. It might be hiding in the garage or under the porch. Sam thinks his puppy is *not* in the garage. Where will Sam look for his puppy?

Task	Critical features	Example
Not Own Belief	Desire: Character's desire explicitly mentioned. Belief: Subject's belief is first solicited, then character is attributed opposite belief. Target: Actual location of object unknown.	Sam wants to find his puppy. It might be hiding in the garage or under the porch. Where do *you* think Sam's puppy is? (e.g., under the porch). That's a good guess, but *Sam* thinks his puppy is in the garage. Where will Sam look for his puppy?
Changed Belief	Desire: Character's desire explicitly mentioned. Belief: Character has initial belief, but then changes to opposite belief. Target: Actual location of object unknown.	Sam wants to find his puppy. It might be hiding in the garage or under the porch. Sam thinks his puppy is under the porch. Where will Sam look for his puppy? *But*, before Sam can look for his puppy, Sam's mom comes out of the house. Sam's mom says she saw his puppy in the garage. So now Sam thinks his puppy is in the garage. Where will Sam look for his puppy?
Explicit False-Belief	Desire: Character's desire explicitly mentioned. Target: Object is said to really be in one location. Belief: Character is said to believe object is in other (wrong) location.	Jane wants to find her kitten. Jane's kitten is really in the playroom, Jane thinks her kitten is in the kitchen. Where will Jane look for her kitten? Where is the kitten really?
Inferred Belief	Desire: Character's desire explictly mentioned. Belief: No belief explicitly mentioned, but character is said to have previously seen target in one location not the other. Target: Actual location of object not known.	This is Jane. This morning Jane saw her magic markers in the desk, not on the shelf. Now Jane wants magic markers. Where will she look?
Inferred Belief control	Desire: Character's desire explicitly mentioned. Target: Subject sees that target objects are in *both* locations. Belief: No belief explicitly mentioned but character is said to have previously seen target in one location not other.	Look, there are magic markers in the desk *and* there are magic markers on the shelf. This morning Jane saw the magic markers on the shelf, not in the desk. Now Jane wants magic markers. Where will she look for magic markers? Are there magic markers in the (other location) too?
Discrepant Belief	Desire: Character's desire explicitly mentioned. Target: Subject sees that target objects are in *both* locations. Belief: Character is said to believe target is in one location not other.	Look, there are bananas in the cupboard and bananas in the refrigerator. Jane wants a banana. Jane thinks there are only bananas in the cupboard; she doesn't think there are bananas in the refrigerator. Where will Jane look for bananas? Are there bananas in the (other location) too?

comes out of the house. Sam's mom tells Sam she saw his puppy in the garage. So now, Sam thinks his puppy is in the garage" (the Changed Belief task). That is, Sam now has the opposite of his earlier belief and the child is asked again to predict where Sam will look for his puppy.

A correct response to such a Changed Belief task indicates that the child knows that beliefs can change and that the same desire coupled with two different beliefs leads to two different actions; this reflects the child's understanding of the independent contribution of belief as well as desire to the formulation of an action. Also, because Sam changes his initial belief before he looks for the dog, a correct response shows that the child appreciates that beliefs do not inevitably result in actions – the independence of belief from action and the independence of belief from desire.

Subjects

Thirty-two children from a university preschool participated; sixteen 3-year-olds (3:5 to 3:11, $M = 3:9$) and sixteen 4-year-olds (4:1 to 4:9, $M = 4:5$).

Materials and procedures

Children were presented with three instances of each of the four tasks – Standard, Not, Not Own, and Changed Belief tasks – for a total of 12 stories. Because Changed Belief tasks always followed a Standard Belief task, utilizing the same story protagonist and topic, children were essentially presented with three types of stories and three instances of each type. The nine stories involved a character wanting to find a puppy, to eat some raisins, to plant seeds, to buy candy, to give a toy, to play on outside play equipment, to make a tent, to build a dollhouse, to find a hat. The three instances of each general type were presented in a group, with the order of stories within the general type counterbalanced across subjects. The order of the three general types of stories was also counterbalanced with the constraint that the Changed Belief stories should never be presented first. (It seemed that to begin with changing beliefs might be unnecessarily confusing.) Altogether, then, each child was seen individually for one session during which the experimenter told nine stories (three of which included both a Standard Belief task as well as a Changed Belief task). During each story, the child was first shown a drawing of the protagonist's face, and then a drawing of both possible locations. The child responded either verbally or by pointing to a location.

Results

The top portion of Figure 3 depicts the design of the study and some of the relevant competing hypotheses. The upper left-hand graph indicates that if

Figure 3.   *Predicted and observed results for the conditions used in Experiment 2.*

Predicted Results

Observed Results
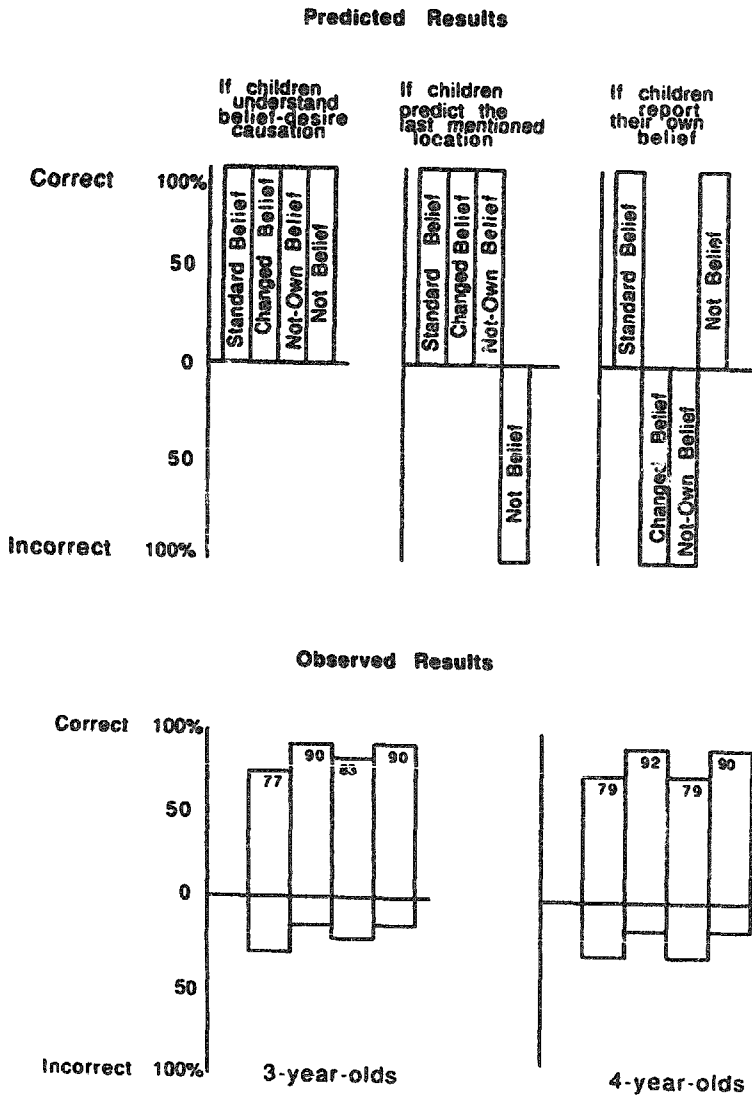
children understand this basic sort of belief–desire causation, then they should be uniformly correct across all versions of the task. Correct responding means the straightforward prediction in Standard Belief tasks, the unmentioned alternative in Not Belief tasks, the opposite of the child's own stated belief in Not Own Belief tasks, and the subsequent changed belief rather than the original belief in Changed Belief tasks.

The upper middle graph depicts expected results if children simply predict that the character will search the last mentioned possibility. In this case they would err consistently on Not Belief tasks. The upper right-hand graph depicts performance if children simply predict what they themselves would do *and* if their beliefs just happen to coincide with the belief attributed to the actor. In *this case children could be fortuitously correct on Standard and Not Belief tasks. However, if they are correct in this manner on a Standard Belief task, then they should be incorrect on the parallel Changed Belief task. And if they simply state what they would do, then they should be incorrect on the Not Own Belief tasks as well.

At the bottom of Figure 3, the actual data are shown. Three- and four-year-olds were consistently correct, averaging 85% and 89% correct, respectively. A 2 (Age) × 4 (Story version) ANOVA on proportion correct yielded no significant effects: 3- and 4-year-olds did not differ ($F < 1$) and correct responding was uniformly high on all stories – $F(3, 90) = 2.34$. Children's responding was also compared to chance. Because story version had no effect, we compared children's mean performance overall to a chance value of 50%, which represents random responding between two alternatives. Correct responding at both ages was significantly above chance – $ts(15) > 2.31$, $ps < .01$. Individually, children received three instances of each of the four story versions, and thus made a total of 12 responses. Nine correct responses out of twelve is significantly above chance ($p < .05$, one-tailed binomial test); twelve of sixteen 3-year-olds (75%) and thirteen of sixteen 4-year-olds (81%) performed at or above this level of consistency.

Young 3-year-olds

Three-year-olds performed well, but our sample was mostly older threes ($M = 3:9$). We therefore tested eight younger children, aged 2:9 to 3:6 ($M = 3:2$). These children averaged 84% correct. They were correct 67% of the time on the Standard Belief tasks, 92% on Not Belief tasks, 98% on Not Own Belief tasks, and 79% on Changed Belief tasks. Five of the eight children were correct on nine or more of their twelve questions ($p < .05$); the remaining three children were correct on eight of the twelve.

Discussion

Children's high level of performance speaks for itself – even 3-year-olds had little difficulty in predicting a character's action in accordance with the character's beliefs. Our stories presented characters who had definite desires, but desires which were consistent with both alternative actions. Only the character's beliefs determined which was the appropriate option. Correct responses thus revealed a conception of beliefs as independent from desires in the sense that beliefs are seen to provide needed information not available in information about desires.

It is important to emphasize the logic of our design. Four different belief–desire tasks were used. Taken singly, correct performance on any one task does not convincingly demonstrate belief–desire reasoning. That is, the individual tasks admit of alternate interpretations. Collectively, however, many alternate interpretations are ruled out by good performance on one version of the task or another. The uniformly good performance of 3- and 4-year-olds across all tasks is thus an important aspect of the data. The next experiment builds on this logic. Experiment 3 includes additional belief–desire tasks to further minimize the possibility that response strategies rather than belief–desire reasoning account for younger children's good performance.

Experiment 3

The data in Experiment 2 show impressive degrees of accuracy on belief–desire reasoning tasks, even among 3-year-olds. Such results are seemingly at odds with the established results from the traditional false-belief task. False-belief research suggests that children younger than 4 or $4\frac{1}{2}$ years old are consistently inaccurate at belief–desire reasoning in that they predict that an actor with a false belief will search for an object where it really is, not where the actor believes it to be. This is the opposite of what belief–desire reasoning should yield.

In Experiment 3, we attempt to clarify and reconcile these discrepant findings. One possibility, of course, is that there is no discrepancy – our 3-year-olds might be just especially advanced, more like Wimmer and Perner's (1983) 4-year-olds. If so, success on false-belief tasks and on our belief–desire tasks may actually develop concurrently. To address this, we tested the same children on both sorts of tasks.

Two further possibilities are that (1) false-belief tasks are unnecessarily difficult, or that (2) our tasks are spuriously easy. With regard to the former, note that, in contrast to our tasks, on Wimmer and Perner's (1983) false-belief task the child is never told the protagonist's belief, for example, "Sam thinks

his dog is in the garage." Instead, the child must infer the protagonist's belief. The child knows that the character saw the object hidden in Location 1 and did not see it moved to Location 2. From this, the child must infer that the character believes the object is still in Location 1. Perhaps this inferred-belief requirement makes the traditional false-belief task relatively difficult. Indeed, Wimmer (Wimmer, Hogrefe, & Sodian, in press) now suggests that this is the essence of young children's difficulty. If so, a false-belief task with no inference requirement, where the subject is simply told that the protagonist believes (wrongly) that the object is at Location 1, should be mastered earlier, as are our tasks.

It is also possible that our belief–desire tasks allowed children to respond correctly without understanding belief. Suppose, for example, that the young child has no conception of belief and hence does not really understand belief statements ("Sam believes his dog is in the garage"). Instead, children might simply attempt to determine the real state of affairs and then, knowing the actor's desire, predict the actor will act to fulfill his desire. We will call this a reality assessment strategy. One specific version of a reality assessment strategy might be as follows: First, the child might simply translate belief statements into reality statements: "Sam believes his dog is in the garage" becomes "Sam's dog is in the garage." Second, the child would reason: "Sam wants his dog; it's in the garage, so Sam will look in the garage." If children engage in this sort of reality assessment reasoning, then they could be correct, for example, on our Standard Belief tasks in Experiment 2. Similarly, if asked to predict a protagonist's action in a false-belief task, the child using reality assessment would simply determine what is really so (where the object really is), then couple that with his understanding of the protagonist's desire: "He wants the object, it's really in Location 2, so he will look in Location 2." Additionally, in our Not Own Belief tasks the child might have interpreted the statement "That's a good guess but Sam thinks ..." to be a statement as to what is really true, rather than merely a description of Sam's belief. In fact, Perner (in press) has suggested that a version of a reality assessment strategy accounts for early success on our Not Own Belief tasks. Therefore, we included a new condition in Experiment 3 to control for the use of reality assessment strategies (the Inferred Belief control task).

Method

Tasks
Four task types were used. *Not Own Belief* stories were just like those used in Experiment 2 (see Table 2). For example: "Jane wants to find her kitten. Where do *you* think the kitten is, in the playroom or in the kitchen? Well,

that's a good guess, but Jane thinks the kitten is in the (opposite location). Where will Jane look for the kitten?" In order to provide false-belief tasks as comparable as possible to these Not Own Belief tasks, we constructed simplified versions called *Explicit False-Belief* tasks. In these tasks (see Table 2) children did not have to infer the protagonist's false-belief but were told it directly. For example: "Jane's kitten is really in the playroom, but Jane thinks the kitten is in the kitchen. Where will Jane look for her kitten?" Explicit False-Belief tasks of this sort should prove easy if children's difficulty in the traditional task is that it requires inference of belief.

To test directly whether young children find inference of belief difficult, we included stories requiring an inference of belief from the protagonist's perceptual access to the relevant situation – *Inferred Belief* tasks (see Table 2). Here, correct prediction of action requires attributing an inferred belief to the protagonist. For example: "This morning Jane saw her magic markers in the desk, not on the shelf. Now she wants magic markers. Where will she look?"

A final type of task was included to determine whether children were making their predictions on the basis of the protagonist's beliefs, or via a reality assessment strategy. A reality assessment strategy seemed most viable on the Inferred Belief task, so we devised *Inferred Belief control* tasks (see Table 2). On these tasks, the stories told of identical objects hidden in each of two locations. The protagonist was said to have seen only one of these objects earlier. For example: "There are magic markers in the desk *and* there are magic markers on the shelf. This morning Jane saw the magic markers in the desk, but she did not see the magic markers on the shelf. Now Jane wants magic markers. Where will she look for magic markers?" Children were also asked whether the desired object was in the other location ("Are there magic markers in the desk, too?"), to insure that they remembered all the information correctly. If children use only a reality assessment strategy (assessing where the target really is and predicting the actor will fulfill his or her desire), then they should be equally likely to answer that the protagonist would look in either place, or specify both locations, since both really contain the desired item.

Subjects

Forty children from the same preschool as in Experiment 1 participated: sixteen 3-year-olds (range 3:0 to 3:11, $M = 3:7$) and twenty-four 4-year-olds (range 4:0 to 5:0, $M = 4:6$). Because earlier studies suggest that younger and older 4-year-olds often perform differently on false-belief tasks, the 4-year-olds were divided into thirteen 4-year-olds (range 4:0 to 4:6, $M = 4:3$) and eleven 4½-year-olds (range 4:7 to 5:0, $M = 4:9$).

Materials and procedures

Each child was tested individually in a single session. The experimenter presented two instances of each of the four task types (Explicit False-Belief, Not Own Belief, Inferred Belief, and Inferred Belief control). The two stories of each type were always juxtaposed, but the four types were presented in counterbalanced orders across each age group. Each of the eight stories concerned a different protagonist, desired object, and locations, and these topics were approximately counterbalanced over the types of stories.

Within each type of story, certain procedural controls were instituted. Within the Explicit False-Belief stories, the order of the belief information (e.g., Sam thinks the puppy is in the garage) and the reality information (e.g., the puppy is really on the porch) was counterbalanced, as was the order of the two questions ("Where will he or she look?" and "Where is it really?"). In the Inferred Belief stories, the order of the two phrases (e.g., "saw the kitten in the playroom and not in the kitchen") was alternated (e.g., "didn't see the kitten in the playroom but saw the kitten in the kitchen"). In the Inferred Belief control stories, the same precaution was taken, in addition to an alternation of the order of the two questions ("Where will he or she look?" and "Is there a kitten in the kitchen, too?").[1] The Not Own Belief stories required no further controls.

Each story was accompanied by two drawings, first a picture of a child's face ("This is Jane"), then a picture of the two locations, drawn in such a way that the object might be in the location, even though it could not be seen.

Results

Figure 4 presents the proportion of correct responding for 3-, 4-, and 4$\frac{1}{2}$-year-olds. To be correct, children had to predict the location appropriate to the character's belief. In addition, on Inferred Belief control tasks they had to correctly assert that there were items in *both* locations, and on Explicit False-Belief tasks they had to assert that the item was really in its correct location. A 3(Age) $\times$ 4(Story type) ANOVA on these data yielded main effects of age and story type subsumed under an Age $\times$ Story type interaction – $F(6, 111)$ = 2.78, $p < .02$. Simple effects of age for each of the four story types indicated that only performance on the Explicit False-Belief task changed with age – $F(2, 37) = 12.75$, $p < .01$. (While ceiling effects are apparent in these data, the following nonparametric analyses circumvent this problem.)

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[1]The other order involved first asking, "Is there a kitten in the playroom?" (or wherever the protagonist had *not* seen the kitten), repeating the information about the character's perception, e.g., "But this morning Jane saw the kitten in the kitchen, and she did not see the kitten in the playroom," and then asking, "Where will s/he look?"

Figure 4.   *Percentage of correct responses given to the conditions used in Experiment 3.*

Observed Results
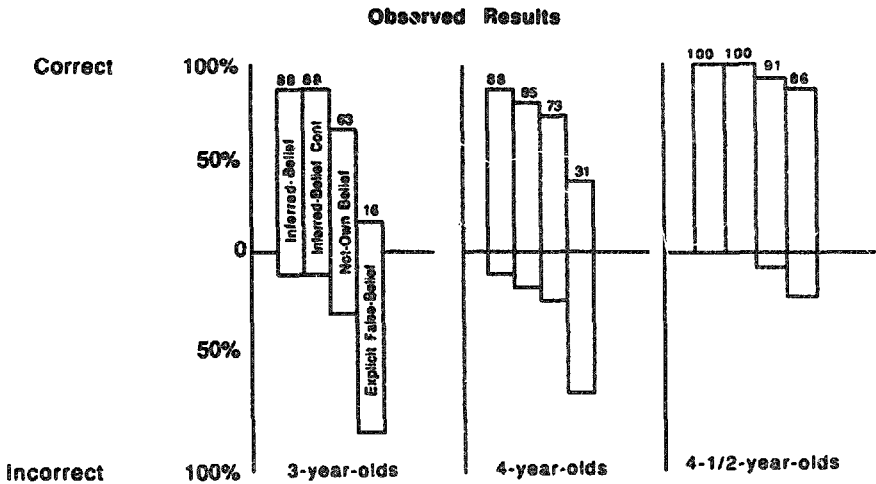
We were especially interested in whether the two versions of the Inferred Belief task were equivalent. If the Inferred Belief control task is even marginally more difficult, then some sort of reality assessment strategy might be at work here and, possibly, in Experiment 2. Three-year-olds were 88% correct on the Inferred Belief task and 88% correct on the Inferred Belief control version. Four-year-olds were 94% and 92% correct, respectively. Because each child got two instances of each type of task, scores could range from 0–2. Children could be consistent (2–2, 1–1, 0–0), one-off (2–1, 1–0), or inconsistent (2–0) in their responses to the two stories. Performance on the two tasks was virtually identical: Of the 40 children, 31 were consistent, 9 one-off, and none inconsistent. The nine one-off children were six 3- and three 4-year olds.

Performance on the Inferred Belief and Not Own Belief tasks did not significantly differ. If being correct on both of the two instances of each story type is considered a passing score, then 13 children passed the Inferred Belief control tasks, but failed Not Own Belief tasks, whereas six children showed the reverse pattern – nonsignificant, McNemar's χ^2.

Finally, we were interested in the direct comparability of Not Own Belief and Explicit False-Belief tasks. If being correct on both of the two instances of each story type is considered passing, then 13 children passed Not Own Belief tasks while failing Explicit False-Belief tasks and only one child showed the reverse pattern – McNemar's $\chi^2 (1) = 8.64, p < .01$. When children failed

the Explicit False-Belief stories, it was rarely because they failed the control question; 92% of the time they failed by asserting that the character would look for the item in its actual location.

As in Experiment 2, a chance level of 50% is appropriate. Collectively, performance on the Inferred Belief, Inferred Belief control, and Not Own Belief tasks (which did not differ from one another) differed from chance for 3- (M = 79%), 4- (M = 82%) and 5-year-olds (M = 97%) – ts > 7.27, ps < .000. Individually, children received six different stories of these three types. Responding to five of six correctly is significantly above chance (p < .05, one-tailed). Ten of sixteen 3-year-olds (63%), nine of thirteen 4-year-olds (69%), and ten of eleven 4½-year-olds (91%) performed at or above this level of consistency. Performance on the Explicit False-Belief tasks was significantly below chance for 3-year-olds – t = −4.57, p < .001 – significantly above chance for 4½-year-olds – t = 3.73, p < .005 – and did not differ from chance for the younger 4-year-olds.

Discrepant belief tasks

An especially troubling theoretical possibility is that young children might use reality assessment strategies to reason about tasks such as ours. We therefore tested 3-year-olds on additional tasks designed to control for this possibility. These tasks, *Discrepant Belief* tasks (see Table 2), were like the Standard Belief tasks of Experiment 2 in that they required children to predict the character's action from a stated desire ("She wants bananas") and a stated belief ("She thinks bananas are in the cupboard"). As in Inferred Belief control tasks, however, there were actually bananas in both locations and the subject knew this. Use of a reality assessment strategy should lead to predicting that the character would search either location or both (since bananas are really in both). An understanding of belief should lead to the single correct prediction.

Discrepant Belief tasks also parallel Not Own Belief tasks in several important regards. In a Discrepant Belief task, like a Not Own Belief task, the child subject has his or her own belief – in this case, the correct belief that bananas are in both places. The story character, however, has a different belief – in this case, that there are bananas only in the cupboard. To be correct the child must predict the character's action on the basis of the character's belief, not on the basis of the child's own belief. In Experiment 2, three-year-olds averaged 83% correct on Not Own Belief tasks; in Experiment 3 this fell to 63%. While these percentages did not differ significantly from each other, we wished to more firmly demonstrate that 3-year-olds are largely correct on problems where there is a discrepancy between one's own

and the other's beliefs. Testing 3-year-olds on Discrepant Belief tasks serves this purpose and also provides data on a more controlled Not Own Belief type of task. On this task children could not simply misconstrue the belief statement (e.g., "Jane thinks bananas are only in the cupboard") to be a reality statement ("Bananas are only in the cupboard"), because they know for certain that target objects are in both locations.

Fifteen 3-year-olds (3:2 to 4:0, M = 3:9) from the same preschool used in the prior studies participated. Each child was given three instances of a Discrepant Belief task. For example, in one instance the child subject was shown drawings of a cupboard and a refrigerator with paper flap doors. The child was told "Look, there are bananas in the cupboard" (the experimenter opened the cupboard to show the bananas) "and there are bananas in the refrigerator" (the experimenter opened the refrigerator). Both doors were shut and then the child was shown a picture of a story character and told, "This is Jane. Jane wants a banana. Jane thinks there are only bananas in the cupboard; she doesn't think there are bananas in the refrigerator. Where will Jane look for a banana?" After the child answered this question he or she was asked, "Are there bananas in the refrigerator too?"

The three different story instances involved a character looking for a banana, for mittens, or for magic markers. Across children, the location believed correct by the character was counterbalanced (e.g., thinks bananas are in cupboard vs. thinks bananas are in refrigerator). In each story the belief statement had two parts; the character, for example, (1) thinks there are only bananas in the cupboard and (2) doesn't think there are any bananas in the refrigerator. The order of mention of these "thinks" and "doesn't think" statements was counterbalanced across stories and children, so that each appeared equally often in last (and first) place. Thus children could not be correct simply by predicting the last mentioned location.

Three-year-olds were 82% correct on these Discrepant Belief tasks – where "correct" means predicting the actor's behavior on the basis of the actor's belief. This level of performance was significantly higher than a chance performance of 50% correct – t (14) = 4.49, p < .001. All correct predictions were followed by correct answers on the control question designed to ensure that subjects knew that the target objects were really in both locations (e.g., "Are there bananas in the opposite location too?"). Nine of fifteen children (60%) were correct on three of three Discrepant Belief tasks; five of the remaining children were correct on two of three, and one was incorrect on all three.

Discussion

There are two primary findings. First, Inferred Belief tasks, Not Own Belief tasks, and Discrepant Belief tasks yielded comparable and high performance in 3-year-olds. Thus, the Inferred Belief and Discrepant Belief tasks take their place with Not Own Belief tasks, and the Standard, Not, and Changed Belief tasks of Experiment 2, as part of the package of belief–desire reasoning tasks solved by quite young children. Consistently high performance across all these tasks provides an interlocking variety of controls against alternate interpretations. An important addition to these controls is provided by the Inferred Belief control and the Discrepant Belief tasks of the present experiment. Consistently correct performance on those tasks would not be possible if children were using a reality assessment strategy instead of reasoning about beliefs.

The Inferred Belief tasks also provide a substantive addition to the tasks used in Experiment 2. Correct performance on Inferred Belief tasks show that 3-year-olds' belief–desire reasoning abilities extend beyond situations in which the actor's beliefs are explicitly stated. In our Inferred Belief tasks, subjects were not told the protagonists' beliefs (e.g., "He thinks ...") but had to infer them. How could subjects make this inference? Presumably they did so by using something like the scheme in Figure 1, that is, by knowing something of the influence of perception on belief and thus inferring belief from the actor's perceptual input. Our Inferred Belief tasks were so simple that correct responses to them do not warrant crediting young children with much knowledge about, or much facility regarding, the derivation of beliefs from perceptions. Nonetheless, they do indicate a nascent ability of this sort, something like the understanding that seeing leads to believing and not seeing leads to ignorance (Taylor, 1988).

The second primary result is that, in spite of 3-year-olds' demonstrable belief–desire reasoning skills, such children still fail false-belief tasks. Note that our Explicit False-Belief tasks were especially simple ones in which subjects were straightforwardly told of the protagonist's belief ("Sam thinks ..."). In spite of this, 3- and many young 4-year-olds predicted the actor would look where the target really was, not where it was believed to be.

Consistently incorrect performance on Explicit False-Belief tasks brings with it an additional important control. It is conceivable, albeit unlikely, that in tasks such as ours young children misconstrue "think" statements as action statements. That is, a statement such as, "Sam thinks his dog is in the garage" could be mistranslated into something like "Sam will look in the garage," a mental verb simplistically being interpreted as an action verb. If children engaged in such mistranslation, they could be correct on many of our tasks, because the subject is told "Sam thinks ... ." However, 3-year-olds' consistent

failure on our Explicit False-Belief tasks rules out this possibility. On these tasks, young children heard that "Sam thinks an object is at Location 1," but they consistently predicted that Sam would look at Location 2. These results also rule out related alternatives, such as the possibility that belief terms are just translated into desire terms (e.g., "Sam thinks the dog is in the garage" becomes "Sam wants to go to the garage"). Prior research on children's understanding of mental terms suggests that even 2½- and 3-year-olds do not mistranslate mental verbs such as *think* into action verbs or into verbs of desire (Bretherton & Beeghley, 1982; Shatz, Wellman, & Silber, 1983). Still, the Explicit False-Belief tasks convincingly and directly rule out this alternate interpretation of our results.

Originally, Wimmer and Perner (1983) contended that the essential difficulty of false-belief tasks was that they require consideration of contradictory beliefs. More recently, Flavell (Flavell, Green, & Flavell, 1986) and Gopnik and Astington (1988) have suggested something similar: namely that young children are unable to entertain alternative beliefs or representations of the same object or state of affairs. That is, young children will fail on tasks where they must simultaneously consider two different representations (in the case of false beliefs, the child's own belief as to the object's location, and the protagonist's conflicting belief). However, in an important sense, our Not Own Belief, Discrepant Belief, and Inferred Belief control tasks require consideration of two contradictory beliefs as well – the child believes the object is in Location 1 or in both locations, the protagonist believes it is in Location 2, and the protagonist's action must be predicted on the basis of his or her belief, not the child's. Thus, in several of our tasks the child's own beliefs are discrepant with, if not actually contradictory to, the character's beliefs. In fact, this seems a critical aspect of an understanding of belief – that different people can have different beliefs (and this in part accounts for why they engage in different actions). Our data suggest that this is a part of the conception of belief well within the grasp of 3-year-olds.

General discussion

We begin by evaluating three hypotheses about young children's belief–desire reasoning: one suggested by Perner, one by Wimmer, and our own. In a recent paper, Perner (in press) provides some provocative analyses of how young children might solve belief–desire reasoning tasks without a conception of belief. In places, Perner seems willing to grant 3-year-olds a primitive conception of belief; nevertheless, he also asserts that 3-year-olds do not really conceive of beliefs as genuine mental states distinct from desires. In

any event, he poses some alternative explanations which could possibly account for our results without resorting to a construct such as belief.

A clear example of how 3-year-olds might operate without a conception of belief can be derived from Perner's analysis of how 3-year-olds might solve our Not Own Belief tasks (Perner, in press). In this analysis, Perner acknowledges (as would we) that 3-year-olds themselves have beliefs, that is, they have their own knowledge and understanding of various real situations. Indeed, 3-year-olds often predict others' actions by simply considering the real external situation (as coded in their own knowledge of the situation). When asked where Sam will look for an object, they report their own knowledge of where the object is. In our terms, this constitutes use of a reality assessment strategy. However, 3-year-olds are at times ignorant, that is, they may not themselves know what is really so. Indeed, on our Not Own Belief tasks they do not know where the target really is. In such cases, Perner contends, they could simply employ an interesting default strategy. When reality assessment fails, 3-year-olds could search their own knowledge for any association between the protagonist and one of the alternatives. Since the story statement "Sam thinks the object is at Location 1" associates Sam with "object at Location 1" (and not with "object at Location 2"), the child predicts Sam will look at Location 1 (not 2). There are three essential parts to this analysis: (1) employment of a reality assessment strategy, (2) employment of an "associational" strategy, and (3) prioritizing (1) over (2).

The associational strategy deserves some elaboration because it is an intriguing alternative to crediting 3-year-olds with a genuine understanding of belief. Perner is vague in his description of how young children might associate characters and alternatives, but one important possibility is that a child simply forms an uninterpreted link between character and situation, a nonspecific association between the two. Sam is connected with "object at Location 1" in the child's mind, Bill could be connected with "object at Location 2." Clearly, 3-year-olds could use belief statements from an adult to construct such nonspecific associational links: The statement "Sam thinks the object is at Location 1" could simply link Sam with "object at Location 1" for the young child in a general and nonspecific manner. Thus, younger children may not understand that Sam *believes* (or knows, thinks, guesses, etc.) that "the object is at Location 1" or "at Location 2"; rather, belief statements (among others) may just connect Sam with one of the alternatives.

Note that such an associational strategy alone cannot account for 3-year-olds' performance. Most clearly, in false-belief tasks the character is associated with the *false* alternative, "object at Location 1" (when the object is really at Location 2), but 3-year-olds predict that the character will look at Location 2. Our own Explicit False-Belief tasks provide the clearest example

of this to date. The object is at Location 2 but the character is associated *only* with Location 1 (via the "He thinks it is at Location 1" statement). In this situation, 3-year-olds do *not* predict on the basis of the character's "association."

For these reasons, Perner proposes that 3-year-olds' strategies are prioritized: Their first priority is use of a reality assessment strategy, but if that cannot be used (e.g., if reality is unknown), then "the next best strategy" is to look for any association between the character and the locations (the associational strategy).[2] Note that such a prioritized list of strategies could yield the observed incorrect answers on false-belief tasks coupled with correct answers on Not Own Belief tasks; this was the specific pattern of results that Perner considered. However, such a proposal cannot account for the larger pattern of results we present. It is especially inconsistent with 3-year-olds' correct answers on the Inferred Belief control and Discrepant Belief tasks. In these tasks, if 3-year-olds' first priority is a reality assessment strategy, as Perner proposes, they should use that strategy to predict the actor's action (because really there are items in both locations and the child knows this). But 3-year-olds do not predict that the character will look in both locations or in either location without preference. Instead, they *correctly* predict the character will search in accordance with his belief.

We have dwelt on the above possibility because it represents a class of proposals to the effect that 3-year-olds can succeed on our tasks without a conception of belief, and because it is an especially powerful and intriguing instance of its class. However, 3-year-olds' consistently correct performance on Not Belief, Not Own Belief, Changed Belief, Standard Belief, Inferred Belief control and Discrepant Belief tasks is inconsistent with this class of proposals and with this specific proposal. Response strategies, such as basing one's choice on the location last mentioned or first mentioned or such as simply translating belief terms ("think") into action meanings ("will look") or desire meanings ("wants to go to"), cannot produce consistently good responses. And more intriguing possibilities – such as predicting on the basis of (1) one's own stated belief, (2) a reality assessment strategy, (3) an uninterpreted association between the character and an alternative, or even (4) a prioritized list of such strategies – cannot produce the observed patterns of response. It remains logically possible that 3-year-olds' consistently correct

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[2]Perner says, "... children's task is to predict where Mary [the character] will go in the actual world and so the most obvious search for Mary's destination would be the knowledge base, which reflects the *external* [italics added] situation. However, in the knowledge base there is no record about the ice cream van's [the object's] location. ... The next best strategy is to consult Mary's belief," that is, to search for any association between the character and the alternative (Perner, in press, p. 23).

performance on this list of tasks might coincidentally result from a concatenation of differing response strategies fortuitously appearing on just the right task versions and not others. However, this is extremely improbable; the simpler but impressive conclusion that young children understand belief within a sensible belief–desire reasoning scheme is compelling.

This is our position. Three-year-olds construe human action in terms of a concept of belief as an internal mental state as do adults. Three-year-olds do not conceive of people as simply being nonspecifically associated with propositional content: Sam is associated with "object at Location 1." Instead, they conceive of people as thinking and not-thinking, knowing and not-knowing, desiring and not-desiring certain alternative states. The current data show, we contend, that 3-year-olds know that such mental states are the causes of overt actions, viewed within the larger context of a rudimentary belief–desire reasoning scheme. Considering 3-year-olds' overall performance, the conclusion that they are mentalistic belief–desire psychologists is compelling. Against the background of their successes, the fact that 3-year-olds fail to correctly solve false-belief tasks remains an interesting finding but not a criterial deficiency. False-belief errors suggest that young children have yet to master an interesting complication in belief–desire reasoning rather than that they fail to engage in such mentalistic reasoning at all.

Why do 3-year-olds fail false-belief tasks? We hypothesize that, from the perspective of the 3-year-old, false-belief tasks present a conflict between desire reasoning (Sam wants the object and it is at Location 2: Sam will look at Location 2) and belief reasoning (Sam believes the object is at Location 1: Sam will look at Location 1). In such situations, 3-year-olds predict on the basis of desire. They do so not because they have no conception of belief but because for them belief and desire are in conflict and they weight desire over belief in arriving at a prediction. They have something like a "when in conflict, predict via desire" rule.

When there is no such conflict, however, then belief is easily included in their reasoning. Examples of their ability to include belief occur in our Inferred Belief control and Discrepant Belief tasks. In those tasks, while reality (desired objects are located at Location 1 and 2) is discrepant from belief (the character believes the objects are only at Location 1), there is no direct contradiction between reality and belief. Hence, there is no conflict between belief and desire reasoning, beliefs augment or focus desires. In those circumstances, therefore, 3-year-olds consider and appropriately incorporate belief information. Similarly, in our Not Own Belief task, even if the child him or herself thinks the object is at Location 1, he or she can predict the character's action on the basis of the character's belief (the character thinks it is at Location 2), because the child does not know where the object really

is. Given that ignorance, there is no contradiction between desires and beliefs to contend with, and belief information simply and appropriately augments the desire information (he wants the object, he thinks it's at 1: he'll look at 1).

Of course, from the adult perspective (and apparently that of 4½-year-olds as well) there is no real conflict between belief and desire in the situations we have used; actions that are motivated by one's desires are always channeled through one's relevant beliefs. Beliefs do not *contradict* desires, even though belief can lead one to engage in certain acts which result in *unfulfilled* desires. Indeed, older children understand that mistaken beliefs are an especially important way in which a character may fail to get what he wants (e.g., by acting ineffectively on the basis of a false belief). Three-year-olds, while understanding much about belief, do not fully appreciate this fact.

In saying that 3-year-olds understand beliefs, we do not wish to attribute to them a notion that is as articulated or as developed as an adult's conception. However, we do wish to claim that 3-year-olds' conception contains two essential features. First, they conceive of beliefs as intentional entities in Brentano's (1874/1973) sense. That is, they know that to have a belief is to have a mental state that is "about" an external state of affairs. This itself involves some understanding of mental states, real states or situations, and that a mental state can be in a relation of aboutness or correspondence to a real state. Both beliefs and desires are intentional in this sense, thus we claim further that 3-year-olds understand beliefs as being distinctively different from desires. Roughly, to have a desire is to have a disposition toward an object or state (and thus desires can affect reactions such as happiness). However, to have a belief is to have a conviction about a state of affairs (and thus beliefs can determine reactions such as surprise). The distinction between beliefs and desires, that is, between intentional states which are dispositions versus convictions, is a crucial one. We believe that 3-year-olds grasp this distinction, because on our tasks they predict that a character with a single desire will engage in different acts depending on his or her conviction about the relevant state of affairs. In addition, they judge that a character equally disposed to several options (e.g., wanting magic markers, which reside in both a cupboard and a drawer) will execute a single more specific act given a specific conviction (e.g., a belief that markers are only in the drawer). We do not as yet know the full extent of 3-year-olds' understanding of mental states of conviction, or to what extent their early notions must change to become more adult-like (but see suggestions in Flavell, in press; Perner, in press; Wellman, in press). Nevertheless, our position is that such young children possess a sensible, familiar, and important conception of belief, if not a fully developed one.

Our estimation of 3-year-olds' belief–desire reasoning abilities is also at

odds with Wimmer's latest position. In his latest proposals, Wimmer (Wimmer et al., in press) concedes that 3-year-olds can conceive of beliefs and hence can predict action on the basis of the actor's belief. However, such an ability is seriously constrained, according to Wimmer, by 3-year-olds, inability to understand that beliefs arise from (among other things) perceptual experiences in the world. Thus 3-year-olds may well be able to solve tasks such as our Standard, Not Own and Changed Belief tasks, because those tasks explicitly specify the character's belief in statements such as "Sam *thinks* the dog is in the garage." However, 3-year-olds still fail traditional false-belief tasks, because in the traditional task the actor's belief ("the chocolate is in the kitchen") is never stated and must be inferred from knowledge of the character's perceptual experience ("he saw the chocolate in the kitchen"). Wimmer, Hogrefe, and Perner (1988) show that 3-year-olds will deny that a person who has seen the contents of a container "knows" the contents.

Our data contradict this hypothesis in two ways. First, if difficulties with inferring belief are what account for young children's failure on traditional false-belief tasks, then 3-year-olds should succeed on our Explicit False-Belief tasks. They do not. Second, if 3-year-olds are unable to infer knowledge from perceptual access, then they should fail our Inferred Belief tasks. Yet they pass such tasks with ease. The Inferred Belief control task is particularly convincing here, because children know there are items in both locations but predict Sam's action solely on the basis of Sam's perceptual access.

Recent findings by Pillow (in press) also contradict Wimmer's position. In one of Pillow's studies, 3-year-olds were questioned about their own and a puppet's ability to see a hidden object. Three-year-olds attributed knowledge and perceptual experience to the person (either themselves or the puppet) who had viewed the hidden object, but not to the person who did not view it. In a second study, 3-year-olds were asked to indicate which of two puppets, one who had viewed a hidden object and one who had not, would be able to tell them the object's color. Children chose the correct puppet significantly more often than chance.

It is not clear what procedural differences account for the differences between ours and Pillow's versus Wimmer's results. Nonetheless it seems clear that 3-year-olds' belief–desire reasoning abilities include a nascent understanding of the role that perceptual input can play in forming one's beliefs. Our position therefore is that by 3 years of age children possess most if not all of the pieces of the reasoning scheme in Figure 1. Specifically, (1) they can appropriately predict actions, given information as to the actor's beliefs and desires. In doing so (2) they see beliefs as an importantly separate construct from desires. (3) They can appropriately infer the presence or absence of belief, given information as to the character's seeing or not seeing a rele-

vant situation, *and* they use that inferred belief to appropriately predict action. (4) They will appropriately predict the proper emotional reaction, given the concordance or discordance of the actor's desires and the resulting outcomes (Stein & Levine, 1986). While the data needed to test 3-year-olds' competence at all the sorts of reasoning encompassed by Figure 1 is not currently available, there is sufficient evidence to claim that 3-year-olds operate with a conception of belief very much like the familiar adult one, embedded within a larger belief–desire reasoning scheme recognizably like the one depicted in Figure 1.

Early achievement of a belief–desire psychology is not to be overestimated – very young children still have some trouble sorting out the respective roles of beliefs and desires. Indeed, they have much to learn about the mind, which forms and holds beliefs, and they probably have important realizations yet to achieve about the nature of belief. Nonetheless, this accomplishment is not to be underestimated. That 3-year-olds have and utilize a mentalistic conception of belief is an impressive and important achievement. It means that their view of human behavior and thought is not unlike our own, that is, it is appropriately mentalistic, causal and generative. And the acquisition of even a simple conception of belief is certainly a great step toward a naive adult belief–desire psychology and the ability to solve the full range of belief–desire reasoning problems, including false-belief problems.

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Résumé

Nous présentons trois études de la compréhension des termes de croyance par les jeunes enfants, c'est à dire, leur connaissance sur les attitudes mentales comme penser, savoir et deviner. Les résultats montrent que même de très jeunes enfants, agés de trois ans, comprennent les croyances en tant qu'états mentaux internes différents des désirs, mais joints aux désirs dans un schéma plus large de désir-croyance. Ces jeunes enfants peuvent prédire les actions de façon appropriée étant donné des informations concernant les désirs et croyances d'un individu, comprendre que l'information à propos des croyances est un ajout nécessaire à l'information sur les désirs pour prédire et expliquer des actions; ils peuvent également inférer de façon appropriée la présence ou l'absence de croyances étant donné le fait qu'un individu voit ou ne peut pas voir une situation pertinente, et prédire la réaction émotionnelle apropriée au résultat d'une action causée par des désirs/ croyances. Les résultats sont replacés à l'intérieur d'une description plus large de la psychologie naïve et mentaliste des jeunes enfants.