Understanding representation entails the recognition that objects and events in the world can be represented in multiple and possibly contradictory ways (Flavell, Green, & Flavell, 1986). The understanding that beliefs (mental representations) are not direct copies of the world, and thus can be false, has been shown to emerge at age 4 years (Astington, Harris, & Olson, 1988; Perner, 1991; Perner, Leckam, & Wimmer, 1987). Children under 4 years old fail false-belief tests and thus seem unable to hold in mind at once a representation of reality and a representation of someone's false belief.

Related to an understanding of the distinction between reality and a false belief is an understanding of the distinction between reality and a misleading appearance. In an appearance–reality test, children are shown an object that looks like one thing but is really something else (e.g., a sponge that looks like a rock; Flavell, Flavell, & Green, 1983; Flavell et al., 1986). Children are asked, “What does it look like?” (the appearance question) and “What is it really?” (the reality question). Children under 4 years are prone to realism errors; Once they discover (by touch) that it really is a sponge, they say that it not only is a sponge but also looks like a sponge. Attempts at simplifying the task (Flavell, Green, Wahl, & Flavell, 1987) and training the distinction (Flavell et al., 1986, Experiment 3; Taylor & Hort, 1990) have proved largely unsuccessful. (For other studies demonstrating young children’s difficulties on appearance–reality tasks, see DeVries, 1969; Flavell, 1985, 1992; Flavell, Flavell, & Green, 1987, 1989; Flavell, Green, & Flavell, 1990; Flavell et al., 1987; Flavell, Lindberg, Green, & Flavell, 1992; Flavell, Zhang, Zou, Dong, & Qi, 1983; Gopnik & Astington, 1988; Taylor & Hort, 1990; Wooley & Wellman, 1990)

We explore two possible reasons why 3-year-olds fail appearance–reality tasks. Children may fail because of a correspondence bias: They may assume that representations correspond to the way the object really is (or the way they think the object really is). Children may also fail because of an information processing limitation: They may not be able to hold in mind two conflicting object identities at the same time.

Correspondence Bias

Flavell et al. (1986) argued that children fail appearance–reality tasks because they form only one representation of an object. This avoidance of dual coding is a manifestation of an inability to understand that people can have conflicting representations of an external reality.

This explanation is wholly consistent with what we and others refer to as a correspondence bias (Fodor, 1992; Mitchell & Lacohee, 1991; Moses, 1993; Sullivan & Winner, 1993; Zaitchik, 1991). Although the term reality bias might seem like a better term to use, we use the term correspondence bias because we argue that children’s single representations of objects correspond to the properties of the object that are most salient to them. If the object’s reality is most salient, their representation will correspond with the object’s real identity. If the object’s appearance is most salient, their representation will correspond to the object’s misleading appearance. Flavell et al. (1986, p.
they often succeed on such tasks when the object's real and apparent identities are separated and shown at the same time. For example, in a color appearance–reality task, one can show an object partially behind a color filter: The child can see both the object's real color (the part not behind the filter) and the object's apparent color (the part behind the filter). This presentation eliminates the need to hold in mind simultaneously the object's real identity and conflicting appearance. Flavell et al. (1986) showed that 3-year-olds' performances on such a color task were significantly elevated compared with their performances on a standard task. The same kind of facilitation occurs for appearance–reality tasks in the tactile modality. For instance, 3-year-olds were able to say that an ice cube really was cold and wet, but that the ice cube did not feel cold and wet when they were touching it with an insulated glove (Flavell, Green, & Flavell, 1989). However, as in the color task, 3-year-olds were helped most when the object's appearance and reality were still being perceived by the child during questioning. Thus, children may have difficulty holding both representations of an object in mind simultaneously and comparing them. They may be helped by having both representations directly in front of them.

Further support for this possibility comes from Brenneman and Gelman (1993). They presented children with a dual object (e.g., an eraser that looked like a peanut) along with two other objects: one that corresponded to the tricky object's identity (a plain eraser) and one that corresponded to its appearance (a peanut). When the appearance and reality questions were then asked, 3-year-olds who failed a standard task succeeded. The presence of the two single-identity objects may have helped children to hold in mind simultaneously both identities of the dual object. In short, 3-year-olds may have an information processing limitation that prevents them from keeping the two single representations of an object in mind at once and comparing them. In this study, we sought to replicate the finding that when the appearance and reality questions can be answered without the need to hold both identities of a dual object in mind, even 3-year-olds can succeed.

In sum, we used a between-subjects design to test two hypotheses about why 3-year-olds typically fail appearance–reality tasks. First, children may fail because they fall back on a correspondence bias. Placing the task within the framework of deception was predicted to break the bias and enable 3-year-olds to succeed. Second, children may fail because they have difficulty simultaneously holding two identities in mind. Allowing the child to view both of the object's single identities, which eliminates the need to hold both identities in mind at once, should also allow 3-year-olds to succeed.

Study 1

Method

Participants

Sixty-eight 3-year-olds (36 girls, 32 boys) from primarily White middle-class day-care centers participated, ranging in age from 3 years 0 months to 4 years 0 months (M = 3 years 6 months). For both conditions, children were divided into groups of young (ages 3 years 0 months to 3 years 5 months) and old (3 years 6 months to 4 years 0 months) 3-year-olds. All of the children were tested individually in a quiet area of their day-care center.
Materials and Procedure

Each child was randomly assigned to one of two experimental conditions: the trick condition \((n = 34)\) or the reduced information processing condition \((n = 34)\). All children first received the pretraining task from Flavell et al. (1986) and the standard task from Flavell et al. (1983).

Five different target objects were used in the appearance–reality tasks: a sponge that looks like a rock, a piggy bank that looks like a plant, a radio that looks like a teacup, a magnet that looks like a Hershey’s Kiss (chocolate candy), and an eraser that looks like a crayon. Two of the five objects were used for each child (randomly assigned), one for the standard task and one for the experimental task. Thus, in each condition, all five objects were represented. In the reduced information processing task, two additional objects were used for each target object, corresponding to the target object’s appearance or reality (e.g., a rock and a sponge for the rock–sponge).

Pretraining. Experimenter 1 began by saying to the child, “We brought something to show you. Look at this doll. See, it’s a doll. But now look.” Experimenter 1 then placed a ghost costume on the doll and asked, “When I put this ghost costume on it looks like a ghost, doesn’t it? So, when you look at this with your eyes right now, it looks like a ghost to your eyes, but really and truly it isn’t a ghost. It’s really and truly just a doll.” Experimenter 1 then removed the ghost disguise from the doll and continued, “Sometimes things look one way to your eyes [placing the ghost costume back on the doll] when they really and truly are something else.” Experimenter 1 then removed the disguise from the doll and stated, “Remember, when we put this ghost costume on, it looks like a ghost, but it is really and truly still a doll.” Experimenter 2 then left the room saying, “I have to run to my car. I’ll be right back. I forgot something.” Experimenter 1 then said to the child, “Now let me show you something else I brought.” Experimenter 1 then administered two tasks: either the standard and trick (order counterbalanced) or the standard and reduced information processing (order counterbalanced).

Standard task. In the standard task, Experimenter 1 showed the child one of the tricky objects (e.g., the sponge–rock) without allowing the child to touch it. Experimenter 1 then said, “Look at this. What does this look like to your eyes?” If the child responded by saying the object looked like a rock, Experimenter 1 said, “That’s right, it looks like a rock.” If the child did not know what the object looked like, Experimenter 1 said, “Take another look. Look closely. What do you think it looks like?” If the child said, “a rock.” Experimenter 1 replied, “That’s right, it looks like a rock.” All of the children were able to say what the objects looked like.

Experimenter 1 continued, “But here. You pick it up and feel it. What does it feel like?” If the child said the object felt like a sponge, Experimenter 1 stated, “That’s right, it feels soft and squishy just like a sponge.” Experimenter 1 said, “What is this really and truly?” If the child responded “a sponge.” Experimenter 1 replied, “That’s right, it’s really and truly a sponge. See, I can use it to wipe the table.” Experimenter 1 then asked, “What is this really and truly?” One child failed this question (for the magnet that looked like a Hershey’s Kiss), and thus was not included in the study.

In the reduced information processing task, Experimenter 1 began by showing the child an object corresponding to one of the tricky object’s identities (e.g., a sponge or a rock) without allowing the child to touch the object. The child was asked to say what the object looked like to his or her eyes. After correctly identifying the object (e.g., a sponge), the child was asked to pick it up and feel it. Experimenter 1 then asked the child what the object felt like. After the child responded, Experimenter 1 stated, “That’s right. It feels soft and squishy like a sponge. See, I can use it to wipe something up with.” Experimenter 1 then placed the sponge on the table and asked the child, “So, what is this really and truly?” Experimenter 1 repeated this procedure with the object corresponding to the other identity of the tricky object (e.g., the rock) and, finally, with the target dual object (e.g., the sponge–rock). The order of presentation for the first two objects was counterbalanced, but the target object was always presented last. The objects remained on the table and were placed so that the target object was in the center with the two single identity objects on either side. With the three objects in view, Experimenter 1 pointed to the target object (the sponge–rock) and asked the child the same two test questions as in the standard task.

If children failed the standard task because they fell back on a correspondence bias, they should have performed better on the trick than on the standard task. If children failed the standard task because of the information processing load, they should have performed better on the reduced information processing than on the standard task.

Results

To pass a task, children had to give a correct response on both appearance and reality questions. Those who did received a score of 1; all others received a score of 0. We used this procedure because an understanding of the appearance–reality distinction is demonstrated only if children can say both what the object is and what it looks like. Getting one question right is not sufficient.

Condition 1 (Standard vs. Trick)

Task effects. Only 10 of the children (29%) passed the standard task (see first and second columns of Table 1), whereas 27 children (79%) passed the trick task (see first and third columns of Table 1). In Table 1, one can also see that 8 of the 34 children (24%) passed both tasks, 5 children (15%) failed both tasks, 2 children (6%) passed the standard and failed the trick tasks, and 19 children (56%) passed the trick and failed
the standard tasks. A McNemar's change test revealed that children were significantly more likely to pass the trick and fail the standard task than the reverse, $\chi^2(1) = 15.43, p < .001$, one-tailed.

Contrary to what one might expect, the five who failed both tasks were older 3-year-olds. This finding is consistent with the individual differences in false-belief understanding that all researchers have found, as well as the fragility of such understanding at this age, even under the most auspicious conditions.

**Age effects.** To ensure that the task effects were not predominately due to the performance of the older subjects, we also analyzed the data to compare the performance of the young and the old 3-year-olds on both tasks. Table 1 shows the patterns of performance on both the standard and trick tasks for these two age groups. As in the total group analyses, a McNemar's change test revealed that both the young, $\chi^2(1) = 9.60, p < .005$, one-tailed, and old 3-year-olds, $\chi^2(1) = 8.17, p < .005$, one-tailed, were significantly more likely to pass the trick and fail the standard task than the reverse. Thus, a majority of the young 3-year-olds passed appearance and reality questions when they were placed within the context of a deceptive game. These results are consistent with those studies mentioned earlier that show that 3-year-olds can pass false-belief questions in the context of deception (Chandler et al., 1989; Hala et al., 1991; Sullivan & Winner, 1993; Winner & Sullivan, 1994).

**Task order effects.** We next investigated whether performance on the standard task improved when the standard followed the trick task. Only 2 of 18 children (11%) passed the standard task when it came first, whereas 8 of 16 (50%) passed this task when it followed the trick task. A one-way analysis of variance (ANOVA), with task order as the between-subjects variable, showed this difference to be significant, $F(1, 32) = 7.095, p = .012$. In contrast, the same ANOVA revealed no effect of task order on the trick task. Fourteen of 16 children (88%) passed the trick task when it came first, and 13 of 18 (72%) passed when it came second. These results suggest that the experience of participating in the trick task first carried over to help improve performance on the standard task, whereas initial experience with the standard task did not boost the children's performance on the trick task.

To determine how children performed on each task uncontaminated by order effects, we compared performance on the standard task when it was received first with performance on the trick task when it was received first. When the standard task was received first, the mean score was 0.11 (out of a possible 1.0); when the trick task was received first, the mean score was 0.88. A one-way ANOVA, with task order as the between-subjects variable, revealed this difference to be highly significant, $F(1, 31) = 44.836, p < .001$. Thus, these results confirm that the trick task was considerably easier for children than the standard task.

**Condition 2 (Standard vs. Reduced Information Processing)**

**Task effects.** Only 16 of the children (47%) passed the standard task (see first and second columns of Table 2), whereas 25 children (74%) passed the reduced information processing task (see first and third columns of Table 2). Table 2 also shows that 11 children (32%) passed both tasks, 4 children (12%) failed both tasks, 5 children (15%) passed the standard and failed the reduced information processing tasks, and 14 children (41%) passed the reduced information processing and failed the standard tasks. A McNemar's change test revealed that children were significantly more likely to pass the reduced information processing and fail the standard task than the reverse, $\chi^2(1) = 5.26, p < .025$, one-tailed.

**Question order effects.** It is possible that improved performance on the reduced information processing task occurred because the presence of two additional objects (e.g., a sponge and a rock) legitimized the idea that two different answers could be given in response to the appearance and reality questions. Children might have used a matching strategy in which they answered the reality question correctly (most did so) and then answered the appearance question with the other choice. Because they had already picked the sponge, for example, for the reality question, they may have simply picked the remaining object (the rock) as the answer to the appearance question. If children were succeeding only because they were relying on such a strategy, they should pass more often when the reality question was asked first (because this is the question that most children pass in the standard task) than when the appearance question was asked first (because this is the question that children are more likely to fail).

To investigate this possibility, we compared performance for both orders of questions. When the reality question was asked first ($n = 21$), the mean score was 0.71; when the appearance question was asked first ($n = 13$), the mean score was 0.77. A one-way ANOVA, with question order as the between-subjects variable, revealed no effect. Thus, children do not seem to have succeeded on the reduced information processing task on the basis of a matching strategy.

**Age effects.** Mirroring the total 3-year-old findings, a McNemar's change test revealed that young 3-year-olds were

<table>
<thead>
<tr>
<th>Group</th>
<th>Pass standard, pass trick</th>
<th>Pass standard, fail trick</th>
<th>Fail standard, pass trick</th>
<th>Fail standard, fail trick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young ($n = 18$)</td>
<td>3 (17)</td>
<td>2 (11)**</td>
<td>13 (72)**</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Old ($n = 16$)</td>
<td>5 (31)</td>
<td>0 (0)**</td>
<td>6 (38)**</td>
<td>5 (31)</td>
</tr>
<tr>
<td>Total ($n = 34$)</td>
<td>8 (24)</td>
<td>2 (6)*</td>
<td>19 (56)*</td>
<td>5 (15)</td>
</tr>
</tbody>
</table>

Note. Percentages in parentheses.

*19 > 2, $p < .001$, one-tailed. **13 > 2, $p < .005$, one-tailed. ***6 > 0, $p < .005$, one-tailed.
significant more likely to pass the reduced information processing and fail the standard task than the reverse, \( \chi^2(1) = 6.13, p < .01, \) one-tailed. Thus, reducing information processing demands by making all three possible representations of the target object available does significantly help young 3-year-olds distinguish between appearance and reality. For the old 3-year-olds, although the results were in the predicted direction, a McNemar’s change test revealed that the children were not significantly more likely to pass the reduced information processing and fail the standard task than the reverse, \( \chi^2(1) = 1.45, p < .15, \) one-tailed.

**Task order effects.** Seventeen children received the standard task first and 17 received the reduced information processing task first. Eight out of 17 children passed the standard task when it came first, and 8 out of 17 passed it when it came second. Twelve children out of 17 passed the reduced information processing task when it came first, and 13 out of 17 did so when it came second. A one-way ANOVA, with task order as the between-subjects variable, performed once on the standard scores and once on the reduced information processing scores, confirmed that the order of task administration had no effect on performance.

**Comparison of the Standard Tasks Across Conditions 1 and 2**

Despite random assignment of children to either Condition 1 or 2, similar samples, and identical testing procedures, the percentage of children passing the standard in Condition 1 was not identical to those passing in Condition 2. As shown in Table 1, in Condition 1 of the trick task 10 of 34 children (29%) passed the standard task. As shown in Table 2, in the reduced information processing condition, 16 of 34 (47%) passed the standard task. A chi-square analysis comparing the patterns of passing and failing the standard task in Condition 1 versus Condition 2 showed no significant difference between them, \( \chi^2(1) = 3.05, p < .10. \) This minor variation in percentage passing the standard is comparable to similar fluctuations found by Flavell et al. (1986).

**Error Analyses**

Consistent with reported findings (Flavell et al., 1983, 1986), 81% of the errors made were realism errors. That is, for all objects, most children answered both questions with the real identity of the object. Only 19% of the errors were phenomenism ones, in which children answered both questions with the object’s appearance. With the exception of one participant, children never erred by giving the wrong answer to both questions.

**Discussion**

These results show that even young 3-year-olds can make the appearance-reality distinction, either when the task is framed in terms of playing a trick on another person or when both the identity and the appearance of the object do not have to be held in mind simultaneously. In addition, the experience of answering the questions in the context of a deceptive frame facilitates performance on the questions in a standard, nondeceptive context.

**Study 2**

The child who succeeds on the trick task does so by attributing the correct representation to herself or himself (the reality question), and the wrong, apparent representation to another (the appearance question). In contrast, on the standard task, the child must attribute two conflicting representations of an object to herself or himself. It is possible that the trick task gave children the idea that there could be two ways of representing the situation: the child’s own view and Experimenter 2’s view. Perhaps this alerted the child that two different answers were possible. Thus, it is possible that children succeeded on this task not because the context of deception primed them to think about another’s mental state, but simply because they did not have to attribute two conflicting representations of an object to themselves. We designed Study 2 to test this possibility by giving children both a standard task (identical to the task in Study 1) and a control task in which the appearance question was asked about another person.

**Method**

**Participants**

Twenty-eight 3-year-olds (12 girls, 16 boys) from primarily White, middle-class day-care centers participated in the study, ranging in age from 3 years 0 months to 4 years 0 months (\( M = 3.7 \)). Children were divided into groups of young (ages 3 years 0 months to 3 years 5 months) and old (3 years 6 months to 4 years 0 months) 3-year-olds. All of the children were tested individually in a quiet area of their daycare center.

**Materials and Procedure**

All children first received a pretraining task (identical to that in Study 1), followed by a standard appearance-reality task (identical to that in
Study 1) and a control task (order counterbalanced). Two different tricky objects were used: a magnet that looks like a Hershey’s Kiss and an eraser that looks like a crayon. Children saw one object for each task (again counterbalanced across task).

The control task was a cross between the standard and the trick tasks. After the child held the object and was able to say what the object really was, Experimenter 1 moved the object away from the child so that it could not be held, but only seen. Experimenter 1 said, “[Experimenter 2] is coming back soon. Let’s put this right here and leave it for her to look at.” Experimenter 1 then asked the two questions. The reality question was phrased in the same way in the standard, trick, and control tasks. The appearance question in the control task was phrased identically to this question in the trick task: “Now, when [Experimenter 2] comes back in and looks at this with her eyes, will she say it looks like chocolate or will she say it looks like a magnet?”

Results

Task Effects

Five children (18%) passed the control task, and 4 children (15%) passed the standard task. Of those who passed only one of these tasks, 4 children (14%) passed the control but failed the standard, whereas 3 children (11%) passed the standard but failed the control. A McNemar’s change test showed no difference between these two patterns.

Age Effects

To determine whether those few children who passed the control but failed the standard were the younger 3-year-olds, we looked separately at the old and young 3-year-olds. None of the young 3-year-olds passed the control task. Of the 5 older 3-year-olds who passed the control task, 4 showed the pattern of passing the control but failing the standard, whereas 2 showed the opposite pattern of passing the standard but failing the control. A McNemar’s change test showed that there was no difference between the frequencies of these two patterns of response. Thus, those few who benefited from the control task were the older children, but the benefit, if any, was so minimal as to prove insignificant.

Order Effects

Seventeen children received the standard task first, and 11 received the control task first. Three children passed the standard task when it came first, and 1 passed the Standard Task when it came second. This difference was not significant (Fisher’s exact test). Thus, unlike Study 1 (in which the trick task facilitated performance on the standard), the control task did not facilitate performance on the standard task. Three children passed the control task when it came first, and 2 passed when it came second. Again, Fisher’s exact test showed that this difference was not significant. Thus, the standard task did not facilitate performance on the control task.

Discussion

Study 2 was conducted to rule out the possibility that children succeeded on the trick task simply because it allowed them to assign one representation of an object to themselves and the conflicting representation to another person. When we altered the standard task so that children answered the reality question for themselves and the appearance question for another person, their performance did not improve. Thus, the assignment of beliefs about apparent identities to two separate people (self vs. other) was not the factor that allowed children to succeed on the trick task in Study 1.

General Discussion

This research demonstrates two conditions in which even young 3-year-olds can distinguish between appearance and reality. First, 3-year-olds succeed when the task is framed within the context of the goal of deceiving another. Initial experience with the trick task was also related to subsequent improvement on the standard task, suggesting that the children were generalizing the appearance–reality understanding that the trick task elicited.

As in false-belief studies that involve deception (Sullivan & Winner, 1993), the context of deception may weaken the hypothesized correspondence bias that leads children to assume that beliefs are a direct copy of the world. When the child is asked to try to deceive another, that other’s mental state is highlighted, because the goal of playing a trick on another person is to instill the other with a false belief. To be successful at playing a trick on the experimenter, the child must realize that his or her belief about what the object is (its real identity) will differ from the way the tricked person will see it (its appearance). In this case, it no longer makes sense for the child to assume that the tricked person will think the dual object is the same thing the child knows it to be; there would be no trick. Thus, deception may provide children with a context in which the correspondence bias leads to a conclusion that no longer makes sense. They must then call upon a more complex understanding of representations to deceive the other person.

It might be asked how 3-year-olds can pass a trick appearance–reality task when attempts to train the appearance–reality distinction at this age have consistently failed (e.g., Flavell et al., 1986; Taylor & Hort, 1990). However, training studies have not used the framework of deception as a way into the appearance–reality distinction, but have instead relied on giving corrective feedback and on repeatedly showing children the contrast between an object’s appearance and its reality. That some training methods have not worked does not preclude the possibility that thinking about deceiving someone might help the child. In particular, we argue that thinking about deceiving someone helps the child think about that person’s mental state and thus helps the child realize that this person could perceive an object in a way that did not correspond to the child’s knowledge of the object’s identity.

Two nonmentalistic explanations for the success of the trick task must also be considered. Peskin has argued that children misunderstand deception as pretense and respond to questions about deception on the basis of “acting-as-if” (1996, p. 1735). Perhaps in the trick task, children took the appearance question to mean, “If we pretend that this (spoon–rock) is a rock, what will Experimenter 2 think that it is?” Note, however, that we neither stated anything about pretend, nor did we suggest tricking Experimenter 2 into thinking that the object was a rock. We
simply said, "Let's play a trick on Experimenter 2." Thus, we think it is implausible to suggest that children might have thought we meant, "Let's pretend."

It has also been suggested that children understand a trick to mean that someone will be wrong about something (Sodian, 1994). Perhaps in the trick task, children simply realized that if Experimenter 2 was to be tricked, she would have to give the wrong answer. They may have thus passed the appearance question without any real understanding that Experimenter 2 had a false belief about the object. We argue, however, that if children understand that someone will give the wrong answer, then they, in fact, understand that someone has a wrong view of the situation (i.e., that someone effectively has a false belief).

The second condition in which 3-year-olds succeed is one in which the information processing demands of holding two representations in mind at once are reduced. We reduced these demands by displaying the target object along with two objects representing its apparent and real identities. The improved performance on the reduced information processing task cannot be accounted for by poor memories of the 3-year-olds. Previous studies have shown that 3-year-olds do not seem to have difficulty remembering that an object appeared one way at a certain point in time but later appears another way (e.g., a cutout of a seal was white and will be white again when the green filter is removed, but right now it looks green and really is green). Instead, they seem to hold in mind only one representation at a time, with the understanding that the representation may change (Flavell et al., 1986).

At the same time, in several other studies, researchers have found that when the representations of the object's apparent and real identities are available, 3-year-olds do significantly better on appearance-reality tasks. This has been found in situations in which a visual clue has been left for the child in standard color tasks (Flavell et al., 1986, 1987), in tactile tasks in which the child is still experiencing the appearance and reality contrasts while answering the questions (Flavell et al., 1989), and in a task in which the two representations of the dual object were presented to and left in sight of the child during the questions (Brenneman & Gelman, 1993). These findings suggest that the 3-year-old child may have difficulty reasoning about two conflicting representations that are held at the same time. Our results are also consistent with those of Mitchell and Laccohee (1991), who showed elevated performance on both false-belief and representational change questions with the use of an external representation of the participant's belief.

We suggest, therefore, that the reduced information processing task allowed the children to remember and compare more than one representation at a time because both identities of the dual object were laid out in front of the child. Better performance on this task may occur because the task makes representations available externally and thus reduces the information processing requirements of distinguishing appearance and reality.

It is possible that improved performance on the reduced information processing task occurred because the presence of two additional objects (e.g., a sponge and a rock) legitimized the idea that two different answers could be given in response to the appearance and reality questions. Children might have used a matching strategy in which they answered the reality question correctly (most did so) and then answered the appearance question with the other choice. Because they had already picked the sponge, for example, for the answer to the reality question, they may have picked the remaining object (the rock) for the answer to the appearance question. If children were succeeding only because they were relying on such a strategy, we should have found an order effect. That is, a correct pattern of answers should have occurred more often when the reality question was asked first (because this is the question that most children pass in the standard task) than when the appearance question was asked first (because this is the question that children are more likely to fail). An analysis of order effects, however, demonstrated that question order had no effect on performance. Thus, improved performance on the reduced information processing condition cannot be attributed to the use of a matching strategy.

Performance in the standard task improved when it followed versus preceded the trick task, but no order effect for the standard task was found in the reduced information processing condition. This finding may be due to the fact that the trick task helped focus the children's attention on the importance of mental states in appearance-reality tasks. In contrast, the reduced information processing task probably did not provide any additional insight into the importance of mental states in these tasks, but provided only a temporary solution to 3-year-olds' difficulties with appearance-reality tasks. Reducing the information processing demands of a task may be a useful short-term strategy in improving performance on appearance-reality tasks for 3-year-olds, but tasks that elicit an understanding of mental states may prove to be a more lasting strategy in generalizing appearance-reality knowledge.

In conclusion, these two studies show that even young 3-year-olds can understand the appearance-reality distinction, in the context of both deception and the reduction of information processing demands. Three-year-olds' failure on the appearance-reality task is not due to a lack of competence, but rather to a difficulty in accessing their knowledge. Their difficulty in access seems to be due to either a correspondence bias or a not yet fully developed information processing capacity.

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Received July 18, 1994
Revision received February 12, 1996
Accepted February 12, 1996