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Where Is the Real Cheese? Young Children's Ability to Discriminate Between Real and Pretend Acts

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Abstract

This study examined 2- to 3-year-olds' ability to make a pretend – real distinction in the absence of content cues. Children watched two actors side by side. One was really eating, and the other was pretending to eat, but in neither case was information about content available. Following the displays, children were asked to retrieve the real food (Experiment 1) or point to the container with the real food (Experiments 2 and 3). 3- and 2.5-year-olds distinguished between the real and pretend acts based on behavioral cues alone. Two-year-olds chose the containers at random, but their spontaneous reactions suggested that they discriminated the real acts from pretense to some degree. Possible accounts for the discrepancy between the different behavioral measures are discussed.

Imagine the following situation: A child is observing a person pretending to drink “loudly” from an empty cup. To make sense of this event, the child must interpret the pretend drinking as nonserious, and distinguish it from real drinking behavior. If the child failed to do so, her representations of what real drinking should be like would get confused. Whether, when, and how young children make sense of pretend events is an important scientific issue. Evidence thus far is mixed.

Some research suggests that children are able to comprehend others' pretend actions by the age of 28 months, in the sense that they respond correctly to the pretend content (e.g., imaginary tea) and can imagine the outcome of others' make-believe acts (Harris & Kavanaugh, 1993; Harris, Kavanaugh, & Dowson, 1997; Harris, Kavanaugh, & Meredith, 1994; Kavanaugh & Harris, 1994). For example, after watching an adult (with the help of a puppet) pretending to squeeze some imaginary substance over one of the two toy pigs, 2-year-olds responded correctly by producing a suitable action (e.g., “cleaning” the pig that got “all dirty”) or commenting appropriately on the outcome created by the pretense transformation (Harris & Kavanaugh, 1993). Even 20-month-olds can anticipate the outcome of a pretense transformation and continue the pretense sequence to some degree (Walker-Andrews & Kahana-Kalman, 1999). For instance, after watching an adult pretending to bathe two dolls and “dry” one of them, 20-month-olds could reason that the other doll was still “wet” and “dried” it themselves.

By the age of 3 years, children also have some knowledge about how pretend and real entities differ. Wellman and Estes (1986) showed that 3-year-olds could understand that people can only act physically on real entities. For example, Wellman and Estes told children that one boy had a cookie and another was pretending to have a cookie. Three-year-olds could reason that only the boy with the real cookie could eat, touch, or see the cookie.

Three-year-olds can also differentiate the pretend and real states of an object used in object-substitution pretense. For instance, Flavell and colleagues asked 3-year-olds about the real and pretend identities of a sponge that an adult pretended was a truck. Children responded correctly most of the time: They judged the real identity of the sponge as “really and truly a sponge,” and identified its pretend state by agreeing with “She is pretending that thing is a truck” (Flavell, Flavell, & Green, 1987).

Furthermore, by age 3, children can distinguish between the intentions underlying pretense and real behavior. Children begin to differentiate involuntary actions from pretend ones around 3 years of age. For example, after watching a scene in which one doll was pretending to cough while another doll was really sick and was really coughing, 3- and 4-year-olds could identify correctly that the pretender was trying to cough (Joseph, 1998). Recently, Rakoczy, Tomasello, and Striano (2004) showed that by the third birthday children could discriminate the intention underlying pretending from that underlying trying. For instance, after watching an adult trying to write with a pen but forgetting to take off the cap (as marked by signs of frustration), 3-year-olds (and even 2-year-olds) acted out the real behavior themselves by taking off the cap and writing on the paper. After watching an adult pretending to write with playful expression, 3-year-olds (and some older 2-year-olds) only pretended to write, without taking off the cap.

Taken together, these findings suggest that by age 3 children understand various aspects of the pretend – real distinction. However, other evidence indicates that young children are susceptible to pretend – real confusion under some circumstances. One such instance is children’s error in believing that something they have imagined may become real. For example, Woolley and Wellman (1993) asked children to imagine that there was an object inside a box. When asked whether the object was real or pretend, many young 3-year-olds erred by judging that the object was real. Even older children may sometimes experience similar confusion (Harris, Brown, Marriott, Whittall, & Harmer, 1991; Johnson & Harris, 1994). For example, Harris et al. (1991, Experiment 4) asked 4- and 6-year-olds to look into an empty box and pretend that a creature (e.g., a rabbit or a monster) was inside it. When left alone with the pretend box and a neutral box that was not involved in pretense, children approached the pretend box more quickly and touched and opened it more often than the neutral box. As Harris et al. (1991) suggested, young children might believe that pretend entities can “transmigrate” into the real world.

Young children may also be susceptible to confusion between memories for real and pretend events. In a study by Foley, Harris, and Hermann (1994), after engaging in a series of play episodes with real toys or their pretend substitutes, 3- and 4-year-olds incorrectly claimed that they played with the real toys when they actually carried out the actions with the pretend substitutes. For example, when asked which object they used to show the experimenter how to play with a car, children who previously played with a block said that they actually played with a real toy car.

In sum, there are seemingly paradoxical findings regarding children’s early understanding of pre-tense—children appear to understand some aspects of the pretend – real distinction by age 3, but they also sometimes mistake pretense for real. One resolution to this paradox is that perhaps early understanding of the pretend – real distinction is fragile. Young children may have the pretense – reality boundary “in place,” but it is not yet firm, so that under some circumstances children become confused about certain elements of pretense and reality. As a result, features of pretense may sometimes cross the boundary and “seep into reality” (Harris et al., 1991; Lillard, 1994; Woolley, 1997).

Under what situations are features of pretense likely to cross the boundary and foster pretend – real confusion? One such circumstance is when pretense episodes are emotionally charged (Lillard, 1994; Woolley, 1997). For example, Bouchier and Davis (2000) showed that 5-year-olds appeared to believe that a pretend entity would become real if it elicited positive affect (e.g., a desired gift for Christmas) or negative affect (e.g., a scary monster) rather than neutral affect (e.g., a cup). Children may also mistake pretense for real when the pretense involves marginal characters like witches and Santa Claus (e.g., Rosengren, Kalish, Hickling, & Gelman, 1994; Woolley, Boerger, & Markman, 2004). The third circumstance may be when young children do not have information about certain cues to pretense that are crucial for them to distinguish between pretense and real events, such as when information about content is not available.

The presence of real content can be one important composite of a real act. For example, when one really eats, there must be real food. During pretense, however, people often act upon or refer to entities that manifestly do not exist—the entities are either instantiated by physical substitutes or are purely imaginary. In this situation, lack of real content or deviant content is a salient marker of pretense (Fein, 1981). Four- to 5-year-olds can represent pretense based on missing content: They often cite absence of real food or drink to explain why they judge a snacking event to be pretense (Ma & Lillard, 2006). There is little research directly addressing whether younger children are able to make pretend – real contrasts based on content information, but some indirect evidence suggests that sometime between 2 and 3 years of age this ability may start to emerge.

By age 3, children are able to make pretend – real comparisons explicitly (Woolley & Wellman, 1990), possibly with the help of content information. For example, in Woolley and Wellman (1990, Study 2), 3-year-olds watched an experimenter pretending to brush her teeth or write with an eraser-pencil, and judged correctly that the experimenter was pretending despite their acknowledgment that the pretend actions looked real. Although the researchers did not examine the role of content cues in particular, in either scenario lack of real content might have helped children to make the pretend – real contrasts. In the pretend tooth-brushing scenario, for example, a toothbrush and a cup were involved, but the absence of real toothpaste and water might have cued pretense to children.

Content information therefore may play a critical role in young children's discrimination between pretense and real behavior. However, there are pretense situations in which content information is absent (e.g., one pretends to eat but the viewer cannot see or hear whether food is involved) or insufficient (e.g., one holds a real apple and pretends to bite it). Under such circumstances, children need to rely on other clues to distinguish between pretend and real actions. One potential cue is deviations in the pretender's behaviors. Mothers have been shown to vary their behaviors in systematic ways when pretending to have a snack in front of their toddlers—for example, they talk more, smile more, and move faster (Lillard & Witherington, 2004). Children ages 4 and older can detect pretend acts based solely on behavioral cues when information about content is not accessible (Richert & Lillard, 2004). There is a dearth of research on whether children under age 3 have this ability.

The goal of this study is to determine whether children ages 2 – 3 can distinguish between pretend and real acts based on behavioral cues, when content information is not available. To examine this, we showed children paired events (pretend vs. real eating behavior) with content information concealed. Following the displays, the child's mother asked the child to find the real food. Pretense was signaled via cues like sound effects, animated movements, holding food at one's mouth for a longer-than-normal duration, exaggerated smiles, and more variations in pitch when speaking (see Lillard & Witherington, 2004). If children

correctly interpret such behavioral cues to pretense, they should choose the person acting for real over the pretender when deciding who has the real food.

There are two important characteristics of the design of this study. First, a behavioral index—finding real food—was used in preference to a verbal response because behaviors may be a more sensitive index of understanding (e.g., Goldin-Meadow, 2001). The word “pretend” was avoided because children less than 3 years of age may not comprehend the word “pretend” accurately, and their competence at deciphering pretense may be obscured by their insufficient understanding of a question like “Who is pretending?”

A second characteristic concerns experimental control. To ensure that the stimulus displays were consistent across all participants, the events were videotaped and shown to the child on television. However, the real objects—the bowls from which the child might obtain food—were also on the table in front of their televised counterparts. Prior work involving social referencing from television suggests that 13-month-olds can use emotional information displayed on television toward novel objects to direct their own interactions with those objects in the real world (Mumme & Fernald, 2003), so 2- to 3-year-olds should be capable of mapping from television to reality. To be conservative, however, a pretest was conducted to ensure that children could map information from television to a problem-solving situation in the real world.

Experiment 1

Method

Participants—Fifty children were included in the final sample: Eighteen 2-year-olds ($M=25.3$ months; range =22.7–27.6 months), sixteen 2.5-year-olds ($M=31.2$ months; range =30.3–32.3 months), and sixteen 3-year-olds ($M=38.9$ months; range =37.6–40.2 months), with equal numbers of males and females at each age. Eighteen additional children were eliminated, due to failure to pass the pretest (seven 2-year-olds and two 2.5-year-olds), fussiness (four 2-year-olds, one 2.5-year-old, and two 3-year-olds), or failure to follow the instructions (two 2-year-olds). Children were recruited from birth announcements and recruiting events in a small southeastern American city, and parents were contacted by telephone. Most children were from White, middle-class families.

Materials—The stimuli consisted of five video clips of paired events on a split screen: One clip for the pretest and four clips for test trials. Two containers were used with each clip as described below. In addition, a toy animal was used in the pretest, and foods were used in the test (i.e., grapes, cheese, muffins, and raisins).

Pretest clip: A pretest was conducted to ensure that children could map information from television to a problem-solving situation in the real world. In the pretest clip, two female actors sat side by side on a split screen, with two opaque boxes placed on a small table in front of them. Upon lifting up a yellow box, one actor found a toy animal, showed excitement and then placed the box back on the table hiding the toy under it. The other actor lifted up a red box and found nothing under it. With a disappointed expression, she then placed the box back on the table.

Test clips: Four pairs of female adults performed four scenarios (one for each clip) following the script shown in Appendix A: Eating versus pretending to eat grapes, cheese, small muffin pieces (it was called “cake” in the video clip for ease of understanding), and raisins. These foods often entice young children and would thus be expected to evoke genuine interest. Each clip started with two female adults sitting side by side on a split screen and reading magazines, with a covered bowl placed on a small table in front of each

of them. Then the two adults acted in turn: One adult began to eat (or pretend to eat) from the bowl in front of her, and after approximately 30 s she resumed reading. Then the second adult started to pretend (or really eat) for about 30 s and resumed reading afterwards. At the end of each clip, both adults were back to reading the magazines. The cloth covers of all bowls (two for each clip) were in distinct colors. The clips were of similar duration (range = 60.2 – 63.1 s).

In each clip, pretending was signaled via sound effects, animated movements, holding food at the mouth for a longer-than-normal duration, exaggerated smiles, and more variations in pitch when speaking (see Lillard & Witherington, 2004). Content information was not available as a cue to pretense, and was concealed by three means. First, the containers in the clips (and in reality) were covered. Second, the selected foods were consumed quietly, and no obvious eating sounds were made. Third, the real food was in small pieces, which the adult hid behind her fingers when bringing to her mouth. Adult viewers, including four undergraduates and four parents from the pilot study, viewed the clips carefully and noted the cues they used for their pretend – real judgments. None of the viewers reported use of content cues to make their judgments. In the follow-up interviews, all viewers ascertained that one could not see or hear any direct perceptual information indicating the presence or absence of food in the clips.

Four undergraduates rated each clip for the ease with which they could identify the pretender on a scale from 1 (*very difficult*) to 5 (*very easy*). They judged the clips as equally and very easy ($M=5.0$ for each clip). In addition, ten 5-year-olds (5 boys; $M=64.2$ months; range = 54.5 – 71.0 months) were shown the clips and asked two questions after viewing each display, “Which one has the real food?” and “Who is pretending?” These children were able to distinguish pretense from the real acts with ease: Nine of 10 children responded correctly to both questions on all four trials; the other child responded correctly to both questions on three trials. These data indicated that all four test clips were easy for children as young as 5 to decipher, based on behavioral cues alone.

Procedure—Upon entering the testing room, the child was seated in a small chair in front of a table. A 21 in. color television was placed on the middle of the table, about 50 cm away from the child. The child’s mother sat next to the child throughout the procedure. A video camera recorded the child’s responses during the pretest and test phases.

Pretest: In the pretest, the child was shown the video clip described above. The actual boxes were placed right in front of their televised counterparts. At the end of the clip, the experimenter paused, with the images of the actors still on the television screen, and pushed the boxes to within reach of the child. The mother then asked her child, “Where is the toy animal? Go get the toy animal!” If the child did not initiate a choice, the boxes were pushed back in front of the television and the clip was replayed. Half of the children received the pretest with the target choice on the right side, and the other half received it with the target choice on the left side.

Test: After a short break following the pretest, the test phase started. During the test, each child viewed four video clips as described above (i.e., pretend vs. real eating displays), one at a time. The bowls with cloth covers used in each clip were directly in front of their televised counterparts throughout the presentation, with food only in the bowls that were used for the real acts. The bowls were a slightly larger than their images on the screen. At the end of each clip the experimenter paused, with the images of the actors on the screen, and pushed the bowls to within reach of the child. Then the mother asked her child, “Where are the real grapes [cheese, cake, or raisins]? Go get some grapes [cheese, cake, or raisins]!” If the child made an incorrect choice (i.e., the child uncovered the empty bowl used for

pretense first), he or she had the opportunity to open the second bowl to see that it had the real food. At the end of each trial, the child was allowed to eat the food as a reward.

Half of the children were given the first pair of stimulus events with the correct choice (i.e., the bowl used for real acts) on the same side as in the pretest, and half were given the first pair of stimulus events with the correct choice on the side opposite to that in the pretest. The position of the correct choice in each of the following pairs of stimulus events was alternated. The type of act shown first (real vs. pretend) was counterbalanced across the four trials for each child and across children in the same age group.

Coding and Reliability—For each clip, we coded two types of responses described further below: Children's responses to the request that they find the real food and their spontaneous reactions while watching the video displays (as recorded on videotapes). The actors and the container locations were not visible on the videotapes. Two trained research assistants who were naïve to the underlying hypotheses coded the entire sample together, with auditory information available. Any disagreement between them was discussed until they reached a consensus. A third coder (the first author) coded approximately 25% of the sample alone with the sound muted, and agreement was very good (Cohen's $\kappa = .82 - .93$). Disagreements between the third coder and the undergraduates were resolved by the first author. Specifics for each type of coding are given below.

Responses to the request to find the real food: Children's responses to the request that they find the real food were coded, including (a) which bowl they selected to open first ($\kappa = .91$) and (b) whether they showed surprise or confusion when opening the bowl ($\kappa = .82$). Surprise may indicate lack of understanding: Either a child who chose the empty bowl used for pretense and was surprised to find no food, or (less likely) a child who chose the bowl used for real eating and was surprised to find real food.

Spontaneous reactions: Children's spontaneous reactions while watching the video displays were coded as they pertained to three categories of behavior: Swallowing/lip licking, reaching, and smiles.

(a) Swallowing/lip licking: Sometimes children swallowed or licked their lips, suggesting a whetted appetite for eating while watching the displays. These movements were coded on the first trial only ($\kappa = .86$), because some children were eating the food from the previous trial when watching subsequent trials.

(b) Reaching: When the child reached or initiated a reach toward one of the bowls while watching the video, it was coded as a reach. Relevant behaviors were the arm(s) sticking out trying to get a bowl, or reaching that was aborted by the mother or the child ($\kappa = .89$).

(c) Smiles: When the child smiled or laughed while watching the video presentations, it was coded as a smile ($\kappa = .93$). If the child smiled more in response to pretense than to the real acts, it could suggest comprehension of pretense at either a rudimentary level (i.e., viewing pretend actions simply as non-serious, silly, or strange) or a conscious level (i.e., "knowing smiles"; see also Piaget, 1962).

Results

Preliminary analyses revealed no gender effect on the main measures. Gender was thus not included in the main analyses. Past literature has suggested that when testing young children on multiple trials, first-trial performance would be less biased by confounding factors (e.g., learning effect, fatigue, or perseveration) and thus the most convincing (Golinkoff, Hirsh-

Pasek, Cauley, & Gordon, 1987; O'Sullivan, Mitchell, & Daehler, 2001; Schmitt & Anderson, 2002; Suddendorf, 2003). Therefore, each set of the analyses below examined children's performance (a) on the first trial and (b) over the four trials.

Responses to the Request to Find the Real Food

First trial: Children's responses to the request to find the real food on the first trial were examined, including which bowl they chose to uncover first (i.e., the choice) and whether they showed obvious surprise or confusion after uncovering that bowl.

(a) Choice: A choice was correct if the selected bowl corresponded to the one used for real eating. Chi-square tests revealed that on the first trial, only the 3-year-olds performed significantly above chance, $\chi^2(1)=6.25$, $p<.01$, with 81.3% of them (13 of 16) correctly choosing the bowl used for real eating. The performance of the 2- and 2.5-year-olds was not significantly different from chance (see Table 1).

(b) Surprise: Among children who opened the empty bowl used for pretense first, the proportion of 2-year-olds who showed surprise (66.7%; 6 of 9) was significantly greater than that of 3-year-olds (none of 3), $\chi^2(1)=4.0$, $p<.05$. The other comparisons were not significant. Among children who opened the correct bowl first, no significant age differences emerged. In general, 2-year-olds showed surprise (50.0%, 9 of 18) more often than did 3-year-olds (18.8%; 3 of 16), $\chi^2(1)=3.62$, $p<.05$.

All four trials: Children's responses to the request over the four trials were also examined.

(a) Choice: When examining the mean percentage of children's correct choices over the 4 trials, none of the three age groups performed at a level significantly above chance (54.2%, 64.1%, and 56.3% correct for 2-, 2.5-, and 3-year-olds, respectively; *ns*).

Children's performance patterns across the four trials were examined by age (see Figure 1). Three-year-olds performed significantly above chance on the first trial, but their performance was near chance on the last three trials (range =31.3 – 62.5% correct, *ns*). Interestingly, 3-year-olds' performance declined sharply from the first trial to the second, $\chi^2(1)=6.4$, $p<.05$, and then improved from the second trial to the third, $\chi^2(1)=5.0$, $p<.05$, as revealed by McNemar's test, which examines whether dichotomous data from two repeated trials have the same distribution. Two- and 2.5-year-olds' performance did not differ significantly from chance on any of the four trials (range =44.4 – 72.2% correct, *ns*), nor did their performance improve across trials.

(b) Surprise: Over the four trials among all instances in which children opened the empty bowl first, proportionally more 2-year-olds (45.5%; 15 of 33 trials) showed surprise at the empty bowl than did 3-year-olds (3.6%; 1 of 28 trials), $\chi^2(1)=13.73$, $p<.001$. Also, 2.5-year-olds (26.1%; 6 of 23 trials) showed surprise more than did 3-year-olds, $\chi^2(1)=5.39$, $p<.05$. Among instances in which children opened the correct bowl first, 2-year-olds appeared surprised on 28.2% of the trials (11 of 39 trials), whereas 2.5-year-olds did so on only 7.3% of the trials (3 of 41 trials). This difference was also significant, $\chi^2(1)=5.81$, $p<.05$. The other comparisons were not significant. In general, 2-year-olds (36.1%; 26 of 72 trials) were more likely to show surprise than were 2.5-year-olds (14.1%; 9 of 64 trials) and 3-year-olds (9.4%; 6 of 64 trials), $\chi^2(1)=8.62$, $p<.01$ and $\chi^2(1)=13.46$, $p<.001$, respectively.

Spontaneous Reactions During Video Displays

First trial: Mixed-design analyses of variance (ANOVAs) were conducted to examine children's spontaneous reactions (i.e., swallowing/lip licking, reaching, and smiles) on the first trial, across display conditions (within-subjects factor) and age (between-subjects factor). Means and standard deviations are shown in Table 2. McNemar's tests were conducted to compare the proportions of children who emitted the target spontaneous reaction at least once when watching the real versus pretend acts.

(a) Swallowing/lip licking: With the display condition (pretend vs. real) as the within-subjects factor and age as the between-subjects factor, a mixed-design ANOVA revealed a significant main effect of the display condition, $F(1, 49) = 19.82$, $p < .0001$, indicating that on the first trial children engaged in more swallowing/lip licking in response to the real act than to the pretend act. No main effect of age or significant Age $\times$ Display interaction emerged.

For exploratory purposes, we examined each age group separately (see Table 2). At all three ages, children engaged in more swallowing/lip licking in response to the real act than to the pretend one, but this difference was significant for 2- and 2.5-year-olds only, $t(17) = 3.07$, $p < .01$, and $t(15) = 3.60$, $p < .01$, respectively. McNemar's tests revealed that for both 2- and 2.5-year-olds, the proportion of children who emitted spontaneous swallowing/lip licking at least once when watching the real act was greater than that of children who did so in response to the pretend act, $\chi^2(1) = 9.0$, $p < .01$ and $\chi^2(1) = 10.0$, $p < .01$, respectively.

We also examined the emitting of these behaviors among children who passed the retrieval test (i.e., correctly choosing the bowl used for real eating) versus children who failed the test. Among 2-year-olds, on the first trial 4 of 9 children (44.4%) who passed the test and 6 of 9 children (66.7%) who failed the test emitted spontaneous swallowing/lip licking at least once in response to the real eating act. Among 2.5- and 3-year-olds, when watching the real eating act, those who passed the test were more likely to engage in spontaneous swallowing/lip licking behavior (80% of the 2.5-year-olds and 61.5% of the 3-year-olds) than did children who failed the test (50% of the 2.5-year-olds, and none of the three 3-year-olds). These differences were not tested for significance due to small sample sizes. At all three ages, both children who passed the test and children who failed the test rarely engaged in spontaneous swallowing/lip licking in response to the pretense.

(b) Reaching and smiles: Two mixed-design ANOVAs revealed that on the first trial, neither spontaneous reaching nor smiles in response to the video display differed across display conditions or age. No significant Age $\times$ Display interaction emerged. McNemar's tests indicated that at each age, the proportions of children who reached or smiled at least once in response to the real act did not differ from that of children who did so in response to the pretense.

All four trials: Children's spontaneous reaching and smiles over the four trials were also examined. The means and standard deviations are shown in Table 3. Recall that spontaneous swallowing/lip licking was coded on the first trial only, due to ongoing consumption of the preceding trial's food rewards on later trials.

(a) Reaching: The frequency of children's spontaneous reaching in response to the video displays was summed for each display condition over the four trials. With the display condition as the within-subjects factor and age as the between-subjects factor, a mixed-design ANOVA revealed a significant main effect of the display condition, $F(1, 49) = 12.37$, $p < .001$. Children tended to reach for the corresponding bowl more frequently when

watching the real acts than when watching the pretend ones. No main effect of age or significant Age $\times$ Display interaction emerged.

Each age group was then examined separately for exploratory purposes. At all three ages, children reached more toward the bowl in response to the real acts than to the pretend ones (see Table 3). This difference was significant for 2- and 2.5-year-olds only, $t(17) = 2.32$, $p < .05$, and $t(15) = 2.93$, $p < .01$, respectively. McNemar's tests indicated that over the 4 trials, the proportion of 2-year-olds who reached at least once toward the corresponding bowl when watching the real acts was greater than that of 2-year-olds who did so in response to the pretend acts, $\chi^2(1) = 7.0$, $p < .05$. We also examined children who passed the retrieval test on at least three trials and children who passed the retrieval tests on 0 – 2 trials separately. No findings of interest emerged.

(b) Smiles: Over the four trials, children's smiles in response to the displays did not differ across display conditions or age. No significant Age $\times$ Display interaction emerged.

Discussion

This experiment examined whether 2- to 3-year-olds could discriminate between pretend and real acts in the absence of content cues and whether they understood that the person acting for real was more likely to have the real food than was the pretender. We showed children paired eating acts, pretend and real, with content information concealed, and asked them to find the real food after the display. Some intriguing findings resulted. First, 3-year-olds succeeded on the first trial in choosing the correct bowl, but their performance declined on later trials. Second, there was a discrepancy between 2- and 2.5-year-olds' explicit behavioral choices and their spontaneous responses. These will be discussed in turn.

Three-year-olds' initial success and subsequent deterioration—On the first trial, 81.3% of the 3-year-olds chose the correct container, which is significantly better than chance. Despite their initial success, 3-year-olds' performance on uncovering the correct bowl declined sharply on the second trial and was at chance on the last two trials. Why did this deterioration occur?

One possibility is that children's cognitive processes were overloaded on later trials. On the first trial, 3-year-olds' spontaneous reactions were consistent with their explicit behavioral choices. This suggests that they might have insight into the pretend – real distinction at a tacit level (revealed by their differential spontaneous swallowing/lip licking) and when the situation is relatively simple on the first trial, this insight was strong enough to support their successful behavioral retrieval. On later trials, however, their memory representations of the first trial might have interfered with their representations of the subsequent trials and complicated the situation, so that their cognitive processes might have become overloaded and their initial insight was no longer accessible to support explicit retrievals over multiple trials.

Some children's strategy of "sticking to the winning side of Trial 1" seemed a specific manifestation of the "first-trial interference effect" discussed above. Three of sixteen 3-year-olds displayed a "sticking to the winning side of Trial 1" pattern, or a side bias, consistently choosing the side where they found the real food on the initial trial. As we altered the side of correct choice on every trial after the first one, these three children scored "1, 0, 1, 0" across the four trials, which might compromise the group performance to some degree. The side bias from the first trial to the second one may be explained by perseverative searching in young children (O'Sullivan et al., 2001; Schmitt & Anderson, 2002; Suddendorf, 2003), but perseveration could not explain the side bias across the four trials. As we altered the side of the correct choice on every trial after the first one, a child who perseverated throughout the

test would always choose the winning side of the preceding trial and thus scored “1, 0, 0, 0” rather than “1, 0, 1, 0.”

Children’s decreasing level of performance could stem from factors other than being cognitively overloaded or a side bias on the part of some children. It is possible that after a serious and seemingly easy choice on the first trial, some children became curious about what was inside the other bowl that corresponded to the pretend act and checked it first on the second trial. On the last two trials, they might have learned that they would be rewarded with food even if they made an incorrect choice; as a result, their motivation to honor the request that they find the real food diminished and they chose between the two bowls randomly. The lack of surprise shown by 3-year-olds when uncovering the empty bowl (1 of 28 instances over the four trials) supports this possibility.

As mentioned earlier, past literature has suggested that children’s first-trial performance would be the most convincing. Therefore, 3-year-olds’ success on the first trial might indicate their insight into the distinction between pretend and real acts in the absence of content cues, as well as their awareness that the pretender is less likely to have the real stuff than is the person behaving for real. However, this understanding was fragile, in that when the situation became complicated with multiple trials, 3-year-olds were less systematic in discriminating the real from the pretend.

Two- and 2.5-year-olds’ discrepant responses—When asked to choose which container had the real food, 2- and 2.5-year-old children’s performance was at chance, on the first trial and over all four trials. Regarding spontaneous reactions, smiles seem unlikely to be indicative of understanding in the current experiment. Children smiled in response to the real acts as often as they smiled in response to the pretend ones. It is possible that the pretense amused children while the real eating acts excited children. However, children’s spontaneous reactions indicative of a desire for eating did differ across display conditions. Both 2- and 2.5-year-olds exhibited more spontaneous swallowing or lip licking on the first trial (the only trial for which it could be examined) and more reaching behavior (over all 4 trials) in response to real eating than to pretense. In other words, their apparent desire for eating was elicited more often by real eating than by pretense, discrepant with their explicit behavioral choices. This discrepancy may suggest that younger children understood the situation to some degree: They might have discriminated between the pretend and real actions at an inchoate level, but failed to manifest that knowledge explicitly. However, before we draw this tentative conclusion, several alternative explanations must be considered.

One alternative explanation is that younger children failed the behavioral choice because they had difficulty mapping information from television to reality. This possibility seems unlikely for two reasons. Recall that the pretest in the current experiment ensured that children included in the final sample could map information from television to find a hidden object in the real-world situation. In addition, in pilot testing, we conducted the present procedure with 2-year-olds, using live versus video presentation of one stimulus event. Children’s performance did not differ significantly across conditions (live: $n=7$, $M=24.0$ months, 58% correct; video: $n=4$, $M=23.8$ months, 50% correct).

Another alternative account is that 2- and 2.5-year-olds’ difficulty with the behavioral choice might not indicate a true pretend – real confusion but rather might indicate their continuation of the pretense theme. That is, children might not “decipher” the request to find the real food as a “real” request; they might have simply treated the task as a game and continued the pretense theme for fun (Gergely, 2002; Golomb & Galasso, 1995). This account is also unlikely for two reasons. First, the food selected for every trial was well

loved by young children so as to maximize their motivation to find the real food on the first try. To continue the pretense theme, children would have to distinguish between the real and the pretend, reason which container has the real food, and temporarily inhibit the desire for opening that container. However, there is evidence that inhibitory control develops with age (Kochanska, Murray, & Coy, 1997). It is unlikely that 2- and 2.5-year-olds have better inhibitory control than 3-year-olds, so chances are slim that they could continue the pretense theme and delay the gratification real food could provide while 3-year-olds could not.

Second, younger children's facial expressions after uncovering the selected container are not consistent with continuing the pretense theme. If children were continuing the pretense theme, they should not show surprise but rather amusement after uncovering the empty bowl first. However, among children who opened the empty bowl first, on the first trial 66.7% of the 2-year-olds and 33.3% of the 2.5-year-olds instead showed surprise or confusion. Over the four trials, the percentages of such expressions were 45.5% and 26.1%, respectively. Therefore, 2- and 2.5-year-olds did not respond to the pretend acts in a manner that would suggest continuation of the pretense theme.

The third alternative account for younger children's poor performance concerns affordances. Covered containers afford containment and therefore may elicit opening behaviors themselves (Gergely, 2002). In the present experiment, bowls used for the real and pretend acts were both covered by cloth and therefore might elicit uncovering behaviors to the same degree. It is possible that when asked to find the real food by uncovering one of the two bowls, younger children simply could not overcome the "equal-affordance problem" and chose randomly. If the task were modified so as to remove the equal affordance as an obstacle, children's performance might improve. Experiment 2 addressed this possibility.

Experiment 2

In Experiment 2, we modified the task to tease apart the possible effect of the equal affordance problem. Instead of directly uncovering a bowl, 2 and 2.5-year-olds were asked to first point to the bowl where they thought the real food would be.

Method

Participants—Thirty-two children were included in the final sample. There were 16 children (8 boys and 8 girls) in each of two age groups: 2-year-olds ($M=24.3$ months; range =22.9 – 26.3 months) and 2.5-year-olds ($M=31.0$ months; range =29.6 – 31.9 months). Four additional children were eliminated, due to fussiness (two 2-year-olds) or failure to pass the pretest (one 2-year-old and one 2.5-year-old).

Materials and Procedure—The same stimulus clips, props, and equipment from Experiment 1 were used. The procedure was the same as in Experiment 1, except for the change in response request and its aftermath.

Pretest: At the end of the clip, children were asked to first point to the box with the toy under it (e.g., "Where is the toy animal? Can you point to the box with the toy animal under it?"). They were then given the selected box and allowed to lift it.

Test: At the end of each clip, the bowls were left in front of the television. Then the mother asked the child, "Where are the real ____? Can you point to the bowl with the real ____?" After clearly pointing to one of the bowls, the child was given the selected bowl to see what was inside. The experimenter also invited the child to look inside the second bowl afterwards. The child was eventually rewarded with the food no matter whether his or her choice was correct or not.

Coding and Reliability—On every trial, children's reactions to the request that they point to the bowl with real food were coded, including (a) their first pointing after the request (i.e., the choice) and (b) whether they showed obvious surprise after uncovering the selected bowl. A choice was counted correct if the child pointed to the bowl used for the real acts. The coding of spontaneous reactions was the same as in Experiment 1.

Two trained undergraduates coded the entire sample together. They were not able to see the actors or the container locations on the videotapes. Disagreements between them were resolved by discussion. A third coder coded 25% of the sample alone with the sound muted, and agreed with the undergraduate pair most of the time (Cohen's $\kappa = 0.69 - 1.00$). Disagreements between the third coder and the undergraduate pair were resolved by the first author.

Results and Discussion

To preview, the results of this experiment suggested that the pull to uncover containers was compromising younger children's performance to some degree.

Initial success and subsequent deterioration in 2.5-year-olds' performance—

By pointing to the correct bowl, 81.3% of the 2.5-year-olds succeeded on the first trial (see Table 1), which was significantly above chance, $\chi^2(1) = 6.25$, $p < .01$, and equivalent to the first-trial performance of the 3-year-olds in Experiment 1.

Interestingly, 2.5-year-olds' performance across the 4 trials had a pattern similar to that of the 3-year-olds in Experiment 1: Their performance declined on the second trial (56% correct), increased from the second trial to the third (75% correct, above chance), and decreased again on the fourth trial (38% correct), as shown in Figure 2. This “up-down – up-down” pattern might stem from the “first-trial interference effect” discussed earlier. That is, children's memory representations of the first-trial success interfered with their performance on later trials. This effect might account for some 2.5-year-olds' side bias: Almost one third of the children (5 of 16) displayed a side-bias pattern, by always pointing to the side where they found the real food on the initial trial. Children's decreasing level of performance might also arise from curiosity on the second trial and lack of motivation on the last two trials as discussed earlier. The relatively rare instances of surprise shown by 2.5-year-olds at the empty bowl support this possibility (5 of 24 instances over the 4 trials).

Given that children's choice on the first trial might be the most revealing, 2.5-year-olds' correct pointing on the first trial might strongly suggest they can understand the pretend – real distinction when content information is absent. It also suggests their awareness that a pretender is less likely to have the real food than is a person acting for real.

On the first trial, 2.5-year-olds' spontaneous reactions indicating a desire for eating were consistent with their explicit behavioral choices. As shown in Table 2, on the first trial the real eating act elicited more swallowing/lip licking than did the pretense, $t(15) = 2.94$, $p < .05$. McNemar's tests suggested that on the first trial the proportion of 2.5-year-olds who emitted spontaneous swallowing/lip licking in response to the real act was greater than that of the 2.5-year-olds who did so in response to the pretense, $\chi^2(1) = 5.4$, $p < .05$. In addition, over the four trials 2.5-year-olds reached significantly more toward the bowl used for real eating than toward the bowl used for pretense, $t(14) = 3.75$, $p < .01$ (see Table 3; one outlier that exceeded the group average by three standard deviations in response to real eating was conservatively deleted).

Two-year-olds' discrepant responses—When asked to point to the bowl with real food, 2-year-olds' performance did not differ from chance on the first trial (50% correct, *ns*)

or over the four trials (51.6% correct, *ns*), which was similar to the performance of the 2-year-olds in Experiment 1. Their smiles also did not differ across display conditions. However, they emitted more spontaneous swallowing/lip licking on the first trial when watching the real act than when watching pretense (see Table 2), $t(15) = 2.61$, $p < .05$. They also engaged in more reaching behavior over the 4 trials in response to the real acts than to the pretend ones (see Table 3; this effect was obtained even though two outliers that exceeded the group average by three standard deviations in response to the real eating were conservatively deleted), $t(13) = 3.74$, $p < .01$. In other words, behaviors suggestive of a desire for eating were elicited in 2-year-olds more often by displays of real behavior than by displays of pretend behavior. As in Experiment 1, a tentative conclusion can be drawn that 2-year-olds might have an inchoate understanding of the situation.

One intriguing finding of both Experiments 1 and 2 regards older children's deterioration in performance on later trials. As discussed earlier, the decreasing performance of the older children could be explained by various factors, such as the "first-trial interference effect," some children's side bias, curiosity, or loss of motivation on the subsequent trials. The primary purpose of Experiment 3 was to address the motivation explanation.

Experiment 3

In the first two experiments, older children, who tended to choose correctly on the first trial, were rewarded with food right away even if they made an incorrect choice on the second trial. This might have reduced their motivation on the last two trials. If only rewarded for correct pointing, lack of reinforcement for their curious peek at the "pretend" bowl on the second trial should have helped children be motivated to choose seriously on the last two trials in order to get rewarded. This "reward" change was therefore incorporated into Experiment 3.

Method

Participants—Twelve 2.5-year-old children (6 boys and 6 girls) were included in the final sample ($M = 33.1$ months; range = 30.7 – 35.0 months). One additional child was eliminated due to technical failure.

Materials and Procedure—The same stimulus clips, props, and equipment from Experiment 1 were used. The procedure was the same as in Experiment 2, except that the child was not rewarded with the food if she or he pointed to the incorrect bowl (i.e., the empty bowl used for pretend eating).

Coding and Reliability—The coding was the same as in Experiment 2. For reliability, one coder coded the entire sample alone. A second coder coded 25% of the sample, and had very good agreement with the first coder (Cohen's $\kappa = .80 - 1.00$). Disagreements were discussed to consensus.

Results and Discussion

The results largely replicated the findings with older children in the previous experiments. First, 2.5-year-olds in this experiment succeeded on the initial trial, with 83.3% of them (10 of 12) pointing correctly to the bowl used for real eating, $\chi^2(1) = 5.33$, $p < .05$. On the subsequent trials, however, their performance deteriorated and showed a pattern similar to that of the older children in Experiments 1 and 2: 50% of them pointed correctly on the second trial, 75% on the third one, and 58% on the last one, as shown in Figure 2.

As 2.5-year-olds' performance on the last trial was still around chance even when only correct choices were rewarded, motivation seems unlikely an explanation for children's performance pattern. However, side bias could account for the "up-down – up-down" pattern of some 2.5-year-olds' performance. In this experiment, 25% of the children displayed a side bias, by always pointing to the initial side where they found the real food. Curiosity about the empty bowl used for pretense might also contribute to children's poor performance on later trials, as supported by the relatively low instances of surprise shown by 2.5-year-olds at the empty bowl (4 of 16 instances over the four trials).

Second, the effect of the display condition on children's spontaneous reactions was also replicated. On the initial trial, 2.5-year-olds in this experiment exhibited more swallowing/lip licking in response to the real act than to the pretense (see Table 2), $t(11) = 2.87$, $p < .05$, which was consistent with their behavioral choice. As shown in Table 3, over the four trials 2.5-year-olds approached the bowl used for real eating more often than the bowl used for pretense, $t(11) = 2.54$, $p < .05$, suggesting their tacit distinction between the pretend and real acts on later trials despite their deteriorating performance on the explicit behavioral choices.

General Discussion

Three experiments were conducted to examine whether 2- to 3-year-old children could differentiate pretend and real eating behaviors based on behavioral cues alone, and could determine that the person acting for real was more likely to have real food than was the pretender. Two important findings will be discussed in turn.

Explicit Pretend – Real Distinction in the Absence of Content Cues

We found that when asked to actually retrieve the real food, most 3-year-olds succeeded on the first trial; most 2.5-year-olds succeeded when asked merely to point to the container with real food. Their performance both deteriorated after the first trial, which might be explained by cognitive interference after the first-trial success, a side bias on the part of some children, or curiosity. Two-year-olds (around 24 months of age) were at chance when asked to make an explicit behavioral choice. Taken together, the findings suggest that by around 2.5 years of age, children start to interpret behavioral cues to pretense correctly: They distinguish between pretend and real acts even when content information is not accessible, and can reason that a pretender is less likely to have real food than is a person who is really eating.

The age change noted between 2 and 2.5 years in the current study is roughly parallel to the age change observed in the pioneering work of Harris and Kavanaugh (1993) and their subsequent research (Harris et al., 1994, 1997; Kavanaugh & Harris, 1994). For example, Harris and Kavanaugh (1993) provided experimental evidence that from around 28 months of age, children were competent in understanding various aspects of others' pretense: They responded appropriately to others' make-believe stipulations or unexpected pretense transformations, and they could comment appropriately on outcomes that had been created by pretense transformations. These results are consistent with our finding that around 2.5 years of age, at least on a single trial children can discriminate between pretend and real acts and infer that real acts are more likely to involve real content.

Some interesting questions arise regarding the role of behavioral and content cues in children's pretense identification. The defining component of pretense is the intention to perform activities in an "as if" mode (Hickling, Wellman, & Gottfried, 1997; Lillard, 2002). As this mental component is invisible, young children have to see through the overt manifestations of pretense, among which are behavioral deviations and absence of real content. Behavioral modifications have been observed across different pretense activities (e.g., Lillard & Witherington, 2004; Lillard et al., 2006; Reissland & Snow, 1996), so it is

possible that behavioral cues may generally signal pretense to the viewers. In the current study, by around 2.5 years of age children could make a pretend–real distinction based on behavioral signs alone, when content information was absent. One question concerns whether such behavioral deviations are necessary to cue pretense to children. In other words, when behavioral cues are not present, can children identify pretense based on content information alone? Another question regards how children learn to associate specific behavioral deviations with pretense. As pretense can be defined as an activity in a simulative mode that is derived from its real counterpart (Garvey, 1977), it is possible that children form the representation of what is real first and later detect any violations to that representation as standing for nonreal or pretense through learning. Exactly how this learning process happens is as yet unclear.

Discrepancy Between Different Behavioral Measures

The second important finding concerns spontaneous responses. Two-year-olds' spontaneous reactions indicating a desire for eating were discrepant with their behavioral choices (Experiments 1 and 2): They showed more desire for eating in response to real acts compared with the pretend ones, but when making an explicit behavioral choice, they were at chance. This discrepancy may be explained in at least three ways.

Simply reading the real actions as real at a tacit level—A conservative view is that the discrepancy in behaviors shown by 2-year-olds reveals an understanding of real actions as real without understanding the pretend acts as pretense. In other words, children may have read the real eating as real actions and acted “appropriately” in response—they swallowed, licked their lips, and reached. They did not engage in such behaviors in response to the ongoing pretense, because they viewed the pretend actions as strange, puzzling, or silly, without necessarily understanding them as pretense or not-real. From this perspective, 2-year-olds responded indiscriminately when asked to locate the real food simply because they could not represent the pretend – real distinction. They could not even represent the distinction at a tacit level.

One possible reason for 2-year-olds' immature ability to discriminate between the pretend and real acts in the current study is the lack of content information. Pretend actions can differ from the real counterparts in terms of the mental components and the behavioral manifestation (Lillard, 2002). In addition, in pretense the necessary materials of the normal activities are often absent (Fein, 1981), which may serve as a critical marker of pretense for young children. Children ages 4 and older can identify pretense based on behavioral cues alone when content information is missing (Richert & Lillard, 2004). Younger children, however, may rely heavily on content cues to determine whether one is pretending or acting for real.

Implicit versus explicit understanding of the pretend –real distinction—A richer explanation concerns implicit versus explicit understanding of the situation. Two-year-olds might understand the pretend–real distinction in the absence of content cues at an implicit level, as suggested by their spontaneous desire for eating in response to real eating behavior rather than pretense, but fail to manifest their understanding at an explicit level when asked to retrieve the real food or point to the container with real food. This type of dissociation between different measures of understanding has been observed in various fields of research (e.g., Ahmed & Ruffman, 1998; Church & Goldin-Meadow, 1986; Hood, Cole-Davies, & Dias, 2003).

One explanation for the dissociation between implicit and explicit understanding is the graded representation hypothesis. Responses at the implicit level may operate with a much

weaker or short-lived representation of the situation, whereas an explicit choice requires a stronger, more complex representation to support the retrieval (Munakata, 2001). For example, in the current study 2-year-olds might have formed weaker representations of the pretend – real distinction that sufficed for their differential reactions when watching ongoing real versus pretend eating behavior. Such weak representations, however, might not be strong enough for the explicit behavioral choice afterwards, due to the greater complexity and effort of retrieving or pointing. With development, young children's abilities to form substantiated representations of the pretend – real distinction become stronger.

In addition to cognitive immaturity in general, credulity toward pretense transmigration may also contribute to 2-year-olds' limited ability to form strong representations of the pretend – real distinctions (or vice versa). Past research suggests that children ages 3 – 7 sometimes believe that what they have imagined may turn out to be true. For example, after pretending that there is a creature inside an empty box, children may peek into the empty box rather than an irrelevant box when left alone as if they thought the imagined creature might have crossed the boundary from pretend into real (Harris et al., 1991; Johnson & Harris, 1994). To our knowledge, no such study has been conducted with children under age 3, but it is quite possible that 2-year-olds may be credulous toward pretense transmigration as well. In the present study, after watching the actor pretending to eat and appearing to enjoy the imagined food, 2-year-olds might believe that the pretend food would magically appear inside the bowl from which the actor pretended to eat. This credulity might further blur 2-year-olds' fragile representations of the pretend – real distinction.

Failure to reveal the knowledge due to semantic novelty—Another richer explanation concerns semantic novelty that might have obscured 2-year-olds' performance. In the current task, children were asked to either uncover or point to a bowl where the *real* food would be. Children might start to understand the meaning of the term *real* sometime between 2.5 and 3 years of age, as indicated by their contrasting the term *real* and *really* with pretense or other nonrealities in their everyday speech (Woolley & Wellman, 1990; Study 1). Children under the age of 2.5 years, however, may not be able to understand such contrasts. By this logic, in the current study 2-year-olds might have differentiated the pretend actions and the real ones—as indicated by their differential spontaneous reactions—but failed the behavioral retrieval or pointing due to trouble in understanding the term *real* as meaning *not pretend*.

Future Directions for Research

One future path for investigation concerns the role of content information. First, in the current study 2-year-olds lacked a clear understanding of the pretend – real distinction when given only behavioral cues with content information hidden. An intriguing question is whether 2-year-olds are capable of the distinction when both content information and behavioral cues are available. Given that the current task requires children to find the real food after watching the pretend versus real actions, restoring information about content in the current stimulus events might not be informative—children might go to the visible, real food directly without interpreting (or even paying attention to) the pretend actions at all. Therefore, a follow-up study with a different testing paradigm is needed to address this question in the future. Second, in the present study behavioral cues were sufficient to signal pretense to children ages 2.5 and older. It is not clear whether the behavioral deviations are necessary to cue pretense to children. A follow-up study will address this question by examining whether 2- to 3-year-olds can make the pretend – real distinction with the aid of content cues alone (e.g., detecting pretense based solely on the absence of real materials), when behavioral cues are not available.

Another question for future examination concerns reasoning demands. In the current task, one premise of successful retrieval is children's understanding that a pretender is less likely to have real stuff than is a person acting for real. This reasoning demand might have hindered 2-year-olds' performance. It might be that providing more explicit information about only one container having the real food could reduce this demand and facilitate children's performance. A follow-up study is underway to test this possibility. To reduce the reasoning demand, before each trial we are showing the child the content inside the two bowls to be used, so the child can see that only one bowl has the real food and that the other one is empty. Then the two bowls are covered out of the child's view and the current procedure begins. If children's performance improved under this condition, we would infer that the demand for making an additional inference in the current study might have hindered children's performance.

Finally, in the current study eating behavior and food were involved. Past research suggests a preparedness in early childhood that facilitates children's performance on theory-of-mind tasks (e.g., recognizing lies and mistakes) in the domain of food and safety, in which problem solving is relevant to survival and has evolutionary significance (Siegal, 1995). It is possible that children's ability to make a pretend–real distinction (implicit or explicit) may emerge earlier in the food domain than in other situations. A future study may apply the current paradigm in a domain other than food, and a more general index of implicit pretend–real distinction may be required, such as differential activations in certain brain regions in response to real versus pretend actions (German, Niehaus, Roarty, Giesbrecht, & Miller, 2004).

Conclusions

This study extends the findings of previous research on when and how young children start to make sense of the distinction between pretend and real behavior, and is the first attempt to examine whether 2- to 3-year-olds can distinguish between pretend and real actions based on behavioral cues alone, in the absence of content information that may be an important marker of pretense for young children. The experiments reported here show an emerging ability to make explicit pretend – real contrasts based on behavioral cues alone around 2.5 years of age. Children's spontaneous responses suggest an inchoate or implicit understanding of the distinction in the absence of content cues at about 24 months of age.

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References

- Ahmed A, Ruffman T. Why do infants make A not B errors in a search task, yet show memory for the location of hidden objects in a non-search task? *Developmental Psychology*. 1998; 34:441–445. [PubMed: 9597355]
- Bourchier A, Davis A. The influence of availability and affect on children's pretence. *British Journal of Developmental Psychology*. 2000; 18:137–156.
- Church RB, Goldin-Meadow S. The mismatch between gesture and speech as an index of transitional knowledge. *Cognition*. 1986; 23:43–71. [PubMed: 3742990]
- Fein GG. Pretend play in childhood: An integrative review. *Child Development*. 1981; 52:1095–1118.

- Flavell JH, Flavell ER, Green FL. Young children's knowledge about the apparent-real and pretend-real distinction. *Developmental Psychology*. 1987; 23:816–822.
- Foley MA, Harris JF, Hermann S. Developmental comparisons of the ability to discriminate between memories for symbolic play enactments. *Developmental Psychology*. 1994; 30:206–217.
- Garvey, C. *Play*. Cambridge, MA: Harvard University Press; 1977.
- Gergely G. Some confusion about pretence-reality confusions. *Developmental Science*. 2002; 5:417–419.
- German TP, Niehaus JL, Roarty MP, Giesbrecht B, Miller MB. Neural correlates of detecting pretense: Automatic engagement of the intentional stance under covert conditions. *Journal of Cognitive Neuroscience*. 2004; 16:1805–1817. [PubMed: 15701230]
- Goldin-Meadow, S. Giving the mind a hand: The role of gesture in cognitive change. In: McClelland, JL.; Siegler, RS., editors. *Mechanisms of cognitive development: Behavioral and neural perspectives*. Mahwah, NJ: Erlbaum; 2001. p. 5-31.
- Golinkoff RM, Hirsh-Pasek K, Cauley KM, Gordon L. The eyes have it: Lexical and syntactic comprehension in a new paradigm. *Journal of Child Language*. 1987; 14:23–45. [PubMed: 3558524]
- Golomb C, Galasso L. Make believe and reality: Explorations of the imaginary realm. *Developmental Psychology*. 1995; 31:800–810.
- Harris PL, Brown E, Marriott C, Whittall S, Harmer S. Monsters, ghosts and witches: Testing the limits of the fantasy – reality distinction in young children. *British Journal of Developmental Psychology*. 1991; 9:105–123.
- Harris PL, Kavanaugh RD. Young children's understanding of pretense. *Monographs of the Society for Research in Child Development*. 1993; 58(1 Serial No 231)
- Harris PL, Kavanaugh RD, Dowson L. The depiction of imaginary transformations: Early comprehension of a symbolic function. *Cognitive Development*. 1997; 12:1–19.
- Harris PL, Kavanaugh RD, Meredith MC. Young children's comprehension of pretend episodes: The integration of successive actions. *Child Development*. 1994; 65:16–30. [PubMed: 8131644]
- Hickling A, Wellman HM, Gottfried GM. Preschoolers' understanding of others' mental attitudes toward pretend happenings. *British Journal of Developmental Psychology*. 1997; 15:339–354.
- Hood B, Cole-Davies V, Dias M. Looking and search measures of object knowledge in preschool children. *Developmental Psychology*. 2003; 39:61–70. [PubMed: 12518809]
- Johnson CN, Harris PL. Magic: Special but not exclude. *British Journal of Developmental Psychology*. 1994; 12:35–51.
- Joseph RM. Intention and knowledge in pre-schoolers' conception of pretend. *Child Development*. 1998; 69:966–980. [PubMed: 9768481]
- Kavanaugh RD, Harris PL. Imagining the outcome of pretend transformations: Assessing the competence of normal children and children with autism. *Developmental Psychology*. 1994; 30:847–854.
- Kochanska G, Murray K, Coy KC. Inhibitory control as a contributor to conscience in childhood: From toddler to early school age. *Child Development*. 1997; 68:263–277. [PubMed: 9180001]
- Lillard, AS. Making sense of pretence. In: Lewis, C.; Mitchell, P., editors. *Children's early understanding of mind: Origins and development*. Hillsdale, NJ: Erlbaum; 1994. p. 211-234.
- Lillard, AS. Just through the looking glass: Children's understanding of pretense. In: Mitchell, RW., editor. *Pretending and imagination in animals and children*. Cambridge, U.K.: Cambridge University Press; 2002. p. 102-114.
- Lillard AS, Nishida T, Vaish A, Massaro D, Ma L, McRoberts J. Signs of pretense across age and scenario. *Infancy*. in press.
- Lillard AS, Witherington D. Mothers' behavior modifications during pretense snacks and their possible signal value for toddlers. *Developmental Psychology*. 2004; 40:95–113. [PubMed: 14700467]
- Ma, L.; Lillard, AS. Naïve theories of what makes a pretend act pretense. University of Virginia; 2006. Unpublished manuscript

- Mumme DL, Fernald A. The infant as onlooker: Learning from emotional reactions observed in a television scenario. *Child Development*. 2003; 74:221–237. [PubMed: 12625447]
- Munakata Y. Graded representations in behavioral dissociations. *Trends in Cognitive Sciences*. 2001; 5:309–315. [PubMed: 11425620]
- O’Sullivan LP, Mitchell LL, Daehler MW. Representation and perseveration: Influences on young children’s representational insight. *Journal of Cognition and Development*. 2001; 2:339–365.
- Piaget, J. *Play, dreams, and imitation in childhood*. New York: Norton; 1962.
- Rakoczy H, Tomasello M, Striano T. Young children know that trying is not pretending: A test of the “Behaving-As-If” construal of children’s early concept of pretense. *Developmental Psychology*. 2004; 40:388–399. [PubMed: 15122965]
- Reissland N, Snow D. Maternal pitch height in ordinary and play situations. *Journal of Child Language*. 1996; 23:269–278. [PubMed: 8936687]
- Richert RA, Lillard AS. Observers’ proficiency at identifying pretense acts based on behavioral cues. *Cognitive Development*. 2004; 19:223–240.
- Rosengren KS, Kalish CW, Hickling AK, Gelman SA. Exploring the relation between preschool children’s magical beliefs and causal thinking. *British Journal of Developmental Psychology*. 1994; 12:69–82.
- Schmitt KL, Anderson DR. Television and reality: Toddlers’ use of visual information from video to guide behavior. *Media Psychology*. 2002; 4:51–76.
- Siegal M. Becoming mindful of food and conversation. *Current Directions in Psychological Science*. 1995; 4:177–181.
- Suddendorf T. Early representational insight: Twenty-four-month-olds can use a photo to find an object in the world. *Child Development*. 2003; 74:896–904. [PubMed: 12795396]
- Walker-Andrews AS, Kahana-Kalman R. The understanding of pretence across the second year of life. *British Journal of Developmental Psychology*. 1999; 17:523–536.
- Wellman HM, Estes D. Early understanding of mental entities: A reexamination of childhood realism. *Child Development*. 1986; 57:910–923. [PubMed: 3757609]
- Woolley JD. Thinking about fantasy: Are children fundamentally different thinkers and believers from adults? *Child Development*. 1997; 68:991–1011. [PubMed: 9418217]
- Woolley JD, Boerger EA, Markman AB. A visit from the Candy Witch: Factors influencing young children’s belief in a novel fantastical being. *Developmental Science*. 2004; 7:456–468. [PubMed: 15484594]
- Woolley JD, Wellman HM. Young children’s understanding of realities, nonrealities, and appearances. *Child Development*. 1990; 61:946–961. [PubMed: 2209198]
- Woolley JD, Wellman HM. Origin and truth: Young children’s understanding of imaginary mental representations. *Child Development*. 1993; 64:1–17. [PubMed: 8436024]

Appendix A

Episode of Real Acts

The actor was really eating from a covered bowl while the pretender was looking at a magazine. The actor looked down into the bowl and said, “Grapes [cheese, cake, or raisins].” Then she ate twice from the bowl (with normal speed and a normal duration of holding food at the mouth) and said, “Mm, yummy grapes [cheese, cake, or raisins].” She ate twice from the bowl again, and said, “Mm.” At the end of the episode, she picked up her magazine and looked at it. The actor spoke with a normal tone throughout the episode.

Episode of Pretend Acts

The pretender was pretending to eat from a covered bowl while the other actor was looking at a magazine. At the beginning, the pretender said, “I’m going to eat some grapes [cheese, cake, or raisins] now!” Her pitch was higher than normal. Then she pretended to eat twice

from the bowl. Pretense was signaled via faster movements, a longer-than-normal duration of holding food at the mouth, exaggerated sound effects, and big smiles after her own actions, as compared with the real eating episode. She pretended to eat twice from the bowl again, and said (with high pitch), “Mm, those were yummy grapes [cheese, cake, or raisins]!” At the end of the episode, she picked up her magazine and looked at it.

Figure 1.
Percentage of correct choice over the 4 trials (Experiment 1).

Figure 2.
Percentage of correct choice over the 4 trials (Experiments 2 and 3).

Table 1

Percentage of Correct Choice on the First Trial by Experiment

Age group	Experiment 1		Experiment 2		Experiment 3	
	N	% Correct (n)	N	% Correct (n)	N	% Correct (n)
2-year-olds	18	50.0 (9)	16	50.0 (8)	—	
2.5-year-olds	16	62.5 (10)	16	81.3 (13)**	12	83.3 (10)*
3-year-olds	16	81.3 (13)**	—		—	
Total	50	64.0 (32)	32	66.0 (21)	12	83.3 (10)*

Note.

* $p<.05$,

** $p<.01$.

Table 2
Mean Spontaneous Reactions on the First Trial and SDs By Experiment and Display Condition

Age group	N	Swallow/lip licking				Reach				Smile			
		Real		Pretend		Real		Pretend		Real		Pretend	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Experiment 1													
2-year-olds	18	0.89**	1.13	0.06	0.24	0.17	0.51	0.06	0.24	0.67	1.09	0.44	0.71
2.5-year-olds	16	1.19**	1.16	0.13	0.50	0.44	1.09	0.25	0.58	0.69	0.87	0.50	1.03
3-year-olds	16	1.50	2.19	0.94	1.18	0.13	0.34	0.25	0.78	1.06	1.12	1.31	1.45
Total	50	1.18**	1.55	0.36	0.83	0.24	0.72	0.18	0.56	0.80	1.03	0.74	1.14
Experiment 2													
2-year-olds	16	0.88*	1.26	0.25	0.58	0.21	0.43	0		0.63	1.03	0.75	1.24
2.5-year-olds	16	1.67*	1.68	0.27	0.59	0.38	0.89	0.13	0.34	0.94	1.12	0.81	0.91
Total	32	1.47**	1.90	0.31	0.64	0.21	0.49	0.07	0.26	0.78	1.07	0.78	1.07
Experiment 3													
2.5-year-olds	12	1.08	1.31*	0.08	0.29	0.17	0.39	0.08	0.29	1.17	1.47	0.92	1.00

Note.

* $p < .05$,

** $p < .01$.

Table 3
Mean Spontaneous Reactions Over the Four Trials and SDs By Experiment and Display Condition

Age group	N	Reach				Smile			
		Real		Pretend		Real		Pretend	
		M	SD	M	SD	M	SD	M	SD
Experiment 1									
2-year-olds	18	1.82 [*]	2.77	0.29	0.77	2.18	3.26	2.29	3.04
2.5-year-olds	16	1.81 [*]	2.34	0.38	0.72	3.69	4.01	3.00	3.74
3-year-olds	16	1.13	1.67	0.75	1.24	5.63	5.33	5.19	3.82
Total	50	1.59 [*]	2.29	0.47	0.94	3.80	4.42	3.47	3.68
Experiment 2									
2-year-olds	16	2.36 ^{**}	1.87	0.86	1.03	2.50	3.92	2.00	2.61
2.5-year-olds	16	2.36 ^{**}	1.78	0.71	0.91	5.50	4.89	4.25	3.87
Total	32	2.38 ^{**}	1.99	0.69	0.81	4.00	4.61	3.13	3.44
Experiment 3									
2.5-year-olds	12	2.00	2.17 [*]	0.33	0.65	4.00	4.61	3.13	3.44

Note.

^{*} $p < .05$,

^{**} $p < .01$.