

Mothers' Behavior Modifications During Pretense and Their Possible Signal Value for Toddlers

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An important issue for understanding early cognition is why very young children's real-world representations do not get confused by pretense events. One possible source of information for children is the pretender's behaviors. Pretender behaviors may vary systematically across real and pretend scenarios, perhaps signaling to toddlers to interpret certain events as not real. Pretender behaviors were examined in 2 experiments in which mothers were asked both to pretend to have a snack and really to have a snack with their 18-month-olds. Episodes were analyzed for condition differences in verbal and nonverbal behaviors, including smiling, looking, laughter, and functional movements. Reliable differences were found across conditions for several variables. In a 3rd experiment, children's apparent understanding of pretense in relation to their mothers' behaviors was examined, and significant associations were found with some of the mothers' behavioral changes but not others. This work provides a first inroad into the issue of how children learn to interpret pretense acts as pretense.

Pretend play is a significant activity of childhood, noted for its conceptual links to many of those activities that some consider hallmarks of the human species. It appears to involve the symbolic capacity, like language, because one entity represents another entity (Piaget, 1945/1962; Werner & Kaplan, 1963). Several researchers have noted pretending's links to hypothetical reasoning, planning, and creativity (Bretherton, 1984; Harris, 2000; Kavanaugh & Harris, 1999; Rubin, Fein, & Vandenberg, 1983). In each case, events that are not real are carried out in the imagination.

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Walton (1990) argued that all human art forms—painting, music, literature, and so on—are an outgrowth of our ability to pretend. The participant suspends current reality to take part in that which is depicted, or heard, or read about. Several important aspects of human cognition and culture are thus linked to pretense.

Pretend play begins in the 2nd year and is in full swing by about 24 months of age (Fein, 1981; Nicolich, 1977). Even before age 3, children spend a significant proportion of their play time engaged in pretense activities (Dunn & Dale, 1984; Haight & Miller, 1993). In an important line of work, Harris and Kavanaugh (1993) have shown that children as young as 2 years of age can make appropriate pretense interpretations in experimental settings.

Yet American mothers pretend with even younger children (Farver, 1992; Haight & Miller, 1993; Howes, Unger, & Matheson, 1992; Kavanaugh, Whittington, & Cerbone, 1983; Tamis-LeMonda & Bornstein, 1991). Very young children are still learning a great deal about the real world, and yet their mothers simultaneously present to them distortions of that world. It is vital that children not take these distorted pretense activities as real. As Leslie (1987) pointed out, to do so would garble the developing representational system. Leslie illustrated this with the example of a mother talking into a banana as if it were a telephone. If the child read her behavior literally, he or she might be expected to consider bananas as an alternative form of telephone. Banana representations and telephone representations would then be freely intermingled, so (to the child's mind) the mother might attempt to peel and eat telephones and to answer bananas when the phone really rings. Such confusions would be created every time a child watched a parent pretend. As a result, children whose parents pretended in front of them would be mixed-up youngsters, going about eating telephones and answering fruit. Imaginary object pretense would also be problematic if children did not make pretense interpretations. The child might assume the mother's hand was also a telephone and try to answer it when hearing a ring.

Although young children surely do sometimes get confused about what is real and what is pretend, even children whose parents

pretend in front of them appear to have a reasonably intact understanding of the real world. This suggests that the pretend is rarely confused as the real. Systematic research supports this conclusion as well (DeLoache & Plaetzer, 1985; Harris, 2000; Lillard, 2002; Woolley, 1997). The important question here is why is this the case? What enables children to quarantine pretense events so they are not confused with real ones? This question has two aspects. First, what is the cognitive architecture that enables one to keep pretend and real representations of the world separate, especially given that aspects of the real continue to be represented in pretense? Second, what signals when to employ that architecture and interpret events as pretense? The former question is being taken up by some cognitive scientists (Leslie, 1987; Nichols & Stich, 2000). The latter is the topic addressed here.

One obvious possibility for how children detect pretense is that they know about the real world and that *any* “wrong” act or object is seen as pretense. Deviant acts or content certainly could often be an important cue to pretense. When a child watches a parent “eat” off an empty spoon, the lack of content on the spoon may well be the sole cue to pretense: There is no food there, and so the person must be pretending. However, if one considers the variety of cases of pretense a child will encounter, it appears that deviant acts or deviant content cannot always be the sole cues. One problem with such an interpretation is that it would lead to every deviant or incorrect action being labeled as pretense (“If mother spills juice, she must be pretending to make a river”). Instead, 2-year-olds appear to make the reverse error. Rather than interpreting thwarted intended acts as pretense, they incorrectly interpret pretense as if it were a thwarted intentional act (Rakoczy, Tomasello, & Striano, 2003). In other words, if they watch someone pretend to write with a pen, 2-year-olds imitate the person by really writing, apparently missing the pretend intention. If the person tries to write with the pen (but fails), the child also really writes with the pen. Young children do not appear to interpret every deviant act as pretense, which suggests that deviance does not always cue pretense.

A second problem with deviant content and action cues is that young children are just learning about the world, and hence a great deal of content and many acts are new for very young children. A child watching someone drink from a “juice box” for the first time cannot see the juice, so how can the child know the person is not pretending? When a father uses an electric shaver on a barely visible beard, the blade action is not readily visible. Why is he seen as really shaving on one occasion but as pretending to shave on another? Although knowing about the real world, and thus knowing what is deviant, can certainly explain children’s pretense interpretations in many cases, it cannot always do so. The issue taken up in the present work is what else, besides content cues, might assist children’s pretense interpretations, enabling them to keep pretense and real-world representations separate.

Another set of factors that might assist pretense interpretations is young children’s social cognitive skills. Three skills in particular that toddlers have by 12 to 18 months may go some way in assisting their early understanding of pretense. One such skill is the reading of intentions. It has been shown that 18-month-olds can read intentions into adults’ incomplete acts (Carpenter, Akhtar, & Tomasello, 1998; Meltzoff, 1995). Pretense acts are often incomplete. For example, in pretending to eat, a person might raise a spoon to his or her mouth but not complete the act of putting it inside the mouth. Children must read through the incomplete

pretense act to its intended meaning. Reading intentions is a skill that could assist children in understanding pretense, and they appear to have that skill at least by 18 months.

Another skill that children might bring to bear in interpreting pretense is that of joint attention (Scaife & Bruner, 1975). Following another person’s pretense requires that one jointly attend to the other person’s actions and the objects the person interacts with, to see those actions and objects in the same way that the other person sees them. “Joint attention is, in effect, a ‘meeting of minds.’ It depends not only on a shared or joint focus, but on a shared context and shared presuppositions” (Bruner, 1995, p. 6). Pretense is about such presuppositions: One supposes that a banana is a telephone, and then one acts accordingly. Joint attention skills, which emerge around the end of the 1st year (Carpenter, Nagell, & Tomasello, 1998), seem germane to pretense interpretations.

The third skill, intimately related to joint attention processes and functional by 10 to 12 months of age, is social referencing. In ambiguous situations, a young child will turn to reference a trusted adult’s emotional expression directed at the ambiguous situation. The child then adopts the adult’s emotional stance toward the situation (Campos, 1980). Pretense acts can be ambiguous: From a literal point of view, why in the world would mother be talking into a banana or “eating” from an empty spoon? The adult’s attitude toward his or her own acts may be one of amusement, and he or she may smile at his or her own actions. Indeed, in Piaget’s (1945/1962) descriptions of his own children’s early pretense acts, he often mentioned his children’s smiles as indicators to himself that they were pretending. If adults smile when pretending, and those smiles appear to be in reference to pretense acts, then children might use adults’ smiles as a guide to how to interpret those acts.

Yet just as content cues alone seem insufficient for all pretense interpretations, these social cognitive skills alone do not always suffice either. Certain adult behaviors are necessary for these social cognitive skills to be usefully applied, and pretending adults may assist children by presenting pretense acts in ways that might facilitate their interpretation (Karmiloff-Smith, 1992). Behaviors that parents might use to signal pretense to children are considered next.

Signs of Pretense

Three literatures suggest possible signs of pretense that parents might use in presenting pretense acts to young children: the literature on pretense behavior, the literature on human play fighting, and the literature on play fighting in animals.

The first of these literatures deals particularly with the verbal means by which preschoolers create the *as-if* world. The word *pretend* (as in “Pretend you hated baby fish.”) is perhaps the most direct way to specify pretense, and even preschoolers use it, but not regularly until about 5 years of age (Corsaro, 1986; Furrow, Moore, Davidge, & Chiasson, 1992; Garvey & Berndt, 1975; Giffin, 1984; Lloyd & Goodwin, 1995; Sawyer, 1997; Schwartzman, 1978).

Direct statements without the word *pretend* can also indicate entry into the pretend mode and can specify pretend identities. In these cases, an item that the pretender and the partner both know is often purposely mislabeled. For example, Matthews (1977, p. 214) described a 4-year-old who asked, “Where is the oven?” and

then proceeded to a cupboard and said, "This is the oven," making known the pretense identity of the cupboard. Kavanaugh et al. (1983) noted that mothers even used such "in-frame" labeling of alternate identities to convey pretense to toddlers. Why wrong labels are accepted as temporary stand-ins (rather than permanently leading to mapping errors) and how the word *pretend* is learned in the first place are both important issues for research in cognitive development.

Special linguistic forms are also used during preschooler's pretense. These include tags and the subjunctive tense (Auwarter, 1986; Garvey, 1990, 1993; Giffin, 1984). Garvey and Kramer (1989) also found that children use more past tense verbs, future auxiliaries, modals, temporal expressions, and formal proposals in pretense episodes. Whereas these may be useful cues to the pretense mode for preschoolers, they are unlikely to serve that purpose for toddlers, whose syntactic skills have not yet attained this level of sophistication. With younger children, Reissland (1998) has documented that parents use different frames when pretending than when instructing. When instructing 11- to 15-month-olds to drink from a cup, parents directly told their children what to do; when urging children to feed a doll from a cup, parents used indirect methods of persuasion (i.e., "Do you think she's thirsty?"). Reissland (1998) hypothesized that these different frames provide "a basis for differentiation between the contexts of play and non-play situations before the children have the language capability or conceptual ability to encode and understand play and non-play interactions" (p. 372).

Reissland and Snow (1996) found that parents also vary the pitch and pitch range of their speech in pretend and instructional situations with young children. With both 11- and 15-month-olds, parents spoke at a higher pitch when pretending. In addition, at the younger but not the older age, the pitch range was broader in pretense than in the real situation. Reissland and Snow suggested that a pivotal factor in the use of pitch range for the younger children was that they did not exhibit pretense behaviors themselves, whereas the 15-month-olds did. Perhaps expanded range is a cue to pretense that is dropped as children begin to understand pretense.

DeLoache and Plaetzer (1985), Farver (1992), and Nicolich (1977) all noted sound effects (i.e., "vroom vroom" when pretending about cars) during children's pretense. Such behaviors might signal that an act is pretense if the sound is clearly different in nature or source from sounds that would naturally be emitted during or as part of the real event being enacted. Sound effects might also cue what is symbolized by various objects or events in pretense. A second nonverbal noise that might cue pretense in humans is laughter. Piaget (1945/1962) appears to have relied on his children's laughter as a signal to himself that they were pretending, and Garvey and Berndt (1975) also noted that pretense episodes are sometimes signaled by giggles. Studies of play fighting have suggested that laughter is often a cue that a fight is not real (Boulton, 1993; Smith, 1997), and recent work suggests that some animals make sounds that could be akin to laughter when they engage in play. In particular, Knutson, Burgdorf, and Panksepp (1998) identified a high-pitched chirp that rats make when anticipating play, and Simonet (2001, July) found that dogs emit broad-frequency exhalations during play. These "laughs," when played over a loudspeaker, elicit play initiation behaviors in other rats and dogs, respectively.

Smiles might also serve to cue pretense, providing a key condition for social referencing. Piaget (1945/1962) claimed that "the smile of the child is enough to show that it is perfectly conscious of pretending" (p. 32). Studies of play ("pretend") fighting in humans suggest that people rely on smiles, as well as laughter, to determine when a fight is real versus play (Fry, 1987; Smith, 1997). Play faces are exhibited by nonhuman primates, suggesting an evolutionary history of this play signal (Eibl-Eibesfeldt, 1989; Van Hoof, 1972). In addition to the mere presence of a smile, smiles might be important for what they refer to. Sometimes people smile from overall mood, but other times they smile in response to particular events. Perhaps smiles with reference to pretend behaviors provide a cue to pretense. Although smiles do seem a likely signal of pretense, there are notable dissenters from this view (Fein, 1979; Huttenlocher & Higgins, 1978), which makes empirical investigation important.

Smiles during pretense might also have unique configurations. People often refer to the "knowing smile" (as in Kavanaugh & Engel, 1998; Wellman & Hickling, 1993), but we know of no specification of what makes a smile "knowing." Ekman (1992) described 18 unique facial configurations associated with smiles emitted in specific types of situations but did not mention a "knowing" type (see also Van Hoof, 1972). However, people have been found to exhibit more *Duchenne smiles*, which involve the lip corners and muscles around the eyes, during real enjoyment than during feigned enjoyment (Frank, Ekman, & Friesen, 1993). In addition, following speculations by Ekman and Friesen (1982), Frank et al. (1993) noted that feigned facial expressions were of longer duration (≥ 4 s) than genuine expressions. Pretending with toddlers might really be enjoyable to mothers, leading to more smiles of a genuine nature. Alternatively, mothers also might smile during pretense in order to signal to children not to take the activity seriously. Such smiles might not be genuine *Duchenne smiles* and might be longer in duration.

Because pretending, particularly by a parent in front of a child, is a joint activity, it might also be accompanied by increased eye contact. "Social visual behavior may be used to gather information about others and serve as a signal to others of one's actions" (Fehr & Exline, 1987, p. 228). Parents might look at the child during pretense to gather information about whether the child understands the pretense acts or even simply whether the child is attending to the parent's facial expression. Parents might also look to the child to signal to the child to watch the pretense activities. When the child looks at the parent, the parent might then immediately direct his or her own gaze to the activity to signal to the child to look there also. Using eye gaze in this manner is a phylogenetically old action (Emery, 2000) that could subserve joint attention. Children also tend to engage more with adults who look at them (Hains & Muir, 1996), and parents may look at children to encourage such engagement so as not to be pretending alone.

Regular variations in movement, such as exaggeration (Leslie, 1991) or truncation, are another means by which pretense might be signaled. For example, in pretending to cry, one might exaggerate wiping the eyes, doing so more frequently or with longer strokes than one might use in real life. Such movement thus becomes gesture, intended to convey meaning. Several investigators have suggested that there are such variations in movement in pretense (Kavanaugh & Engel, 1998; Nicolich, 1977; Rubin et al., 1983), and the play fighting literature (in humans and animals) supports it

(Boulton, 1993; Mitchell, 1993; Symons, 1978). The fact that young children appear to be sensitive to goals (Gergely, Nadasdy, Csibra, & Biro, 1995; Woodward, 1998) suggests that they might notice when actions extend beyond goals or fall short of them, making this a useful sign of pretense. It is also possible that gestures occur at a faster or slower rate during pretense and that odd duration serves as a cue. Other research has shown that toddlers are sensitive to the timing of actions (Lewkowicz, 2000).

Regarding frequency, Giffin (1984) noted that children used verbal repetition such as “cooky, cooky, cooky” to denote the cooking of food, which can occur in speeded-up time, in pretense. This same verbal repetition might also occur with movements, such that in pretense one would wipe the eyes (for example) more often than one would wipe them in reality. Symons (1978) suggested that animal play is characterized by events being repeated more often than in real life. In sum, the quantity, timing, and length of movements might regularly differ in pretense episodes. Finally, pretense may involve unique gestures, such as the play bow of canines (Bekoff, 1977), or unique gesture combinations.

In sum, how young children know to categorize some events as real and others as pretend is a mystery. Content cues may often help, as might children’s social cognitive skills, but they do not appear to tell the whole story. We hypothesized that in early pretense interactions, children’s comprehension is also assisted by adults’ altering of their behaviors during pretense in ways that might signal pretense. In this study, we conducted two experiments aimed at investigating this hypothesis by examining parent behaviors in front of toddlers across pretend and real scenarios. Specifically, mothers and their 18-month-olds were brought into the laboratory, where the mothers were asked to pretend to have a snack and to really have a snack with their child. Eighteen months of age was chosen because children have usually begun to pretend by then but their pretending is still emergent. We thus believed that mothers would still need to signal pretense fairly strongly at this age. Snacking was considered an ideal scenario in which to examine how behaviors change during pretense. Most 18-month-olds have been eating on a daily basis for 9–12 months, and they regularly observe others eating, so it is an activity they know well in its real form. In addition, it is an activity for which one can easily hold several variables constant across pretend and real situations in the laboratory. In contrast, pretending with cars and really driving a car tend to involve rather differently sized vehicles; pretending to put a doll baby to sleep could not easily be matched with actually putting a real baby to sleep (with the 18-month-old serving as audience in both cases), and so on. Although some aspects of the findings might be particular to snacking situations, having snacks was deemed to be an ideal starting point for examining whether mothers’ behaviors would change in a reliable way when pretending. Within the snack scenario, many behaviors (eating, drinking, pouring, talking, looking, smiling, and so on) were examined.

The scenarios presented to toddlers involved real dishes but used, for the pretense condition, imaginary juice and Cheerios. This decision was made because if a substitute for juice (such as water) had been used, real drinking might well have ensued for several mothers, diminishing the presentation of a pretense act. For consistency with drinking, imaginary Cheerios were also used. An opaque pitcher with a lid was used for the juice, and the Cheerios were placed in a serving bowl whose sides were tall enough that

the infant could not see the bottom of the bowl when it was placed near the mother, as it was at the beginning of each session. One might argue that using imaginary objects involves a different set of cues than does using substitute objects and thus that the present experiments are not relevant to the issue of how children avoid referential abuse in pretense. Although this raises an empirical question, our assumption is that they do not. Regardless, even in the case of imaginary object pretense, the potential for abuse remains. Children might think that “telephone” also refers to the mother’s hand, her hand engaged in particular behaviors, the air, and so on.

The ecological validity of this method should also be addressed, because different behaviors might occur in a more natural situation, such as the home, than occur in the laboratory. Two reports in the literature suggested there would not be home–laboratory differences. McCune-Nicolich and Fenson (1984), in a discussion of methods used in pretend play research, concluded that the results of work investigating pretend play in laboratory situations versus in home situations did not differ. Bornstein and his colleagues systematically tested for differences and found that children pretend the same amount and at the same level in home and laboratory situations (Bornstein, Haynes, Legler, O’Reilly, & Painter, 1997). Despite these reports, to investigate this issue, we ran the procedure described below in the home and the laboratory with six pilot children. The results revealed no important differences in how mothers behaved across the home and laboratory situations and yielded consistent pretend–real condition differences. The lack of important differences in pilot work, coupled with the higher degree of control allowed by the laboratory, led to the choice of the laboratory for this initial study of what behaviors are available to toddlers when parents pretend with them.

Experiment 1

Method

Participants. Thirty-six 18-month-olds (mean age = 18 months; range = 17 months 2 weeks to 18 months 2 weeks) and their mothers participated. Seventeen were boys, and 19 were girls. Mothers were contacted from a database of toddlers born 18 months previously in the two major hospitals in a small metropolitan area of the United States. Most of the children were White and from middle- and upper-middle-income homes.

Setting. The experiment took place in an approximately 3 × 4 m laboratory room equipped with a one-way mirror and a 0.75-m square table, with an adult chair on one side and a clip-on high chair on the other. A “fly swatter” microphone was placed on the wall adjacent to the table to record sound from both mothers and children. A video camera positioned on top of a tripod approximately 2 m behind the mother’s chair captured an image of the child’s upper body. In an adjoining room, behind the one-way mirror, two video cameras on tripods captured images of the mother. One captured her face only, and the other, her entire upper body. Each mother knew she was being videotaped but never saw the cameras that were focused on her. Each camera was linked to a separate VCR, producing three recordings for each session that were synchronously time-stamped with readings specific to one thirtieth of a second.

Materials were two sets of opaque dishes, one blue and one red, that were each used for either the pretend or the real conditions. Except for color, the dish sets were identical and included two eating bowls, two drinking cups, a metal serving bowl, and a metal pitcher. In the real condition only, the serving bowl contained Cheerios cereal and the pitcher contained juice. A paper napkin was supplied for each condition.

Procedure. Prior to testing, mothers and their children were brought to a waiting room in the laboratory, where the experimenter reiterated what had been said in a phone invitation, namely that the study concerned parent-child interactions. There was no mention of the fact that pretense was the focus of the investigation. Specifically, the experimenter said, "We are interested in how children react to their parent's actions. What I will ask you to do today is to perform some basic actions, like eating Cheerios. While you do this we'll be recording both you and your child so that we can go back later and watch how your child reacts to your actions. This should take about 10-20 minutes to complete." Mothers were then asked to read and sign a consent form and were provided more details about the experiment. Those who received the real condition first were told,

All I want you to do is to sit at a table with your baby and have a snack of Cheerios and juice, just as you might do at home. I will be in the next room, so we can't talk while you're doing this, but I'll be back afterwards to answer any questions you might have. Just make sure that you actually eat some Cheerios and drink some juice. If [your baby] is not good at drinking out of cups, just give [him/her] a tiny bit of juice to work with. We'd like you to do this for a couple of minutes, until I come back in. We want you to be as comfortable as possible and to act in your usual way with [your baby]. Do you have any questions?

During this time, children were allowed to play with toys. Following this, they were taken to the nearby laboratory room for testing. Three children became upset when their mother attempted to separate them from the toys. Because the primary purpose was to view the mothers' behaviors, these children were allowed to keep a toy during the session. Mothers' behaviors for these 3 children did not appear to be affected. Once in the testing room, the children were buckled into the clip-on high chair, and mothers were seated in a swivel chair across from the child. Mothers were then presented with the snack supplies; each utensil was placed in a predetermined location that was consistent across participants and conditions. Mothers were reminded again to eat and drink, to act just as they would at home, and to wait until they heard the tap on the glass to begin. The experimenter then left the room.

After 2 min of recording time, the experimenter returned and said, "OK, you did a great job." As she cleared away the first set of snack utensils and placed out the second set, she said, "Now for the second part of the study, I want you to pretend to have a snack of Cheerios and juice, just like you might do while pretending at home. Once again, make sure that you pretend to both eat the cereal and drink the juice. I'll come back in a couple of minutes when it is time for you to stop. Do you have any questions?"

The pretend-first condition was basically identical to the real-first condition. Half of the mother-child pairs participated in the pretend condition first, and the other half participated in the real condition first.

Following the two snack episodes, the experimenter, the mother, and the child returned to the waiting room, where the mother was asked to rate her comfort level during the procedure and to describe the child's pretense experience and social experiences more generally. Finally, mothers were debriefed as to the purpose of the study.

Coding. Tapes of the mother were coded for verbal behavior, nonverbal noises, facial expressions (specifically, smiles), functional movements, and looking patterns. Twenty percent of the sessions were coded by a second coder for reliability purposes. Because of the presence of Cheerios and juice in the real condition only, it was not possible for coders to be blind to condition, but at least one coder for each of the reliability sessions was naïve to the hypotheses. Interrater reliability for all frequency measures was assessed in terms of percentage of agreement, which was calculated by dividing the number of agreements by the total number of agreements and disagreements. Interrater reliability for all duration measures was assessed by means of a Pearson correlation. The baby videotapes are discussed in Experiment 3.

Smiles: Videotapes of the mother's face were coded for the presence of smiles. A smile was defined as the retraction of both lip corners backward and upward to create a semicircular curve. Because some mothers maintained a grin throughout a session, baseline smiling level was first coded as -1 (downturned mouth), 0 (flat mouth), or 1 (fairly constant grin), and discrete smiles were coded relative to baseline for frequency and duration. Interrater agreement for the smiles coding was 89%. Cohen's kappa was calculated using .5 as the proportion of agreement one would expect by chance; the resulting kappa was .78. The interrater correlation coefficient was .86 for duration measurement. Apparent smile referents were also coded. Smiles were coded as referring to the mother's own action, to the child's action, to the child's confusion, as a greeting smile not apparently referring to anything, or as ambiguous with respect to referent. The interrater agreement for smile referents was 85%, and kappa was .81.

Looks: The mother's looking behavior was coded for looks specifically directed at the child's face, those directed at some aspect of the task (e.g., the utensils, napkin, food), and those directed elsewhere. The sum of the time spent looking at the task and at the child was calculated as a measure of visual attention to the child. The frequency of looking at each location was also noted. Because some mothers might tend to move their eyes from place to place more rapidly in general, look frequency was analyzed as the proportion of looks at the child versus at the task. The interrater agreement for looks coding was 94%, kappa was .88, and the interrater correlation coefficient was .98 for duration measurement.

Functional movements: Mothers' functional movements pertaining to the tasks of eating, drinking, pouring, and serving were coded. Following a tabulation of these four actions, the duration in milliseconds of functionally distinct segments for three of the actions was measured. Eating gestures involved an approach phase, in which the mother's hand moved toward her mouth from the bowl (with food in the real condition and imaginary food in the pretend condition), and a hold phase, in which the mother's hand remained at her mouth before being removed. Drinking gestures also involved an approach phase, in which the cup was moved toward the mother's mouth, and a hold phase, in which the cup remained at her mouth before being removed. Pouring gestures involved an approach phase, in which the pitcher and the cup were moved together; a rotating phase, in which the pitcher was rotated in order to initiate pouring; and a hold phase, in which the pitcher and cup were held in place while completing the pour. Serving gestures were not segmented because mothers varied in the manner in which they served Cheerios, sometimes pouring from the bowl, sometimes scooping with one hand, and so on. The interrater agreement for functional movements coding was 98%, kappa was .98, and the interrater correlation coefficient was .91 for duration measurements.

Verbal behavior: Two coders transcribed all sessions. One coder created a full transcription, and the second coder checked that transcription against the original taped session and edited the transcription as necessary. Each final transcript was then coded for several potentially relevant references. First, a total word count was made for each condition, and the number of discrete word references mothers made to various aspects of the snack situation was tabulated. References to objects involved in the snack (e.g., *bowl*, *dish*, *cup*, and *glass*), references to the snacking behaviors of eating and drinking (*bite*, *nibble*, *eat*, *sip*, and *drink* as a verb), and references to the actual items of consumption (*cereal*, *snack*, *Cheerios*, *juice*, and *drink* as a noun) were specifically coded as distinct categories of verbalization. Use of the word *pretend* was also noted. Interrater agreement for all verbal coding was 90%, and the kappas were .94.

Nonverbal noises: All noises that appeared to be deliberately produced by the mother that were not natural by-products of her actions were coded and categorized as either sound effects or comment noises. Sound effects were noises apparently intended to mimic sounds made during the course of eating (e.g., biting, chewing noises), drinking (e.g., sipping, swallowing noises), serving (e.g., noises reflecting the movement of cereal from bowl to bowl or the dropping of cereal in the bowl), and pouring (e.g., noises

accompanying the flow of water from pitcher to cup). Comment noises such as laughter and "mmm" were also coded. Interrater agreement for nonverbal noises was 78%.

Results

A preliminary concern involved examining how normal and comfortable the testing situation was for the parent-child pairs. On the posttest questions, 33 of 36 mothers said they did pretend with their children. Twenty-four said they pretended daily, and 9 said they pretended weekly or a few times a week. Twenty-two of the 33 pretenders said they had even pretended the same things they pretended during the experiment. Mothers also reported feeling comfortable in the experimental setting, with a mean comfort level of 4.45 (*pretty much at home*) on the 1-6 scale. These data suggest that our procedure was in the realm of ordinary parent-child interaction for our sample.

The behavioral data were coded from the videotapes. Across all dependent variables, only one significant main effect of condition order and one of sex were evident; these were not considered sufficiently interesting to discuss. Data were collapsed across these variables for subsequent analyses, which, except where noted, were conducted using two-tailed, paired *t* tests comparing the pretense and real conditions.

Smiling. Smiling was coded relative to baseline facial expression. One mother was coded as maintaining a fairly constant grin under both conditions, 8 were coded as maintaining a smile in the pretend condition only, and 1 was coded as maintaining a constant grin only in the real condition, which was significant by the binomial test. This last mother was in the real condition first, and her grin subsided gradually throughout that session. She smiled frequently in the pretend condition, but her resting expression was usually neutral.

The number of discrete smiles, relative to each mother's baseline, was significantly greater in the pretend ($M = 7.72$, $SD = 3.16$) than in the real ($M = 5.00$, $SD = 2.72$) condition, $t(35) = 4.98$, $p < .01$. The mean duration of individual smiles was significantly longer in the pretense condition, where smiles lasted on average 4.69 s ($SD = 1.90$), versus 3.73 s ($SD = 1.72$) in the real condition, $t(35) = 2.88$, $p < .01$. As follows from these results, the total mean time smiling was also greater in the pretense condition ($M = 34.82$ s, $SD = 16.27$) than in the real condition ($M = 18.86$

s, $SD = 11.95$), $t(35) = 5.63$, $p < .01$. Furthermore, in pretending, there were more long smiles lasting over 4 s ($M = 3.31$, $SD = 1.93$) than there were in the real condition ($M = 1.75$, $SD = 1.38$), $t(35) = 4.25$, $p < .01$.

Smile referent. Mothers' smiles usually appeared to be about either their own or the child's action. In the pretense condition, the percentage of smiles about the child's action ($M = 52\%$, $SD = .25$) did not differ from the percentage of smiles about the mother's own action ($M = 41\%$, $SD = .24$). In the real condition, however, 76% of the mother's smiles appeared to be about the child's actions ($SD = .27$), whereas just 19% appeared to be about the mother's own action ($SD = .27$), $t(33) = 6.75$, $p < .01$ (see Figure 1). Comparing across conditions, we found that mothers smiled significantly more often at their own actions in the pretend condition than in the real condition, $t(33) = 4.94$, $p < .01$.

Looking. Looking at the child versus at the task was examined in terms of the sum of the looking time and in terms of the relative frequency of looking at the child versus at the task. For the sum of the duration of time spent looking at each location during the 2 min, there were mean differences both for task and child, as shown in Figure 2. Mothers spent more time looking at the child overall in the pretend condition than in the real condition, $t(35) = 5.80$, $p < .01$, and they looked more at the task in the real condition than in the pretend condition, $t(35) = 5.87$, $p < .01$.

Functional movements. Overall, mothers engaged in more snack-related movements (pouring, serving, eating, and drinking) during pretense ($M = 16.0$, $SD = 4.21$) than during real snacking ($M = 12.94$, $SD = 2.95$), $t(35) = 5.10$, $p < .01$. This pattern of significance held for drinking and serving and emerged as a trend for pouring.

The mean length of time spent on different segments of actions also varied by condition (see Figure 3). Approaches were significantly shorter for pretend eating ($M = 0.54$ s, $SD = 0.13$) than for real eating ($M = 0.76$, $SD = 0.18$), $t(35) = 6.95$, $p < .01$, and for pretend drinking ($M = 0.76$, $SD = 0.20$) than for real drinking ($M = 1.00$, $SD = 0.37$), $t(35) = 4.74$, $p < .01$. Holding actions were significantly longer for pretend eating ($M = 0.64$, $SD = 0.39$) than for real eating ($M = 0.47$, $SD = 0.23$), $t(35) = 2.33$, $p < .05$, and significantly shorter for pretend drinking ($M = 1.63$, $SD = 0.60$) than for real drinking ($M = 2.05$, $SD = 0.65$), $t(35) = 3.10$,

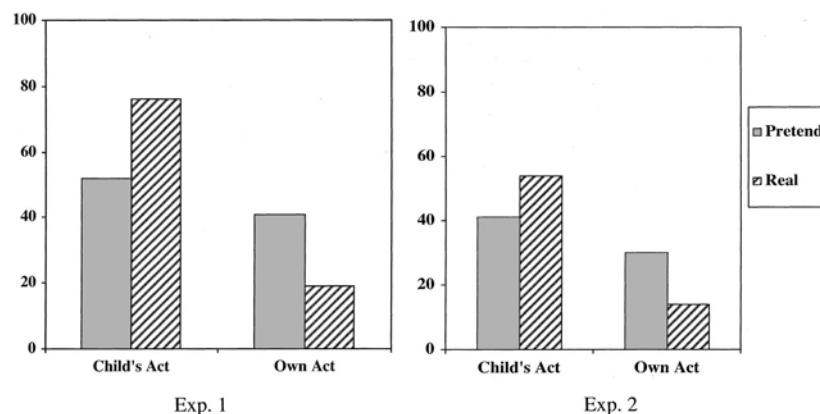


Figure 1. Frequencies of mothers' smiles in response to the child's versus their own acts. Exp. = experiment.

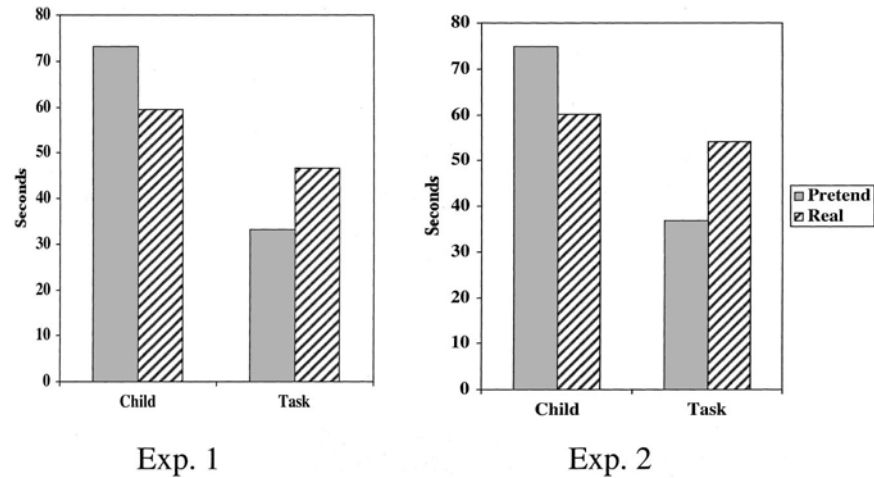


Figure 2. Mean sums of the durations of looking at the child versus looking at the task in each condition. Exp. = experiment.

$p < .01$, and for pretend pouring ($M = 0.56$, $SD = 0.37$) than for real pouring ($M = 1.02$, $SD = 0.48$), $t(35) = 6.51$, $p < .01$.

Verbal behavior. Overall word count indicated that mothers talked more in the pretense condition ($M = 138$ words, $SD = 48$) than the real condition ($M = 114$ words, $SD = 40$), $t(35) = 3.43$, $p < .01$. To compensate for these differences across conditions, we used proportions in most word analyses.

The word "pretend": The word *pretend* was used a mean of 0.97 ($SD = 1.86$) times in the pretend condition (and never in the real one). Twenty-three mothers never used it at all, 9 used it 1–3 times, and 4 used it 5–7 times.

Object and action references: There were proportionately more references to concrete objects (cup and plate) in the pretend condition (4.22/138, or 3.04%, $SD = 4.49$) than in the real condition (1.86/114, or 1.67%, $SD = 2.00$), $t(35) = 2.56$, $p < .05$. Pretend behaviors (eating and drinking) were also referred to significantly more (5.11/138, or 3.7%, $SD = 4.44$) than were real

ones (2.31/114, or 2.0%, $SD = 2.04$), $t(35) = 3.62$, $p < .01$. The percentages of references to the consumables that were imagined in the pretend condition and actually present in the real condition (Cheerios and juice) did not differ across conditions (10.50/138, or 7.6%, $SD = 6.62$, for pretend; 8.47/114, or 7.5%, $SD = 4.43$ for real).

Nonverbal noises. The mean number of sound effects produced was 11.11 ($SD = 5.36$) in the pretend condition, and 0.03 ($SD = 0.17$) in the real condition, $t(35) = 12.52$, $p < .01$. (In the real condition, 1 mother made one artificial drinking noise.) In the pretend condition, the majority of sound effects were eating noises ($M = 6.39$, $SD = 4.04$), followed by drinking noises ($M = 3.08$, $SD = 2.09$), pouring noises ($M = 1.14$, $SD = 1.93$), and serving noises (such as "clink clink" when pretending to drop Cheerios onto the plate; $M = 0.50$, $SD = 0.70$).

Mothers laughed an average of 2.28 times ($SD = 2.22$) in the pretend condition and 1.75 times ($SD = 1.61$) in the real condition,

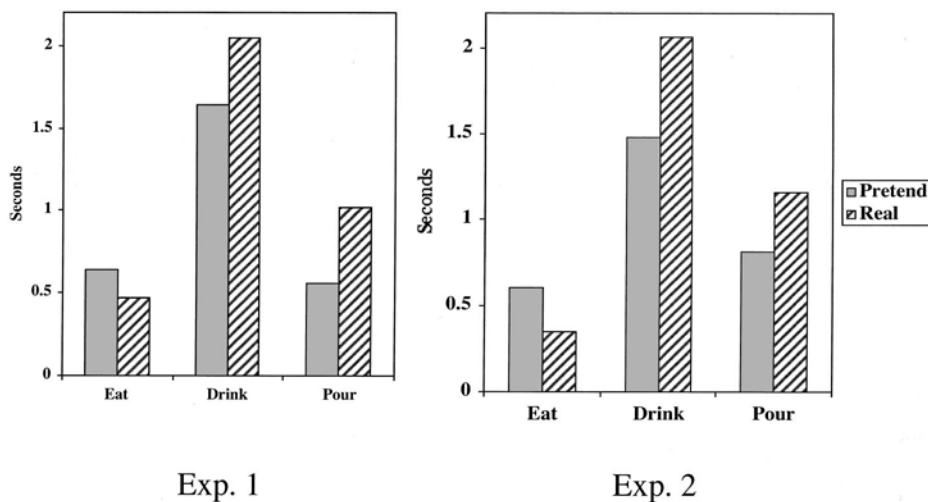


Figure 3. Mean durations of the hold phase of functional movements. Exp. = experiment.

which was not a significant difference. The mean durations of individual laughter instances were not different in the two conditions. Mothers did make more phonetic comments (“mmm”) in the pretend condition ($M = 7.47$, $SD = 5.48$) than in the real condition ($M = 5.42$, $SD = 3.38$), $t(35) = 2.46$, $p < .05$.

Discussion

This experiment showed that mothers varied their behaviors in systematic and regular ways when pretending to have a snack, versus when really having a snack, with their 18-month-olds. In terms of verbal behavior, they talked more during pretense and referred more often to observable actions and objects such as their drinking motions and the cups. They did not refer more to the absent pretense objects (juice and Cheerios).

Providing conditions for social referencing, they did look at their children more when pretending than when engaging in eating a real snack. They also smiled more in the pretense condition than in the real condition, and their smiles were significantly longer. One might wonder about the degree to which this was due to a coding issue, for example, to mothers looking down more during the real condition. The positioning of the camera was low enough that mothers' smiles were clearly visible despite such changes in head position. There were more long (>4 s) smiles during pretense, in keeping with findings by Frank et al. (1993) and Hess and Kleck (1990) that faked smiles are longer in duration than are genuine ones; this finding may suggest that during pretend snacking, parents were not necessarily feeling more positive affect but were attempting to convey it. In addition, significantly more smiles appeared to refer to the mother's own action in the pretense condition than in the real condition. Mothers might also convey the pretense mode through their body language, as animals convey play, and indeed, mothers' snack-related movements were different in the pretense condition. First, mothers engaged in more snack-related movements when pretending than when engaged in eating a real snack, and second, many of those movements were of shorter duration, on average, when pretending.

In some ways the pretense behavior could be glossed over as simply being more intense: more talk, more smiles, and so on. Yet other data belie that characterization: Mothers slowed some actions (such as the hand at the mouth when eating) and in some cases (such as smiles after the baby's actions, references to Cheerios and juice) behaved similarly across conditions. Thus the particular pattern of pretense behaviors that emerged was not simply more intense; it was more intense in selected ways.

One question arising from these findings is whether the shorter durations of functional movement segments stemmed from the increased velocity of the movements, or from the movements following shorter paths of motion, or both. To determine which was the case, in Experiment 2 we replicated this procedure with the addition of a motion monitor. Changes in body movement are known to be associated with play in several other species, and determining whether such cues might be available to young children is of significant interest. Several researchers have recently examined the communicative potential of actions (Goldin-Meadow, 2000; Woodward, 1998) and of how the world is presented uniquely to young children (Brand, Baldwin, & Ashburn, 2002).

Another important concern in Experiment 2 was whether the findings of Experiment 1 would be replicated with the motion monitor. The monitor involved small sensors being attached to the mother's wrists, with wires extending along her arms and down her back. Although these objects were small and light, their mere presence could conceivably alter behaviors. The sensors allowed for precise specification of how the mother's movements changed during pretend snacking and, in particular, whether they were quicker or followed different paths of motion. If the presence of the sensors changed behavior, such changes were expected to be consistent across conditions, still allowing for specification of condition differences.

Experiment 2

Method

Participants. Nineteen 18-month-olds (mean age = 18 months; range = 17 months 2 weeks to 19 months 0 weeks) and their mothers participated. Twelve were boys and 7 were girls. Other sample features were similar to those of Experiment 1.

Setting. The experiment took place in the same room as Experiment 1, and most aspects of the set-up were the same except that an Ascension Technology (Burlington, VT) Flock of Birds motion monitor was used, with software supplied by Innovative Sports Technologies. The motion monitor's extended-range transmitter, a 30-cm cube, was placed 42 cm behind the mother's chair, on a 70-cm pedestal, and sensors were attached to the mother's wrists, neck, and waist, as described below. Because of experimenter error, one mother did not have a pitcher in the pretend condition.

Procedure. The procedure was exactly as in Experiment 1 except as necessitated by the motion monitor. Prior to testing, mothers were outfitted with two cuff wraps, one on each wrist, and a torso harness that wrapped around the neck and waist. Cuffs and harness came equipped with fastening units to secure each magnetic sensor in place. Four $2.5 \times 2.5 \times 2.0$ cm sensors were attached to the mother: one sensor on each wrist, one sensor at the base of the neck, and one sensor (the ground) at the waist. The sensors had wires extending from them, which were made as unobtrusive as possible by securing them to the mother's arms and back; from there the wires continued to the extended-range transmitter and then through a small hole in the wall to the computing equipment in a different room. Each 6-df sensor, sampled at 100 Hz, captured three-dimensional position and orientation data and registered linear and angular velocities of the body segment to which it was attached. Once all sensors were in place, mothers were instructed to stand directly in front of the transmitter for a 10-s calibration of the x -, y -, and z -axis coordinates.

Coding. Videotapes were coded in the same manner as in Experiment 1. Motion monitor data were collected by isolating particular snack-related events (pours, drinks) and calculating the displacement of the magnets on the x , y , and z axes, the displacement magnitude for all three variables combined, and the maximum velocities for movements toward and away from targets (the mouth for drinking, the cup for pouring, and so on.) For pouring only, the angle of rotation and the velocity of rotation were also calculated. Because not all mothers engaged in a usable action of each type in each condition, *ns* for motion monitor data vary.

Results

The primary purpose of Experiment 2 was to examine parents' movements more closely, using the motion monitor, and to determine whether the parents' behavior would be substantially affected by the presence of the motion monitor. Data were analyzed as in

Experiment 1. Reliabilities were calculated as in Experiment 1 and were comparable.

A preliminary concern was to examine the frequency of previous pretense behavior outside the laboratory and how normal and comfortable the new testing situation was for the parent-child pairs. On the posttest questions, 18 of 19 mothers said they did pretend with their children. Thirteen said they pretended daily, and 4 said they pretended weekly or a few times a week. Six of the 18 pretenders said they had even pretended the same things they pretended during the experiment. This represents a much smaller percentage than in Experiment 1, in which about 66% of pretenders said they had pretended snacking scenarios. Mothers also reported feeling slightly less comfortable in the experimental setting than in Experiment 1, with a mean of 3.84 on the 1-6 scale (*a little like at home*). By comparison, in the first experiment, the mean comfort level was 4.45 (*pretty much at home*). This reduced comfort level could have been due to the reduced frequency of pretending to have snacks, although the comfort and prior experience measures were not significantly correlated. More likely, it was due to the motion monitor pieces being strapped to the mothers' bodies. Despite the differences in comfort level, the data were remarkably similar to those of Experiment 1, as shown below.

Smiling. Smiling was again coded relative to baseline facial expression. Three mothers were coded as being basically smiley in both conditions, whereas 11 were considered smiley at baseline only in the pretend condition, and none only in the real condition, which was significant by the binomial test ($p < .01$).

The number of discrete smiles, relative to each mother's baseline, was significantly greater in the pretend condition ($M = 10.11$, $SD = 4.00$) than in the real condition ($M = 5.21$, $SD = 3.43$), $t(18) = 6.3$, $p < .01$. The mean duration of individual smiles was also significantly different: 3.16 s ($SD = 1.63$) in the pretend condition and 1.94 s ($SD = 1.18$) in the real condition, $t(18) = 5.32$, $p < .01$. Furthermore, there were more long smiles lasting over 4 s in the pretend condition (2.7 per session) than in the real condition (0.53 per session), $t(18) = 5.98$, $p < .01$. Although mothers smiled less overall in this experiment, the patterns of significance across conditions precisely mirror those of Experiment 1.

Smile referent. The proportions of smiles about the child's action and about the mother's own action in each condition also mirrored those of Experiment 1 (see Figure 1). Mothers smiled significantly more at their own actions in the pretend condition (30%, $SD = .23$) than in the real condition (14%, $SD = .17$), $t(17) = 2.73$, $p = .01$.

Looking. The sum of the time spent looking at the child during the 2 min was again longer in the pretend condition ($M = 74.92$ s, $SD = 11.72$) than in the real condition ($M = 60.14$ s, $SD = 14.34$), $t(18) = 5.70$, $p < .01$, and the sum of the time spent looking at the task was shorter in the pretend condition ($M = 36.82$ s, $SD = 11.22$) than in the real condition ($M = 54.14$ s, $SD = 14.21$), $t(18) = 6.59$, $p < .01$ (see Figure 2). Regarding frequency of looking, mothers also looked more frequently at the child (relative to the task) in the pretend condition than in the real condition, $t(18) = 2.61$, $p < .05$.

Functional movements. The total number of snack-related functional movements was again greater in the pretend episodes ($M = 10.68$, $SD = 3.74$) than in the real episodes ($M = 8.32$, $SD =$

2.21), $t(18) = 2.68$, $p < .05$. This number reflects an overall decrease in the number of functional movements across conditions. This is undoubtedly due to the wires being attached to the mothers' hands. Although the wires did not actually inhibit movement, mothers may have felt constrained.

As in Experiment 1, the duration of functional movements tended to be shorter for pretend than real scenarios, with the exception of holding the hand at the mouth while eating, which tended to last longer in pretend. Specifically, the durations of approaches of the hand from the table to the mouth were shorter for both pretend eating ($M = 0.51$ s, $SD = 0.14$; real, $M = 0.75$, $SD = 0.15$), $t(14) = 4.25$, $p < .01$, and pretend drinking ($M = 0.77$ s, $SD = 0.26$; real, $M = 1.08$, $SD = 0.25$), $t(11) = 3.80$, $p < .01$. As is shown in Figure 3, the durations for hold behaviors were shorter for pretend drinking ($M = 1.48$ s, $SD = 0.51$; real, $M = 2.06$, $SD = 0.49$), $t(13) = 2.99$, $p = .01$, and longer for pretend eating ($M = 0.60$ s, $SD = 0.27$; real, $M = 0.35$, $SD = 0.20$), $t(14) = 9.98$, $p < .01$. The duration of the hold component of pouring was also significantly shorter in the pretend condition ($M = 0.81$ s, $SD = 0.50$; real, $M = 1.16$ s, $SD = 0.57$), $t(16) = 2.15$, $p < .05$.

Motion monitor. The data obtained with the on-screen timer on the video screen included duration but did not allow one to determine whether durations differed owing to velocity or to distance covered (because, for example, some actions involved movements toward the camera). The motion monitor data did provide that information. Average peak velocities for different movements are given in Table 1. For drinking, the approach of the hand to the mouth and the movement of the hand away from the mouth were both faster during pretend snacking than during real snacking: $t(13) = 3.20$, $p < .01$ for approach; $t(14) = 4.78$, $p < .01$ for removal. The physical displacement of the hand in space was not different across conditions. For eating, movement of the hand away from the mouth was significantly faster in the pretend condition, $t(14) = 2.85$, $p = .01$; movement of the hand toward the mouth was slightly faster but not significantly so. Again, there were no differences in the physical displacement of the hand across the two conditions.

For bringing the pitcher to the cup to pour, average peak velocity was faster in the pretend condition, $t(16) = 2.57$, $p < .05$. Movement of the pitcher away from the cup was not examined because of discrepancies in how to judge the onset of movement away during pours. Peak velocity during the rotation phase of the

Table 1
Mean Peak Velocities of Movements in Experiment 2

Movement and condition	Eating		Drinking		Pouring	
	M	SD	M	SD	M	SD
Approach						
Pretend	0.56	0.26	0.57	0.19	0.49	0.17
Real	0.48	0.15	0.42	0.13	0.36	0.14
Away/rotate						
Pretend	0.62	0.29	0.74	0.27	82.10	30.98
Real	0.42	0.18	0.49	0.13	53.16	12.66

Note. All measurements are in meters/second except pour rotation, which is measured in degrees per second.

pour, when the pitcher was over the cup and being rotated, was noted instead. Velocity of rotation during pouring was faster when pretending to pour than when really pouring, $t(16) = 3.56, p < .01$. In addition, for pouring there was a difference in displacement, indicating that the mother's hand traced a larger path of motion when pretending to pour ($M = 0.16$ m, $SD = 0.12$) than when pouring for real ($M = 0.10$ m, $SD = 0.06$), $t(16) = 2.20, p < .05$. The motion monitor thus allowed a more refined picture of the duration results, showing that in all cases when duration was shorter, it was due to the mother's hand moving more rapidly during pretense than during real motions, rather than because the paths of motion were shorter. In addition, movement was also exaggerated for one pretense motion: The pitcher was moved in a larger arc when pretending to pour. No snack-related movements were spatially truncated.

Verbal behavior. In the pretense condition, mothers said an average of 173 words ($SD = 44$), and in the real condition they said an average of 178 ($SD = 46$), a nonsignificant difference. Compared with Experiment 1, talking increased across conditions, and this change was particularly marked in the real condition, where the average number of words spoken had been just 114. Because there were no word-count differences across conditions, word and sentence analyses involved actual numbers rather than proportions.

The word "pretend": The word *pretend* was used a mean of 1.16 ($SD = 1.39$) times in the pretend condition (and never in the real one). Eight mothers never used it at all, 10 used it 1–3 times, and 1 used it 5 times. Mothers in Experiment 1 had used the word on average just under 1 time, but a larger proportion had not used it.

Object and action references: As in Experiment 1, pretend behaviors (eating, drinking) were referred to more than were real ones ($M = 8.26, SD = 10.18$ vs. $M = 4.47, SD = 4.30$), $t(18) = 3.79, p < .05$ (one-tailed). Unlike in Experiment 1, there were no significant differences in the number of references to concrete objects (cup and plate) in the pretend condition ($M = 5.42$, or 3.2%, $SD = 3.29$) and the real condition ($M = 4.63$, or 2.6%, $SD = 3.52$). This finding reflected an increase in object references in the real condition. As in Experiment 1, references to the consumables that were imagined in the pretend condition and actually present in the real one (Cheerios and juice) did not differ across conditions ($M = 11.00, SD = 8.65$ for pretend; $M = 12.68, SD = 4.85$ for real).

Nonverbal noises. The mean number of sound effects produced was 6.68 ($SD = 5.30$) in the pretend condition and 0.63 ($SD = 1.07$) in the real one, $t(18) = 5.19, p < .01$. This represents an overall reduction from Experiment 1, but the reduction is largely attributable to the reduction in pretend eating noises, which is likely related to the reduction in the functional movement of eating because sound effects and numbers of functional movements were correlated ($r = .45$). Still, the majority of sound effects were again eating noises ($M = 2.21, SD = 2.42$), followed by drinking noises ($M = 1.89, SD = 1.94$), pouring noises ($M = 1.37, SD = 1.89$), and serving noises ($M = 1.21, SD = 2.23$).

Comment noises consisted of laughter and phonetic comments ("mmm"). Mothers laughed an average of 2.74 times ($SD = 1.97$) in the pretend condition and 1.37 times ($SD = 1.50$) in the real condition, which was a significant difference, $t(18) = 3.80, p < .01$. The direction of the difference here is the same as that seen in

Experiment 1, although in that experiment it did not reach significance. The number of phonetic comments did not differ across the pretend ($M = 9.26, SD = 3.75$) and real conditions ($M = 8.68, SD = 4.41$). There were condition differences on this dimension in Experiment 1, but the overall data were not markedly different across experiments.

Discussion

With few exceptions, particularly in the verbal/vocal realm, the results of the second experiment mirrored those of the first. Some changes were to be expected given that mothers had magnetic sensors attached to their wrists and wires running along their arms and backs. Although these were loose enough not to be physically restraining, the mere presence of such items might have reduced overall movement. The relative effects of those accoutrements should probably have been the same across conditions, still allowing for condition differences to be examined. In addition to the presence of the sensors, mothers in this experiment reported less pretending at home of "what we did today" (although not less pretending in general) and a somewhat lower comfort level than did mothers in the first experiment. Because comfort level and experience appeared unrelated, the slightly reduced comfort level was likely attributable to the sensors.

Despite these changes, many data were remarkably similar to those obtained in Experiment 1. In addition to providing a replication, Experiment 2 allowed more precise determination of how mothers' movement differed when they pretended.

As in Experiment 1, mothers engaged in significantly more snack-related activities in pretense, providing children with more samples of the pretended behaviors than they had provided of the real ones. Looking at each activity individually, we found significantly more drinking, and a consistent pattern of slight increases for the other three snack-related movements, in the pretense condition.

In terms of quality of movement, the durations of the snack-related movements were very similar to those in Experiment 1, with pretend actions tending to have shorter durations than real ones. The significant change in procedure in this experiment was the use of the motion monitor to allow for more precise determination of the cause of these duration differences. The motion monitor data showed that these duration differences were due to differences in velocity rather than in the path of motion. Mothers' hands approached and moved away from goals more quickly in the pretense than in the real condition. One might question whether this was due to the weight of real substances as opposed to their imaginary counterparts. The very slight changes in weight when carrying a real versus an imaginary Cheerio, or a cup with some juice in it rather than an empty cup, might have led to the speed differences. However, the hand even moved more quickly away from the mouth after pretending to eat a Cheerio than after really eating one. This suggests that the finding has more to do with how time is experienced in the pretend realm, a topic raised in the General Discussion.

Pretense movements are often said to be exaggerated relative to real ones. However, the only path-of-motion difference noted was a longer path of motion for pretend pours. When pretend pouring, mothers lifted the pitcher farther above the glass than they did when pouring for real. The other movement that might be consid-

ered exaggerated was the longer duration of holding the hand at the mouth when pretend eating, a finding observed across experiments.

As in Experiment 1, mothers smiled more when pretending to snack than when snacking for real, and those smiles were longer. In addition, they displayed more smiles ≥ 4 s when pretending. In Ekman and Freisen's (1982) analysis, facial expressions of that length are more often faked. In addition, the specific placement of smiles, more so after their own pretense activities than after their own real ones, allows for the possibility of a social referencing interpretation. As in Experiment 1, mothers may have been signaling to toddlers not to take their pretend eating and drinking seriously.

In addition, mothers spent more time looking at the child, relative to the task, in the pretend condition, whereas in the real condition looks at the child and at the task had similar overall durations. This is consistent with the results of Experiment 1. Increased looking time suggests increased attention, perhaps to monitor comprehension or perhaps simply to share experience.

Finally, verbal behavior showed some similarities and some differences from that in the prior experiment. Mothers talked more, particularly in the real condition, than they had in Experiment 1, eliminating condition differences. A recent study in the laboratory without the motion monitor but with a microphone attached to the mother showed a pattern intermediate between the patterns of these two experiments. One possibility is that the additional equipment made mothers less comfortable and that this led to more talking. However, in the experiments run thus far, mean comfort level was positively, rather than negatively, associated with average number of words spoken in the real condition.

Despite the increased talking overall (particularly in the real condition), several of the same condition differences emerged as emerged in Experiment 1. Mothers again referred more often to pretend behaviors than to real ones, they issued more commands and fewer questions, and they used many more sound effects in pretense than in real snacking situations. Finally, in Experiment 2, mothers laughed more when pretending than when snacking for real. Laughing has been observed to distinguish pretend and real fighting, and vocalizations that some consider to be like laughter are thought to signal play in some animals.

In sum, most of the findings in Experiment 2 replicated those of Experiment 1, the major exceptions being the amount of talking mothers did in the real condition and the reduced frequency of pretend eating. Other findings were remarkably similar to those of Experiment 1, despite the motion monitor, the slightly reduced comfort levels, and the variation in the amount the samples had engaged in pretend eating at home. The motion monitor allowed for pinpointing of the source of shorter duration times for functional movements. Those movements were in fact enacted more quickly in pretense. One snack-related movement, pouring, also involved a longer path of motion. Consistent with the hypothesis, then, mothers did behave differently during pretend snacking and real snacking.

Experiment 3

The purpose of the first two experiments was to determine if mothers enact certain behavioral modifications in pretense as opposed to real situations that might assist young children in inter-

preting pretense acts as pretense. Having identified a number of such modifications, we posed the next logical question: Which of these behaviors do toddlers actually appear to use? To find out, we examined the relation between children's apparent understanding of pretense and mothers' behaviors. To increase power for the correlational analyses, we combined the data from the first two experiments.

Several crucial issues should be raised at the outset. First, to the degree that toddlers' understanding of pretense is guided *exclusively* by deviant content, there should be no relationship between understanding pretense and mother behavior. Lack of the usual content should by itself notify toddlers that pretense is occurring. If content cues alone, which are relatively constant across toddlers, signal pretense, then whether a particular mother makes sound effects a lot or rarely during pretense should bear no relation to whether a baby indicates an understanding of pretense. If any significant relations between baby understanding and a specific maternal behavior are seen for the sample, then there is some reason for an association (or there is Type I error).

Second, however, if associations are found, it cannot be said definitely that the behavior was used by the baby for interpreting the pretense acts. The analysis might thus make a relationship appear important when the relationship is causal in reverse or has some other cause altogether. It bears repeating that correlation does not mean causation; it only leaves open the possibility of it. Unexamined variables that always co-occur with an examined one, or reverse causal relations, may in fact underlie the correlations.

Third, by examining relationships between frequency of a behavior and understanding (again, measured as frequencies) the Experiment 3 analysis may fail to elucidate important cues. A mother might say the word *pretend* only once, but if that provides a definitive cue to pretense, her baby should indicate understanding thereafter during the session. Depending on whether the cue was issued early or late in the 2-min session, indicators of baby understanding could be few or many for the session. Thus the present analyses might fail to illuminate truly important cues, even ones considered in the analyses. In future work we plan to address this concern.

Finally, the behavioral measure used to indicate baby understanding (baby's smiles, laughs, and actions) is not an airtight one. Young children clearly smile even when they are not pretending, and they might attempt to drink from the glass expecting to find real juice there. However, summing those events in the pretend context can be indicative of understanding pretense, and for reasons pointed out below, baby smiles and behaviors have proven to be a useful (if not perfect) measure.

As rough preliminary measures, then, overall apparent baby understanding and overall mother behavior across the pretense sessions are interesting to examine. If there are significant associations, they will suggest that the maternal behavior or something that goes along with it is *associated* with 18-month-olds' apparent understanding of pretense.

Method

Participants. Fifty-two 18-month-olds from the first two experiments and their mothers were included. Three additional children from Experiment 1 were not used because they had a toy throughout the session that influenced their behavior. For some measures, fewer children were in the

sample. For example, not all mothers poured from the pitcher. The differing *ns* are noted for these cases.

Procedure. Tapes of the toddlers were examined for signs of understanding pretense. Toddlers' smiles, laughs, and pretend snack-related actions were considered evidence of understanding. Use of these measures was supported by parents' intuitions about how they knew when their children understood pretending: Of 53 distinct replies, 26 referred to the baby engaging in the activities, and 22 referred to the child's emotional response to the situation (e.g., smiling, laughing). Pretend snack-related actions included pretend pouring, drinking, serving, eating, and wiping the table. Each smile or laugh was awarded 1 point, and each snack-related action was awarded 1 point. Points from the two categories were summed to form a baby understanding score. A second coder coded 26% of the sample, and agreement was 84%. The kappa for the actions was .93.

It seemed to us that the more toddlers had pretended previously, the more likely they should be to understand what their mothers were doing. The understanding measure was therefore checked for a relationship with the parent's report of the child's experience with pretending. Points were allotted to the posttest replies as follows: If mothers responded affirmatively to "Do you pretend with your baby?" a single point was allocated. When asked further about how often, if mothers replied, "weekly," they were given an additional point. "A few times a week" earned 2 additional points, and "daily" was allocated an additional 3 points. For the question "Do you ever pretend the things we asked you to do today?" a "yes" received 3 points, "some" or a "yes" with a caveat (e.g., "just drinking") received 2 points, a guarded "no" (e.g., "not really" or "just occasionally") received 1 point, and a solid "no" received a 0. These scores were summed, resulting in a possible range of scores from 0 to 7 for experience with pretending.

Because it might reasonably be the case that toddlers with experience in pretending to have snacks (in particular) would be served by a set of cues different from that of toddlers with no such experience, we also examined the potential cues by dividing the sample into experienced and inexperienced toddlers. Experienced children were those whose mothers claimed on the posttest questionnaire that they had previously pretended the very same things they were asked to do in the laboratory. Children of mothers who gave guarded responses such as "not really" were included in the inexperienced group, whereas those whose mothers gave responses with caveats ("just drinking") were included in the experienced group.

Results

The number of smiles the 52 children displayed ranged from 0 to 7 with a mean of 2.0 ($SD = 3.44$), and the number of snack-related behaviors ranged from 0 to 17 with a mean of 5.1 ($SD = 1.95$). When smiles and behaviors were summed for the understanding measure, the mean understanding score was 7.10 ($SD = 3.74$) with a range from 0 to 18. Understanding scores were significantly correlated with the level of comfort mothers had reported during the experiment ($r = .39, p < .01$) and with the child's extent of past experience with pretending ($r = .30, p = .01$). Dividing children across the two experience groups, we found that children with experience in pretending obtained significantly higher understanding scores than did children without experience ($M = 8.18, SD = 3.82$ vs. $M = 5.83, SD = 3.29$), $t(50) = 2.35, p < .05$. This was due to differences in their snack-related actions: Children in both conditions smiled approximately two times on average during the session. This might suggest that young children's snack-related actions are a better indicator of understanding than are their smiles, but viewing of the tapes suggested that both are important. Some children indicated understanding by smiling and giggling at their mothers throughout the session, but they did

not engage in the activities themselves. Analyses were also conducted on mothers' behaviors by experience group. No significant differences were found.

Smiles. Baby understanding was significantly related to the amount of time mothers spent smiling during the pretense session ($r = .23, p = .05$). There were trends toward relationships with smile frequency ($r = .22, p = .06$) and with the proportion of the mother's smiles after her own actions ($r = .19, p = .09$). These latter two relations became significant at the .05 level for the 28 toddlers who had prior experience with pretending to have snacks (smile frequency, $r = .35$; smiling after own behavior, $r = .33$). Total smile time became a trend for this group ($r = .27, p = .08$). No smile relations held when we examined only the 23 toddlers whose mothers claimed they had had no experience with pretending to have snacks. Mothers smiled after their own actions for equal proportions of time in both experience groups, making this cue equally available, but these data suggest it was simply not used by the inexperienced children.

Looking. The tendency for mothers to look frequently at the child, relative to at the task, during the pretense session was significantly related to understanding of pretense ($r = .31, p = .01$). This relationship held only for the experienced subgroup ($r = .42, p = .01$), whereas for inexperienced children, the relationship between the total amount of time the mother looked at the child during the pretense session and the child's understanding of pretense obtained significance ($r = .37, p < .05$).

Functional movements. Movements had no significant relations to understanding but did show some trends, all of which indicated that mothers' behavior patterns when pretending were, if anything, associated with less understanding on the part of young children. For inexperienced children only, there was a trend toward it being the case that the more pretense acts a mother presented, the less the toddlers understood ($r = -.33, p = .06, n = 24$). The other two trends concerned durations. One might expect that longer durations would be associated with less understanding, because mothers generally moved faster during pretense. Instead, longer durations of holding the cup at the mouth while drinking showed a trend toward association with *more* understanding ($r = .19, p = .09, n = 50$). In addition, the longer the duration of mothers' pouring actions, the more children understood ($r = .21, p = .08, n = 49$).

The lack of significance of the pouring duration difference in Experiment 1 was thought to be due to the fact that mothers followed a longer path of motion at the onset of the pour. This would allow for the possibility that longer approach motions (translating to a longer path of motion) would be related to more understanding. This does not appear to have been the case, however, because the duration of the move-toward phase alone was unrelated to infant understanding.

Looking at the duration data by baby experience revealed similar patterns. For children without experience in pretending, the durations of eat approaches ($r = .37, p = .05, n = 21$) and pour holds ($r = .42, p < .05, n = 22$) were significantly related to understanding; for experienced children, the length of time the mother held the cup at her mouth while drinking showed a non-significant trend toward being related to baby understanding ($r = .28, p = .08, n = 28$). If anything, then, mothers' behavior patterns when pretending were associated with less understanding (as mea-

sure here) on the part of young children, although with the *ns* involved here, most of these relations were only trends.

The motion monitor results yielded no significant relations to understanding.

Verbal behavior. Only one verbal variable showed even a trend toward a significant relationship with understanding: total words spoken during pretense ($r = .22, p = .06$). The proportion of references to imaginary items, the proportion of references to snack-related behaviors, use of the word *pretend*, and use of sounds effects all bore no relationship to how well 18-month-olds appeared to understand pretending, and this was true regardless of children's level of experience with pretending to have snacks.

Discussion

Eighteen-month-olds' understanding of pretense was measured by summing how often they smiled and laughed during the pretend snacks and how often they engaged in snack-related actions such as pouring and drinking—two variables that most mothers also claimed they relied on to determine whether toddlers understood pretending. The understanding measure was significantly related to experience with pretending, which suggests that it was an appropriate measure. It is important to note that an examination of mothers' behaviors (for all variables) showed that they did not vary significantly within the pretend condition on the basis of baby experience. We then examined understanding in relation to mothers' behavior, reasoning that if particular behaviors do signal pretense, then mothers who enact those behaviors to a greater degree should have toddlers who indicate a better understanding of pretense.

The most important cues, by this account, concerned looking and smiling. Although there were several effects of these variables for the entire sample, the pattern became especially interesting when we broke it down by child experience. For children without experience in pretending to have snacks, the sum of mothers' looking time at the child was significantly related to understanding. One might wonder whether toddlers simply do more of everything when their mothers are looking at them, pretend and real behaviors alike. Checking for associations in the real condition between children's real snack-related behaviors and mothers' looks revealed no such relationship. This suggests that a more continuous level of monitoring of the child is related to understanding for children who have not previously pretended as much. Further analyses are needed to determine whether this relation occurs because it allows mothers to appropriately time other signaling behaviors when the child is visually engaged or because the mothers use visual cues from the child to gauge whether they need to up the level of another pretense cue. Thus other cues might also be important, but the timing of those cues, rather than their overall frequency across a session, assists pretense interpretations. Alternatively, it may simply be that when mothers look at them, toddlers understand that mothers are attempting to share meaning, and this leads the children to make meaningful interpretations of their mothers' acts as being about pretend snacks.

For children with experience in pretending to have snacks, the mother's relative frequency of looking at the child, the frequency of smiles, the total time spent smiling, and the tendency of the mother to smile after her own actions were the most closely related variables. This suggests that a pattern of frequent use of social

referencing behaviors might be related to understanding for young children with experience in pretending. More refined sequential analyses are needed to examine this issue.

Perhaps maternal smiling spurs experienced children to engage in pretend behaviors indiscriminately. If so, then when mothers smiled in the real condition, children should have pretended then as well. However, children did not appear to pretend while having real snacks, which suggests that maternal smiling does not by itself lead to pretend behaviors in toddlers. If maternal smiling cues pretense for children with experience in pretending (and our data do not by any means definitively show that it does—they only suggest that it might), it does so in the context of other cues that are available in the pretense situation. Among those other cues might be deviant content and other maternal behaviors. Alternatively (or perhaps additionally), there might be configural features of pretend smiles that differ from those of real smiles, or the placement of the smiles after actions might carry the bulk of the significance.

Mothers' verbal behaviors, at least as analyzed here, appeared to bear little relation to children's understanding other than that overall word count in the pretend condition was significantly related to understanding. Recall that this variable was significantly different across conditions only in Experiment 1. More refined verbal analyses should be conducted in future studies.

Finally, although movements were distinctly different across conditions, with most occurring more often and faster during pretense (with the exception of holding the hand at the mouth), this variable did not appear to promote understanding. There were even trends toward shorter durations of movement being associated with lower understanding scores.

In sum, using frequency and durations of mother behavior relative to apparent understanding as a rough measure of the cue value of mothers' behaviors, we found that mothers' looking and smiling appeared to be most closely related to young children's understanding. This result is in keeping with the analysis that social referencing may serve an important function in pretense understanding. However, the caveats raised in the introduction to this experiment with regard to how these findings can be interpreted should be borne in mind. Future studies of pretense understanding with larger sample sizes should use structural equation modeling, time-series, and other analyses to more precisely pinpoint how these variables interrelate.

As a final point, by examining only children 18 months of age, we left open the issue of whether older and younger children's understanding is associated with these or other behaviors. Perhaps older and younger children draw on different specific cues to understand that a behavior is pretense, but mothers deliver cues without regard to age. Further experiments are being conducted to examine this issue.

General Discussion

Parents pretend in front of very young children, and viewing pretense acts could easily confuse children's developing representations of the real world. The fact that pretense does not generally appear to upset referential relations suggests that children have an early ability to quarantine, or keep separate, real and pretend events. In addition, something must signal to children (not necessarily at the conscious level) to quarantine pretend events. The

topic of this research is whether there are potential signals embedded in the pretense scenario that might lead children to engage in this quarantining and to not interpret pretense events literally. Deviant content or actions is one probable signal, but for the reasons discussed in the introduction, there must be additional signals as well. The specific hypothesis tested here was that there are consistent differences in the behaviors of experienced pretend-ers (in this case, mothers) and that some differently presented behaviors might help cue toddlers to the fact that pretense is occurring. A snack scenario was deemed an ideal situation in which to begin study of this issue, because 18-month-olds are very familiar with snacking and because important factors can be tightly controlled across the pretense and real scenarios. Comparing mothers' behaviors across pretense and real conditions revealed many significant differences in the dimensions studied and allowed for the possibility that such differences serve as pretense signals at some point in development. The third experiment indicated that (viewed quantitatively) some behaviors and not others are at least associated with 18-month-olds' apparent understanding of pretense.

Verbal Behavior

Regarding verbal behavior, one potential cue to pretense is the use of the word *pretend*. Although finding consistent use of the word by parents to indicate pretense would be interesting, it would simply push down the age at which one would have to examine other indicators of pretense, because there must be some manner in which the word was learned in the first place. Regardless, across both studies, only a few mothers used the word frequently with their 18-month-olds, and many mothers never used the word at all. Use of the word was unrelated to child understanding.

Mothers' talking was increased during pretense in the first experiment only, a finding needing further explanation. Amount of talk was related to understanding, but no specific measures of what was talked about were related to understanding. Still, the results regarding the topic of talk were very interesting because topic may assist children whose language is more advanced. The hypothesis was that there would be proportionately more references to the absent items in the pretense condition, because parents would have to "make real" the imaginary objects of Cheerios and juice. But across both experiments, they did not, with only about 8% of their words referring to these objects across both conditions. Instead, mothers referred proportionately more often during pretense to what we might consider the behavioral support structures (drinking, eating) for the imaginary snack and, in Experiment 1 only, to the object support structures (cups, plates). This finding mirrors claims that children initially understand pretense in terms of actions (Harris, Lillard, & Perner, 1994; Lillard, 2001) but not in terms of substitute objects (Tomasello, Striano, & Rochat, 1999). Maternal behavior mirrored and may contribute to this sequence of learning, because mothers referred to the pretend behaviors more so than to the pretend objects. What this difference in maternal reference suggests is that mothers were using words to anchor children to the pretend situation but were doing so in a manner that may have made it less likely that referential relations were abused. To refer to an act that includes all the aspects of drinking except ingestion of liquid as "drinking" is relatively banal abuse; to refer to the air as "juice" is extreme abuse of proper referential relations.

Sound effects constituted a huge contrast across conditions in both experiments. Mothers used many sound effects in the pretense condition, but in the real condition sound effects were rare. Sound effects establish the pretend scene, filling in details that are missing because of the lack of real substance. Indeed, sound effects are often exaggerations of the sounds they mimic: Mothers made loud slurp sounds when pretend drinking, a behavior considered rude when really drinking. Sound effects differ from the noises they intend to imitate both in quality (they usually sound different from the real sounds they represent) and often in source (the pouring noise emanates from the mother's mouth instead of from where the juice should emerge). Other researchers (e.g., McCune, 1995) have used the production of sound effects as an indicator that pretense is occurring, and other research in our laboratory indicates that adults are more likely to correctly judge acts as pretense when they are accompanied by sound effects. However, the understanding variable suggested that 18-month-olds do not make use of this signal.

Smiles

Smiling behavior was significantly different across conditions, and its use in pretense was associated with understanding for some children. In both experiments, more mothers held a baseline constant grin in the pretense condition than in the real condition. More important, discrete smiles were more frequent in the pretense condition, and individual smiles were longer. Unfelt or deliberately posed facial expressions are often of longer duration than are spontaneously produced ones. Real smiles, in contrast, are rarely more than 4 s in duration (Frank et al., 1993; Hess & Kleck, 1990). The smile data obtained in these experiments are in keeping with the hypothesis that mothers smile in pretense to signal to children how to interpret the pretense events.

The social referencing literature suggests that by 12 to 18 months, children are able to take an adult's emotional response to a situation and adopt that same response themselves. In this light, referents of mothers' smiles during the pretend and real snacks were also very interesting. Across both conditions in both experiments, these American mothers smiled frequently at their children's behaviors, showing positive emotion about many of their children's actions. However, only in the pretense condition did mothers smile as frequently after their own behaviors. One might wonder if this goes along with the increase in the number of mothers' functional movements overall during pretense, but the numbers suggest otherwise. In Experiment 1, for example, although there was about a 25% increase in discrete functional movements during pretense, the increased frequency of smiling was orders of magnitude greater (about three times as frequent). Increased smiling after mothers' own ambiguous pretense behaviors could be providing the conditions for social referencing: Mother pretends to drink, then smiles. An important question for future research is whether toddlers look to their mothers at these moments and then adopt her attitude, completing the classic social referencing sequence.

The understanding data are suggestive in this light. Interestingly, the maternal smile variables that were most associated (smile frequency, overall time smiling, and frequency of smiling after own action) were particularly important for toddlers whose mothers said they had pretended to have snacks on some previous

occasion. Mothers did not deliver these cues more to experienced toddlers than to inexperienced ones, so availability does not explain the pattern of relations. Perhaps for inexperienced toddlers, the mothers' behaviors were too ambiguous for such signals to help, or perhaps they only helped when associated with mother looking. By this analysis, toddlers with experience at pretending to have snacks do more of the work of searching their mothers' faces for indicators of pretense and therefore could use the smiles to assist in their understanding.

Another important question regarding smiles is whether pretend smiles have a unique facial configuration, the so-called "knowing smile." Ekman's (1992) catalog of 18 types of smiles does not describe a pretend or "knowing" smile, but there is discussion of a masking smile, a smile that goes along with deceptive behaviors (Ekman, Friesen, & O'Sullivan, 1988). In this smile, there are traces of facial muscular action normally associated with negative emotions. We are currently examining the facial configuration of the pretend smiles, particularly those that seem to be about the mother's own behavior, to see if there might be a special knowing smile of pretense or whether pretense is associated with the facial musculature used in smiles of deception.

Looking

Looking behavior also varied across conditions, with mothers spending more time looking at the child in the pretense condition than in the real condition. Eighteen-month-olds are likely able to detect the variations in mothers' gazes, because studies have shown that even by 4 months, toddlers discriminate between straight-on gazes and gazes averted by 30° from a distance of 60 cm (Vecera & Johnson, 1995). Adults are even sensitive to gaze changes as slight as 1.4° at 122 cm (Anstis, Mayhew, & Morley, 1969).

Looking at the child might serve two functions. First, it might serve an information-gathering function for the parent (Fehr & Exline, 1987), perhaps about the child's attention or comprehension. Brand et al. (2002) noted that when teaching toddlers about new objects, mothers tended to lock gaze with the infant, giving exaggerated displays of emotion. Perhaps parents up pretense signals—for example, talk more—when children are not looking at them or appear confused.

Second, looking might serve a communicative function. Other studies (reviewed by Fehr & Exline, 1987) have shown that speakers tend to look more at their audience (or listeners) when they are intimates sharing emotion, when they are in a cooperative relationship, and when they are more expert in the matter about which they are speaking. All of these conditions hold, particularly for pretense, and so could explain the increased maternal looking during pretense. The parent might look at the child to ensure that the child is sharing the adult's emotional reaction to the event as silly and that the child is noticing that the mother smiles after her own behaviors. Further, pretending together is certainly a cooperative enterprise, even more intensely so than having a meal together. Hains and Muir (1996) found that toddlers are sensitive to adult gaze and respond with positive emotion when adults look at them. By 24 months of age, children also look more at adults when engaging in play (Leekam, Gagliano, Meins, & Franco, 2002; Striano, Tomasello, & Rochat, 2001). Finally, mothers are surely more expert at pretense than are 18-month-olds, and this alone

might lead to the increased looking. The fact that the tendency to check the child's face by looking at the child was strongly associated with understanding of pretense for experienced pretenders, and that total time looking at the child was associated with inexperienced pretenders' understanding, suggests that parent looking during pretense serves an important function. Deciphering exactly what that function is requires further work.

Functional Movements

Functional movements were of interest in two regards. First, there were more snack-related actions in the pretense than in the real condition, although this finding was somewhat attenuated when the motion monitor was used. Perhaps frequency is increased in order to present more instances so as to get the point across. In the same way, parents often label new objects repeatedly: "It's a ball! See the ball? Can you get the ball?" The verbal repetitions probably assist in teaching the referent. Likewise, repeated use of descriptive gestures (e.g., squeezing) has been shown to help children learn adjectives (e.g., *spongy*; O'Neill, Topolovec, & Stern-Cavalcante, 2002). One might think that by presenting a high frequency of pretend drinking behaviors, parents may be getting across the meaning of those behaviors. Interestingly, however, this did not appear to be the case: The number of acts presented was not related to understanding, and indeed, for inexperienced toddlers, there was even a trend toward less understanding when more acts were presented.

As Zukow-Goldring (1996) argued, how adults use their hands while interacting with children seems to be an important contributor to toddlers' developing representations of the world. Snack-related gestures were also mistimed in the pretense condition. When segmented into distinct units, most gesture units occurred too quickly. For example, hands moved to mouths too fast, and liquid was poured too quickly. The motion monitor data showed that these shortened durations were indeed about velocity, not path of motion. Gestures have been described as "truncated" in some kinds of pretense. For example, when play fighting, a dog will not actually bite another dog but will stop short of biting (Bateson, 1955/1972). However, the shorter durations of these gesture segments did not appear to be about cutting short the physical distance over which an action transpired; they appeared instead only to be about pace. Speeded-up time may be a general feature of pretense, as observed by Giffin (1984) for preschoolers: "Cooky, cooky, cooky!" led to the food being rapidly cooked. In pretense scenarios, one can get sick and well in just a few minutes, age 5 years in 20 s, and so on. Perhaps mothers' fast movements are reflective of speeded-up time, and perhaps toddlers use this as a cue to pretense.

The literature on velocity sensitivity suggests that children should be quite sensitive to velocity by 18 months. For example, Dannemiller and Freedland (1991) found that by 20 weeks of age, toddlers could discriminate horizontal bars oscillating at 3.3 vs. 2.0 deg/s, a 1.3-deg/s difference. When we translated the meters per second peak velocity data provided by the motion monitor into degrees per second (accomplished by multiplying meters per second by 57.3/.5, .5 being the distance in meters to the target; C. von Hofsten, personal communication, September 2002), the difference in speed in the pretend and real conditions was well above what even 20-week-olds can discriminate. For example, on average, there was a 9-deg/s difference in the speed of eating ap-

proaches. Thus 18-month-olds should have the capacity to see such differences; whether they do discriminate the events when shown serially rather than side by side is a topic for further research. Adults are sensitive to such temporal exaggerations in that once they have learned to identify a person by a point-light display of their behavior (say, a drinking action), when the action is exaggerated (slowed if it was already slow, or speeded up if it was already fast), identification improves (Hill & Pollick, 2000).

The relations revealed by the understanding analyses, however, suggested that this was not the case: There were several nonsignificant trends and one significant association between shorter action durations and less understanding. Perhaps this cue is helpful at other ages, but at 18 months it appears to be either useless or even somewhat confusing.

One movement segment that took longer in the pretense condition was how long the hand remained at the mouth for eating. In real eating of Cheerios, mothers typically inserted the food, then moved their hands away, but in pretend eating, the hand often remained at the mouth. This may be a case of exaggerated action, that is, of exaggerating the motions of eating. Other work also suggests that some pretense gestures, namely play fighting ones, are exaggerated in humans, animals, and birds (Hill & Bekoff, 1977; Pettifor, 1984; Symons, 1978). Tinbergen (1960/1967) discussed the function of such exaggerations as making a behavior more conspicuous. Exaggeration can occur over time, with events taking too long, as the eating hold gesture did. Exaggeration can also occur over space, with movements extending over too wide or long a trajectory. The motion monitor showed that pouring was exaggerated in physical space, with the pitcher being lifted higher over the cup. Exaggerating drinking and eating in this manner may have been less likely to occur because a direct path was followed from table to mouth. Possibly because the *ns* for the motion monitor study were small—and still smaller when confined to those toddlers with understanding data—correlational analyses with displacement and velocity variables were unrevealing.

In sum, looking and smiling emerged as the most important variables associated with understanding of pretense at 18 months. Many other cues were available but—at least when associations were judged by frequency and duration—were apparently not used at this age. Further work should use sequential analyses to more specifically examine which parent behaviors precede a high frequency of understanding-related behaviors on the part of the toddlers, and structural equation models should be used to examine the interrelations among variables.

Teaching

One might wonder about the extent to which the behavioral variations seen in this experiment were about pretense per se versus simply about presenting something new. Mothers might, for example, have seen themselves as teaching about pretense. The behavioral changes may generalize to other teaching events, and perhaps they would not have occurred if pretense were more familiar to the children. Partially supporting this, some (but not all) of the behaviors that varied across our pretend and real scenarios mirror those that Brand et al. (2002) found varied in presentations to toddler (6–13 months) versus adult audiences.

In Brand et al.'s (2002) study, mothers were asked to teach either an intimate adult or their toddler about new objects. Mothers

presenting to toddlers were rated higher in “interactiveness,” a variable that included observer judgments of exchanges, joint attention, and gaze checking. They were also rated higher in repetitiveness. These are features that also appeared in our pretense condition relative to our real condition. The Brand et al. study also involved teaching the adults, and if the behavioral adjustments for toddlers were simply about teaching, then Brand et al. would not have had condition differences. Perhaps such behaviors are specific to interacting with young children, yet in the present study children were the addressees in both conditions. The behaviors might be specific to teaching children.

Against this interpretation is the fact that in our experiment, it appeared that for many children, the real condition involved new activities as well. Parents were at times clearly showing children how to pour real juice from a pitcher and drink real juice from an uncapped cup. Thus, some teaching was occurring in the real condition in the present experiments. Further, recall that about two thirds of mothers pretended daily, and many (especially in the first experiment) even pretended these very activities with their children, so this was not the first time most of our sample was exposed to pretend behaviors. Thus there was clearly some teaching occurring in the real condition, and there were some cases in which the pretend condition was not a new experience, and both of these make it unlikely that the pretense behaviors boiled down to simply teaching. Still, in future work it would be interesting to compare how parents present pretense to other adults and to older children, whom they are clearly not teaching, as well as to record how adults teach children about new activities using the precise measurement techniques used in the present study. Such follow-up investigations would allow pinpointing of which behavioral changes are specific to pretense and which might occur in any teaching scenario.

Conclusion

The work described here was aimed at a fundamental mystery in child development: Why are young children who are just learning about the real world not deeply confused by the presentation of pretend acts? We hypothesized that children are able to quarantine pretense situations from real situations and that some signals to engage in this quarantining of pretense situations are embedded in pretense behaviors.

Several differences were found across pretense and real snack behaviors as presented to toddlers, and at least some of these differences appear to be important to toddlers' understanding of pretense. To review, in the snack scenario we used, mothers talked proportionately more about their pretense behaviors than their real ones, but not about the pretense objects themselves. Pretense was also accompanied by an array of sound effects that were virtually absent in the real scenario, and there was somewhat more laughter during pretend snacking. However, frequencies of these variables were not associated with infant understanding. Mothers engaged in more snack-related movements, and those movements were often mistimed, with many segments of the movements occurring more quickly in pretense than when for real. However, the movement variables were either unimportant or possibly even negatively related to infant understanding. Mothers smiled more when pretending, and the increased smiling seemed to be particularly about their own behaviors. They also looked much more at the child when pretending. Both of these variables appeared to be important

to understanding, with smiling figuring mainly for toddlers with some experience in pretending to have snacks and looking figuring for toddlers both with and without such experience. The looking variable may be important because mothers who look at their toddlers know when other visually available signs are useful and are able to monitor baby understanding and thus know when signs are needed. Alternatively, looking may matter because it signals joint attention situations to the infant, who then seeks the meaning of the mother's behavior.

Classifying pretense events as pretense is crucial to preserving the integrity of the child's developing real-world representations. Pretending in childhood is a major point of entry into dealing in hypothetical words, a skill that crucially underpins much of human culture and progress. In ongoing and future work, we plan to examine such issues as how well these behaviors extend to other types of pretense, how these behaviors change as children develop, and which pretense behaviors are most important to pretense identification at different ages.

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