Maternal Behavior Modifications during Pretense and Their Long-Term Effects on Toddlers’ Understanding of Pretense

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Recent studies indicate the need to investigate the sources of toddlers’ understanding of another person’s pretense. The present study is a cultural and longitudinal extension of the work of Lillard and Witherington (2004), who claimed that mothers modify their behaviors during pretense and that the some of these behavior modifications help their toddlers understand maternal pretense. Experiment 1 investigated whether mothers would change their behaviors during pretense with a sample of 31 Japanese mother–infant pairs. Experiment 2, with a subsample of 20 mother–child pairs who had participated in Experiment 1, examined whether the maternal behavior modifications at 18 months predicted their toddlers’ understanding of pretense at 24 months. The results of Experiment 1 indicated that Japanese mothers smiled more frequently, gazed at their toddlers longer, used sound effects more frequently, and engaged in more frequent snack-related actions in a “pretense condition” than in a “real condition.” In addition, some of these behaviors were significantly related to their toddlers’ apparent understanding of pretense. Experiment 2 showed that both the frequency of maternal smiles and the number of sound effects in the pretense condition at 18 months predicted toddlers’ understanding of the pretense enacted by a strange adult at 24 months. This research indicates the impact of maternal behavior modifications during pretense on the development of symbolic thought in the 2nd year of life.

A child’s ability to pretend is one of the most important advances in cognitive development during early childhood, because it is traditionally considered one of the landmark expressions of the emergence of symbolic function (Piaget, 1962). Previous studies have reported that understanding of pretense is associated with other important cognitive abilities in early childhood—for example, an understanding of mind (Davis, Woolley, & Bruell, 2002; Gopnik & Slaughter, 1991; Mitchell & Neal, 2005). Although children participate in pretend play with mothers from around their 1st birthday (Haight & Miller, 1993), they do not seem to confuse pretend and real representations. Developmental psychologists have therefore shown an interest in the question of how young children come to understand other people’s pretense. Across several decades, researchers have examined this topic in relation to young children’s ability to understand the pretender’s mental representations (Aronson & Golomb, 1999; Davis et al., 2002; Gopnik & Slaughter, 1991; Harris, 1994; Harris & Kavanaugh, 1993; Joseph, 1998; Leslie, 1987; Lillard, 1993, 1994, 1996, 1998; Mitchell & Neal, 2005; Nichols & Stich, 2000; Sugimoto, 2008).

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Research data have increasingly emphasized the importance of social input that helps toddlers to understand another's pretense. For example, toddlers' pretend play has been shown to be strongly encouraged by their parents in middle-class American families (Haight & Miller, 1993; Slade, 1987) and Japanese families (Asao, 1996; Takei, Ogino, Ohama, Tatsuno, & Saito, 1981; Tamis-LeMonda, Bornstein, Cyphers, Toda, & Ogino, 1992). In one of these studies, Haight and Miller (1993) found that 99% of instances of pretend play at 12 months were invited by mothers and that 75% of children's utterances at 12 months were reproductions of their mothers' preceding talk about pretense. For example, after one mother animated a stuffed bear by saying "Hi" to it, her child then also greeted the bear with a "Hi." Thus, early pretend play appears fundamentally to be a social and collaborative activity with adults, at least in some cultures (Gaskins, Haight, & Lancy, 2006; Göncü, Mistry, & Mosier, 2000; Haight, Wang, Fung, Williams, & Mintz, 1999; Rakoczy, 2008; Rakoczy, Tomasello, & Striano, 2005; Striano, Tomasello, & Rochat, 2001).

These observations underscored the need to examine how social input facilitates toddlers' understanding of pretense and to consider toddlers' own cognitive abilities. The most important social input for toddlers' understanding of pretense appeared to be in the form of mothers' behavioral modifications during pretense. In a pioneering study, Lillard and Witherington (2004) observed that when U.S. mothers pretended to eat a snack in front of 18-month-old children, these mothers smiled more frequently, used more words and sound effects, gazed more frequently at their children, and engaged in more snack-related actions than when they ate a real snack. Some of these maternal behaviors (smiling, gazing at the children, and words) were significantly related to toddlers' apparent understanding of pretense. Most of the findings of Lillard and Witherington were replicated by Lillard et al. (2007), who studied a wider age range (15- to 24-month-olds in their Experiment 1) and used a different scenario (grooming scenario in their Experiment 2). In addition, Nishida and Lillard (2007) reanalyzed the mother-toddler interactions videotaped by Lillard and Witherington and found that in the pretense condition, toddlers' smiles and/or pretense actions occurred more frequently after a sequence of maternal behavior modifications than after a pretense action alone or a smile alone.

This series of studies by Lillard and her colleagues revealed that mothers changed their behaviors during pretense and consequently helped toddlers to understand pretense. These studies were important because they showed that social input is embedded in pretend play in ways that might assist toddlers' understanding of pretense. However, such evidence was limited to studies in Lillard's laboratory, and to generalize these findings, it was necessary to examine whether maternal behavior modifications during pretense were observable in other settings. If mothers in other cultures, for example, wanted their toddlers to enjoy collaborative pretend play, data are required to show that they change their behaviors during pretense in the same ways as American mothers (Lillard et al., 2007; Lillard & Witherington, 2004).

In addition, it was unknown whether maternal behavior modifications during pretense have long-term effects on toddlers' subsequent understanding of pretense. Many studies have shown that adult modeling of pretense leads to an increase in the frequency and complexity of toddlers' pretend play (Fenson & Ramsay, 1981; Haight & Miller, 1993; Rakoczy et al., 2005; Slade, 1987; Striano et al., 2001; Watson & Fischer, 1977). However, with the exception of a study by Tamis-LeMonda and Bornstein (1994), there have been very few studies about the long-term effects of maternal pretense on toddlers' pretense behavior and understanding. Tamis-LeMonda

and Bornstein showed that prior maternal pretense did not predict toddlers' subsequent pretend play behavior. But they examined only the amount of time that mothers spent engaging in pretend play with their toddlers during an observational period. It seems likely that the quality of maternal pretense is more important than the duration of play time. If maternal behaviors in pretend play were analyzed in more detail, it might reveal an association between maternal behavior modifications during pretense in the 2nd year of life and their toddlers' understanding of pretense several months later.

The first goal of the present study (Experiment 1) was to determine whether Japanese mothers would change their behaviors when pretending in front of their toddlers, which had been observed by Lillard and Witherington (2004). Previous studies had shown that Japanese mothers, like U.S. mothers, spend a good amount of time engaging in pretend play with their toddlers (Asao, 1996; Takei et al., 1981; Tamis-LeMonda et al., 1992). Thus, it seemed appropriate here to observe the pretense behavior of Japanese mothers. The present study also investigated the relationship between maternal behavior modifications during pretense and Japanese toddlers' apparent understanding of maternal pretense. For toddlers in some cultures, changes of maternal pretense behaviors seemed to be a message that "this is play," analogous to Bateson's (1972) description of "play signals" used in play fighting. It was predicted that Japanese mothers would alter their behaviors in the context of pretense and that maternal behavior modifications would be related to toddlers' apparent understanding of pretense.

The second goal of the present study (Experiment 2) was to examine whether maternal behavior modifications during pretense at an earlier age would have a positive effect on toddlers' later understanding of pretense. As mentioned, we examined toddlers' apparent understanding of pretense in relation to maternal modifications at 18 months and developed an explicit measure of 24-month-old toddlers' understanding of the other person's pretense. Previous studies had mainly used the Teddy Task (Harris & Kavanaugh, 1993) in investigations of 2-year-old children's understanding of pretense (Bosco, Friedman, & Leslie, 2006; Walker-Andrews & Kahana-Kalman, 1999). Use of the Teddy Task enabled us to examine the long-term effects of social input during early pretense behavior on toddlers' later understanding of pretense.

EXPERIMENT 1

Experiment 1 adopted the "snack script" from the studies of Lillard and her colleagues (Lillard et al., 2007; Lillard & Witherington, 2004) for use with Japanese mothers and their 18-month-old children. To compare the Japanese data with data from previous study (Lillard & Witherington, 2004), maternal smiling, gaze, speech, sound effects, and snack-related actions were coded as maternal behavior measures in Experiment 1. The main difference between the present study and that of Lillard and Witherington (2004) was in the coding of maternal speech. Although Japanese is an unsegmented language wherein sound boundaries between words are not clear, boundaries between the morphemes (units smaller than words) are clear to native Japanese (Yasukawa & Yokoo, 2010). Therefore, Japanese texts are usually segmented into morphemes when analyzed (Murawaki & Kurohashi, 2008; Yasukawa & Yokoo, 2010), and this method was also used in Experiment 1. On the other hand, both onomatopoeias and nonverbal noises were included in a sound-effects category similar to that in the study by Lillard and Witherington. Japanese onomatopoeia consists of sound-symbolic

words that directly express the sounds of the external world and of specific actions and situations (Hida & Asada, 2002).

Experiment 1 also assessed whether maternal behavior modifications during pretense were related to toddlers' apparent understanding of pretense. We used the sum of the frequencies of toddlers' smiles and pretense actions in relation to their mothers' behavior modifications as a measure of toddlers' apparent understanding of pretense, along the lines of Lillard and Witherington's approach (2004). These variables were the best available indirect measures of apparent understanding in the seminaturalistic snack scenario (Lillard, 2006), because toddlers could not report their cognitions directly. In fact, Nishida and Lillard (2007) provided support for the use of smiles and pretense actions as representations of understanding by demonstrating that toddlers did not always smile and act whenever their mothers smiled or acted. Rather, children responded primarily to maternal specific behavioral sequences (i.e., mothers demonstrated a pretense action, looked at the child, and smiled). Therefore, toddlers' smiles and pretense actions were coded in Experiment 1 as an index of the toddlers' apparent understanding of pretense.

Method

Participants

Participants were 31 18-month-olds (17 boys, $M = 1;6$, range = 1;5–1;7, $SD = 0.88$ months) and their mothers ($n = 31$, $M = 33;8$, range = 21;9–42;9, $SD = 59.28$ months). All participants were native Japanese speakers and came from middle-income families in the Chiba/Tokyo area of Japan. Two mother–child pairs were excluded from the experiment because of either experimental error or the child's noncooperation. Sixteen mother–child pairs participated in the pretense condition first, and 15 pairs participated in the real condition first. The mean ages of the children and mothers were not statistically different between the pretend-condition-first group and the real-condition-first group.

Setting

The experiment was performed in a laboratory room equipped with a one-way mirror and a 0.75-m² table, with an adult chair and a high chair for the children. Images of the child's upper body were captured using a video camera placed approximately 2 m behind the mother's chair while images of the mother's upper body were captured using another camera placed about 2 m behind the child's chair. Each mother was informed that she was being videotaped, and the cameras were enclosed in cases that made them difficult to locate. Each camera was linked to a separate VCR that recorded each session with a synchronous time stamp every 0.01 s.

Materials and Procedures

Materials and procedures were adapted from Lillard and Witherington (2004), with one exception: Instead of Cheerios and juice, *hiring* (a ring-shaped, allergy-free snack made from millet) and mineral water were used to prevent food allergy reactions. A red dish set (bowl and

cup) and blue dish set were used for each mother–child pair; either one of the two sets was used for pretense or real conditions. A metal serving bowl, metal pitcher, and paper napkin were used in both conditions. In the real condition, the serving bowl contained 6 g of *hiering* and the pitcher contained 330 mL of water.

Mothers were told that the study was about parent–child interactions, and pretense was not revealed as the focus of the study. The child was buckled into the high chair, and the mother seated herself in a swivel chair across from the child. For the real-condition-first group, the experimenter placed the first set of materials on the table and gave the following instructions: a) “I want you to sit at the table with your child and have some snacks and water, just as you might at home.” b) “If your child wants a snack, just give her/him a little bit of the snack.” c) “I’d like you to do this for 2 min, until I come back in.”

The experimenter then left the laboratory and returned after 2 min. As she cleared away the first set of materials and provided the second set for the pretense condition, she gave the following instructions: a) “Now I want you to pretend to have a snack and water, just like you might do during play time at home.” b) “If your child wants a snack, please pretend to give her/him some.” c) “I’d like you to do this for 2 min until I come back.”

For the pretense-condition-first group, the same procedure was used, except that the pretense condition took place first.

Coding of Mothers’ Behavior

The experimenter coded maternal behaviors from the video. A second experimenter blind-coded 20% of the sessions for reliability purposes. The frequency and duration of each behavior were measured using Sigsaji2, a free computer program (Arakawa & Suzuki, 2004).

Smiles. A smile was defined as the retraction of both lip corners backward and upward to create a semicircular curve. The frequency and total duration of smiling were measured. Interrater reliability for coding of smiling was 89% ($\kappa = .88$). The referents of smiles were also coded; smiles were coded as referring to the mother’s own action, the child’s action, the child’s confusion, or to other behaviors. Interrater reliability for the referents of smiles was 90% ($\kappa = .93$).

Gazes. Gaze behavior was coded as directed at the child, at objects used for tasks (e.g., bowl, snack), or as not otherwise classified. The total duration of gazing at the child or at task objects was measured for each mother. Duration was measured to the quarter-second by Sigsaji2. Interrater reliability for both the duration of gaze and the referent of gaze was 94% ($\kappa = .87$).

Speech and sound effects. Both speech and nonverbal noises were transcribed, and these were all transcribed into segmented morphemes using McCab-0.97 (Kudo, 2008), a morphological analyzer software. In the present study, each speech segment was classified as either normal utterances or onomatopoeias, and the frequencies of each of these were calculated for each mother. Normal utterances included all of the mother’s speech other than onomatopoeias. Sound effects included onomatopoeias and nonverbal noises (e.g., smacking of the lips). Examples of onomatopoeias included “*mogu*” (referring to both the sound of chewing and the chewing action) and “*goku*” (referring to both the sound of drinking and the drinking action). The frequency of nonverbal noises (e.g., smacking of the lips) was also calculated. These noises were

nonwords that functioned as sound effects. Interrater reliability for all utterances and nonverbal noises coding classifications was 90% ($\kappa = .93$).

Snack-related actions. Serving, eating, pouring, and drinking were coded as snack-related actions, and the frequency of these behaviors was calculated. Serving was coded for the movement of the mother's hand transferring a snack (or imaginary food) from the metal serving bowl into the colored bowl. Eating was coded for the movement of the mother's hand from either bowl toward her mouth with food or imaginary food. Pouring was coded for tilting the pitcher over the cup. Drinking was coded for moving of the cup toward the mother's mouth, whether a real drink was present or not. Snack-related "real" actions were coded in the real condition, while snack-related "pretense" actions (e.g., pretend to be eating, pretend to be drinking) were coded in the pretense condition. In the pretense condition, all snack-related actions were coded as pretense action, because these actions were conducted in the absence of real food. Interrater reliability for these behaviors was 99% ($\kappa = .99$).

Coding of Toddlers' Behavior

The frequencies of toddlers' smiles and pretense actions in the pretense condition were summed as a measure of their apparent understanding of pretense, along the lines of Lillard and Witherington's approach (2004). A smile was defined as either a laugh or the retraction of both lip corners backward and upward to create a semicircular curve (interrater reliability = 94%, $\kappa = .72$). Pretense actions included pretend pouring, drinking, serving, eating, and spilling (interrater reliability = 98%, $\kappa = .91$). In the pretense condition, each smile and each pretense action was given 1 point. Points from the two categories were added to obtain a score for apparent understanding. For purposes of comparison between the two conditions, frequencies of toddlers' smiles and their pretense actions in the real condition were also counted and added.

Results

Preliminary analyses were conducted to determine whether the two groups (pretend-condition-first group vs. real-condition-first group) or child gender should be separated in further analyses of maternal and toddler behaviors. A series of analyses of variance (Order of Conditions $\times$ Child Gender) revealed no statistically significant main effects for order nor gender on any maternal and toddler behavioral measures. Therefore, further analyses were collapsed across order of conditions and child gender. All analyses were conducted using the Statistical Package for the Social Sciences Version 21.

Maternal Behaviors

The first purpose of Experiment 1 was to determine whether Japanese mothers would behave differently when eating a real snack (real condition) versus when pretending to eat a snack (pretense condition), using an adaptation of Lillard's snack script (Lillard et al., 2007; Lillard & Witherington, 2004). Here, paired *t* tests were used to compare behavior in the pretense versus real conditions, and the effect size is reported as a Cohen's *d* (see Table 1).

TABLE 1
Maternal and Toddler Behaviors in the Real and Pretense Conditions of Experiment 1 and the Data of Lillard and Witherington (2004)

	Experiment 1 of the Present Study						Lillard and Witherington (2004)					
	Real Condition			Pretense Condition			Real Condition			Pretense Condition		
	M	SD	Range	M	SD	Range	M	SD	d	t	M	SD
												t
Mother												
Frequency of smiling	6.06	3.86	1–15	10.42	5.09	0–20				$t(30) = 5.55^{***}$	0.97	5.00
Total duration of smiles (s)	14.06	11.84	0.75–47.50	36.30	26.07	0.00–95.73				$t(30) = 5.51^{***}$	1.10	18.86
Smiles referring to the mother's own action (%)	25.77	0.28	0–100	63.36	0.35	0–100				$t(30) = 6.54^{***}$	1.19	19
Smiles referring to the child's actions (%)	56.52	0.33	0–100	24.31	0.30	0.00–93.55				$t(30) = 5.20^{***}$	1.02	76
Total duration of gazing at child (s)	83.13	12.97	54.5–108	90.61	13.74	54.50–117.50				$t(30) = 2.99^{**}$	0.56	60.14
Total duration of gazing at task object (s)	35.33	13.26	11.5–63.5	27.19	13.11	2.50–62.25				$t(30) = 3.31^{**}$	0.62	54.14
Frequency of normal utterances	85.06	45.93	21–203	89.55	43.18	16–176				$t(30) = 0.91$	0.10	114.00
Frequency of sound effects	3.97	5.59	0–20	43.18	39.95	3–143				$t(30) = 6.01^{***}$	1.38	0.03
Frequency of snack-related acts	11.97	5.66	3–26	20.39	9.11	4–42				$t(30) = 6.29^{***}$	1.12	12.94
Toddler												
Frequency of smiling	2.00	2.65	0–11	3.71	3.70	0–13				$t(30) = 2.51^*$	0.53	
Frequency of pretense acts	0.19	0.60	0–3	4.58	4.48	0–17				$t(30) = 5.58^{***}$	1.37	
Apparent understanding score				8.29	6.72	0–22						

* $p < .05$. ** $p < .01$. *** $p < .001$.

Note. To present the data of Lillard and Witherington (2004) in Table 1, all means, standard deviations, and t values were taken from their text. These data were based on Experiment 1 in Lillard and Witherington's study, except for the total duration of gazing at child or task object (Experiment 2) and toddlers' apparent understanding scores (Experiment 3). Some of Lillard and Witherington's data were not presented in their study and are represented here as "no description."

Smiles. Frequency of maternal smiles was significantly greater in the pretense condition than in the real condition, and the total duration of smiles was significantly longer in the pretense condition than in the real condition. Most maternal smiles were in reference to the mother's own actions or the child's actions. To clarify what maternal smiles referred to, the percentages of smiles referring to each target within real and pretense conditions were computed. The percentage of smiles that referred to the mother's own actions was significantly greater in the pretense condition than in the real condition, whereas the percentage of smiles that referred to the child's actions was significantly smaller in the pretense condition than in the real condition. In the real condition, the percentage of smiles referring to the child's actions was significantly greater than that referring to the mother's own actions, $t(30) = 3.09$, $p < .01$, $d = 1.01$. In the pretense condition, the percentage of smiles referring to the mother's own actions was significantly greater than that referring to the child's actions, $t(30) = 3.77$, $p < .01$, $d = 1.20$.

Gazes, speech, sound effects, and snack-related actions. Most gazing behaviors were directed at either the child or the task (e.g., at the dish set or snack). Mothers spent more time gazing at the child in the pretense condition than in the real condition, and they spent more time gazing at the task in the real condition than in the pretense condition (see Table 1). The frequencies of sound effects and snack-related actions were significantly greater in the pretense condition than in the real condition, but the number of normal utterances was not significantly different between the two conditions (see Table 1).

Toddlers' Behaviors

Differences in toddlers' behaviors between the two conditions were examined using paired t tests, as also presented in Table 1. Both the frequencies of toddlers' smiles and their pretense actions were significantly greater in the pretense condition than in the real condition. Moreover, in the pretense condition, frequency of pretense actions was significantly and positively correlated with frequency of smiles ($r = .44$, $p < .05$), while there was no such correlation in the real condition ($r = .19$). These results suggest that it was reasonable to add the frequency of toddlers' smiles with their frequency of pretense actions to form an "apparent understanding score."

Correlation Between Maternal Behavior Modifications and Toddlers' Apparent Understanding of Pretense

In the real condition, with the exception of total duration of smiles, no maternal variables were correlated with the sum of frequency of toddlers' smiles and pretense actions (Table 2). The significant and positive correlation between the total duration of maternal smiles and the sum of toddlers' smiles and pretense acts in the real condition may be attributed to the low frequency of toddlers' pretense actions. In the pretense condition, the frequency of maternal smiles, total duration of smiles, total duration of mothers' gazes at the child, number of normal utterances, and number of sound effects were all significantly and positively correlated with toddlers' apparent understanding scores. The total duration of the mothers' gazing at the task objects was significantly and negatively correlated with toddlers' apparent understanding scores in the pretense condition, perhaps because when mothers gazed at objects related to the task they no longer gave full attention to their toddlers.

TABLE 2
Spearman's Rank Correlations Between Maternal and Toddler Behaviors in the
Pretense and Real Conditions (Experiment 1)

		<i>Toddler</i>	
		<i>Real Condition</i> <i>Sum of Smiles and</i> <i>Pretense Acts</i>	<i>Pretense Condition</i> <i>Apparent Understanding</i> <i>Score</i>
Mother	Frequency of smiling	.27	.40*
	Total duration of smiles (s)	.43*	.49**
	Total duration of gazing at the child (s)	.24	.41*
	Total duration of gazing at task object(s)	-.20	-.36*
	Frequency of normal utterances	.28	.46**
	Frequency of sound effects	.17	.62**
	Frequency of snack-related acts	-.08	-.14

* $p < .05$. ** $p < .01$.

Comparisons Between the Present Study and Lillard and Witherington's (2004) Study

To compare the present results from Experiment 1 with the American data, the target numbers were taken from the text of Lillard and Witherington (2004) and are presented in Table 1. Except for the frequency of normal utterances, the present study and Lillard and Witherington's study revealed the same differences between real and pretense conditions (see Table 1). In addition, except for frequency of sound effects, the present study and Lillard and Witherington's study (Experiment 3) revealed the same pattern of correlations between maternal behaviors and toddlers' apparent understanding scores. Unpaired t tests (two-tailed) were then conducted to further examine differences in the use of both maternal normal utterances and sound effects between the present study and Lillard and Witherington's study, using the actual statistics (i.e., means, standard deviations, and sample sizes) reported in the text of Lillard and Witherington's study. There were significantly fewer normal utterances here in the real condition, compared with in Lillard and Witherington's study, $t(65) = 2.76$, $p < .01$, although there was no such difference in the pretense condition. The number of sound effects in the real condition, $t(30) = 3.92$, $p < .01$, and the number of sound effects in the pretense condition, $t(30) = 4.44$, $p < .01$, were significantly greater in the present study than in Lillard and Witherington's study.

Discussion

Experiment 1 revealed that Japanese mothers, like American mothers, changed their behaviors when pretending in front of their toddlers. Specifically, they a) smiled more frequently in the pretense condition than in the real condition, and most of their smiles in the pretense condition referred to their own actions rather than the child's actions; b) spent more time gazing at the child in the pretense condition than in the real condition; c) used more sound effects in the pretense condition than in the real condition; and d) displayed more snack-related actions in the pretense condition than in the real condition. These results were highly similar to those obtained

by Lillard and Witherington (2004). Experiment 1 also indicated that some maternal behavior modifications during pretense (i.e., smiling, gazing, and normal utterances) were associated with toddlers' apparent understanding of pretense, as was also shown in the study by Lillard and Witherington. These similarities, across samples in different cultures, suggest the common role of a pretense expert who acts playfully toward the toddler to indicate that "this is play" in the course of the development of symbolic thought.

Yet some of the present findings also differed from the American data—for example, with regard to normal utterances. The present study showed no significant difference in the frequency of normal utterances between the two conditions, whereas Lillard's studies (Lillard, et al., 2007, Experiment 1; Lillard & Witherington, 2004, Experiment 1) had shown that mothers used more normal utterances in the pretense condition than in the real condition. However, some of Lillard's own experiments (Lillard et al., 2007, Experiment 2, where a different scenario was used; Lillard & Witherington, 2004, Experiment 2, where a motion monitor was attached to the mother) also did not replicate her original result that mothers used more words in the pretense condition than the real condition. That is, normal utterances may not always be part of mothers' behavioral modifications during pretense.

A second difference between the present data and Lillard's data was found regarding sound effects. The present study showed that the frequency of mothers' sound effects was significantly related to toddlers' understanding of pretense in the pretense condition. However, with the exception of Experiment 2 in Lillard et al. (2007), most of Lillard's studies (Lillard et al., 2007, Experiment 1; Lillard & Witherington, 2004, Experiment 3) did not show a significant correlation between maternal sound effects and toddlers' apparent understanding of pretense. In addition, while the numbers of normal utterances in the real condition were smaller in the present study than in Lillard and Witherington's (2004) study, the numbers of sound effects in both conditions were greater in the present study than in Lillard and Witherington's study. This may be attributed to differences in maternal speech style across cultures or differences between the English and Japanese languages. In fact, Bornstein et al. (1992) found that Japanese mothers tended to use affect-salient speech (nonpropositional, idiomatic, or meaningless statements that included greetings and onomatopoeia) when speaking to their babies, whereas U.S. mothers tended to use information-salient speech (propositional direct statements, questions, and reports about the infant, mother, or environment). Additionally, previous studies have shown that Japanese mothers frequently use onomatopoeia in infant-directed speech (Fernald & Morikawa, 1993; Toda, Fogel, & Kawai, 1990). Perhaps the specific types of maternal behavior modifications to signal pretense may differ between cultures and languages, and toddlers may understand their mothers' pretense when mothers use the culturally appropriate signal.

EXPERIMENT 2

Experiment 2 examined whether maternal behavior modifications during pretense at 18 months would predict their toddlers' later understanding of pretense, using a subsample of the toddlers tested in Experiment 1. About 6 months after Experiment 1 ended, the toddlers participated in Experiment 2 where their understanding of pretense at 24 months was examined using the "Teddy Task" as an explicit measure. The Teddy Task was devised by Harris and Kavanaugh (1993, Experiment 5), and this task had been used previously to investigate 2-year-old children's

understanding of pretense (Bosco et al., 2006, in Italy; Walker-Andrews & Kahana-Kalman, 1999, in the United States). In the Teddy Task, toddlers were required to understand some pretense actions of a female experimenter's hand puppet teddy bear (e.g., the teddy bear pours imaginary tea on a toy pig). Our Experiment 2 examined whether maternal behavior modifications during pretense at 18 months would be associated with toddlers' later understanding at 24 months of pretense, as enacted by a woman other than their mothers.

Method

Participants

The 31 toddlers from Experiment 1 (Time 1) who had reached their second birthdays were asked to participate in Experiment 2 (Time 2). Ten of these toddlers were not able to participate in Experiment 2 for various reasons (i.e., mothers' work schedule, $n = 2$; moved away, $n = 1$; new baby in the family, $n = 1$; no response, $n = 6$). Data for 1 additional toddler were excluded because of experimental error. The final sample for Experiment 2 consisted of 20 2-year-olds (10 boys, $M = 2;0$, range = 1;11–2;1, $SD = 0.55$ months).

Setting

The setting for Experiment 2 was similar to that of Experiment 1, except that the experimenter sat in a swivel chair across from the child and the mother sat in a chair behind the child. Images of the child's upper body were videotaped using a video camera placed approximately 2 m behind the experimenter's chair.

Materials and Procedures

Prior to testing, mothers and their children were brought to a waiting room in the laboratory, where a female experimenter explained the purpose of the study. Mothers accompanied their children throughout the session, but they were asked not to influence their behavior. The Teddy Task began only when the child appeared to be prepared and was happy to play with the experimenter.

Teddy task. The Teddy Task instructions and materials were the same as those used by Harris and Kavanaugh (1993, Experiment 5), except that verbal communication of the instructions was accompanied by predetermined social input. Children were presented with four episodes, all of which involved a "naughty teddy" (a hand puppet manipulated by the experimenter) and two toy pigs. A female experimenter demonstrated four pretense episodes and changed her behavior in a predetermined manner (behavior modifications are italicized in the following sentences). At the beginning of each episode, the two pigs were first positioned within easy reach on either side of the child. The experimenter said with a *smile*, "Here is Teddy. He is being naughty again. Look what he is doing," as she made the hand puppet carry out the episode-specific pretense action using appropriate props. For example, in Episode A, the experimenter made the teddy bear pour imaginary tea over the pig situated to the right of the child while saying "JYAAAA" (the onomatopoeia of pouring tea) for about 3 s, and then she

smiled at the child for about 3 s. The experimenter said, “Oh dear! Can you dry the pig that is all wet?” She then *smiled at the child* for about 3 s and gave the child a towel. Toddlers were then asked to respond with a pretense action involving an appropriate cleaning tool. For each episode, cleaning the correct target with the cleaning tool was scored as a correct response (score range = 0–4 points). The teddy bear’s pretense action, the imaginary substance, the target of the action, the outcome, and the cleaning tool for each episode are all listed in the Appendix. The order of the four episodes was varied randomly across children.

Results

Correlation Analysis

Correlations between maternal behavior modifications during pretense at 18 months and toddlers’ later understanding of pretense at 24 months were examined using the Spearman rank-correlation method, as reported in Table 3. The mean score on the Teddy Task, as a measure of toddlers’ understanding of pretense at Time 2, was 1.65 ($SD = 1.31$, range = 0–4). The frequency of maternal smiles, the total duration of smiles, and the number of sound effects in the pretense condition at Time 1 were significantly and positively correlated with toddlers’ performance in the Teddy Task at Time 2, respectively. No maternal behaviors in the real condition at Time 1 were significantly correlated with toddlers’ performance in the Teddy Task at Time 2.

The correlation between toddlers’ apparent understanding score at Time 1 and their performance on the Teddy Task at Time 2 was next examined using Spearman rank correlations. As shown in Table 3, toddlers’ apparent understanding score in the pretense condition at Time 1 was significantly and positively correlated with their performance in the Teddy Task at Time 2.

TABLE 3
Spearman Rank Correlation Coefficients Between Time 1 Variables and Toddlers’ Understanding at Time 2

				Time 2 (24 Months Old) Teddy Task
Time 1 (18 months old)	Real condition	Mother	Frequency of smiling	.38
			Total duration of smiles (s)	.27
			Total duration of gazing at the child (s)	.24
			Frequency of sound effects	.34
			Frequency of snack-related acts	-.17
			Sum of smile and pretense acts	-.01
	Pretense condition	Mother	Frequency of smiling	.62**
			Total duration of smiles (s)	.51*
			Total duration of gazing at the child (s)	.33
			Frequency of sound effects	.61**
			Frequency of snack-related acts	-.11
			Apparent understanding score	.61**
		Toddler		

* $p < .05$. ** $p < .01$.

However, the sum of toddlers' smiles and pretense actions in the real condition at Time 1 was not associated with their performance on the Teddy Task at Time 2.

Stepwise Regression Analysis

Stepwise regression analysis was used to ascertain whether maternal behavioral modifications during pretense at 18 months would predict their toddlers' understanding of pretense at 24 months. Here, maternal behavior modifications (i.e., frequency of smiles, total duration of smiles, total duration of gazing at the child, number of sound effects, and number of snack-related actions) and toddlers' apparent understanding scores in the pretense condition at Time 1 were used as predictors, and toddlers' performance in the Teddy Task at Time 2 was used as the dependent variable. The frequency of maternal smiles ($\beta = .54$, $t = 3.23$, $p < .01$) and the number of sound effects ($\beta = .37$, $t = 2.23$, $p < .05$) in the pretense condition at Time 1 significantly predicted toddlers' performance in the Teddy Task at Time 2 (adjusted $R^2 = .54$, $p < .01$).

An alternative interpretation of these longitudinal findings is that maternal sensitivity (Ainsworth, Blehar, Waters, & Wall, 1978) promoted toddlers' later cognitive ability, as demonstrated by their successful performance on the Teddy Task. If this were the case, maternal behaviors in the real condition at Time 1 should also have been related to toddlers' performance on the Teddy Task at Time 2. Stepwise regression analysis was next applied to investigate whether maternal behaviors (i.e., frequency of smile, total duration of smiles, total duration of gazing at the child, number of sound effects, and number of snack-related actions) and the sum of the frequency of toddlers' smiles and pretense actions in the real condition at Time 1 predicted toddlers' understanding of pretense at Time 2. None of the variables in the real condition at Time 1 predicted toddlers' performance on the Teddy Task at Time 2, which tended to go against the alternative interpretation of maternal sensitivity.

Discussion

Unlike Tamis-LeMonda and Bornstein (1994) who focused on the amount of time mothers spent engaging in pretend play with their toddlers, Experiment 2 was about maternal behavior modifications during pretense. We found that both frequent smiles and frequent sound effects from mothers in early pretend play seemed to encourage their toddlers' later understanding of pretense. Why were maternal behavior modifications during pretense at 18 months of age associated with their toddlers' understanding of pretense at 24 months? Previous studies concerning the ecological validity of research methods have shown that there is little difference in pretend play between laboratory situations and home situations (Bornstein, Haynes, Legler, O'Reilly, & Painter, 1997; McCune-Nicolich, & Fenson, 1984). For example, Bornstein et al. (1997) showed that both mothers and children performed similarly in their pretend play at home and in the laboratory. This finding suggests that mothers who changed their behaviors frequently during pretense in the laboratory of the present study might have behaved similarly at home, which would have fostered the toddlers' understanding of pretense through pretend play. Toddlers may have learned that both smiles and sound effects are prominent features of the pretender's behavior through their everyday observation of mothers' pretense. Therefore, they may have

recognized from experience the pretense enacted by a stranger who pretended with the use of smiles and sound effects 6 months later.

Why were both maternal smiles and sound effects effective cues for toddler's understanding of pretense? Because "the most widely reported play signal is the open mouth play face" (Pellis & Pellis, 1997, p. 41), smiles and laughter are common signals of play. Moreover, sound effects convey the meaning of the pretender's behavior by mimicking external sounds and referring to specific actions or situations, and sound effects are used frequently by Japanese mothers (Fernald & Morikawa, 1993; Toda et al., 1990). As a result, Japanese toddlers may have used smiles and sound effects as cues to interpret other people's actions as pretense. The Japanese toddlers in the present study were able to observe signals such as smiles and sound effects to discriminate between real versus pretend acts, and therefore, they performed well in pretend play with other people at the age of 2.

GENERAL DISCUSSION

Children are not solitary learners. That is, when describing children's cognitive development, it is necessary to investigate both social input and children's ability to interpret this input (Gelman, 2009). Lillard and Witherington (2004) claimed that mothers send pretense signals to their toddlers by modifying their behaviors during pretense, which contributes to their toddlers' understanding of pretense. The present study elaborated on the work of Lillard and her colleagues, in a different cultural setting and with a longitudinal approach. Specifically, Experiment 1 showed that Japanese mothers, like American mothers, changed their behaviors during pretense and that when they did so, their toddlers seemed to understand maternal pretense. Subsequently, Experiment 2 showed that the toddlers whose mothers changed behaviors during pretense using smiles and sound effects more often at 18 months tended to have a greater understanding of pretense at 24 months. Thus, the present results corroborated and extended the findings of Lillard and Witherington.

Although both Japan and the United States are industrialized societies with many cultural and environmental similarities, it has been reported that there are differences in child-rearing styles between Japanese and American mothers (Shwalb, Nakazawa, & Shwalb, 2005; Tamis-LeMonda et al., 1992). Previous research has indicated that adults have a natural tendency to actively support the activities of their children (Tomasello, 1999), and Gaskins et al. (2006) provided evidence that European American parents believe that pretend play is important for children's cognitive, social, and emotional development. Research has also shown that parents serve as active play partners in communities where they consider pretend play to be a valuable activity (Göncü et al., 2000). It was therefore plausible that Japanese mothers may also think that pretend play is important for their children and that they would enjoy pretend play with their toddlers by changing their behaviors during pretense.

Adult assistance with toddlers' interpretations of people's behaviors is not limited to pretense activities. Brand, Baldwin, and Ashburn (2002) have claimed that infants are guided by adults in processing and interpreting everyday actions. For example, when interacting with infants, mothers apparently modify their behaviors spontaneously in ways that draw the infants' attention to themselves and highlight meaningful units of action. Brand et al. referred to this as "motionese." Infants apparently attend more closely to motionese than to actions directed toward adults

(Brand & Shallcross, 2008). Brand et al. (claimed that motionese contributes to infants' understanding of the significance of certain everyday activities. Csibra and Gergely (2009) further asserted that signals from adults (e.g., motionese, infant-directed speech, direct gaze) and children's sensitivity to such signals establish a communication system that is unique to humans and is culturally universal. They referred to this system as a natural pedagogy that "enables fast and efficient social learning of cognitively opaque cultural knowledge that would be hard to acquire relying on purely observational learning mechanisms alone" (Csibra & Gergely, 2009, p. 148). Similarly, pretense behavior would be difficult to acquire solely through observational learning, and thus, a natural pedagogy system may be operative in pretend play between caregivers and children.

Although Japanese maternal behavior modifications during pretense were similar to those of U.S. mothers from previous studies in many respects, the present study also showed a cross-cultural difference in the use of maternal speech including both normal utterances and sound effects. Japanese mothers here used sound effects including onomatopoeia much more frequently during pretense than did U.S. mothers (Lillard & Witherington, 2004). A difference in maternal speech styles between Japan and the United States has also been revealed by a number of cross-cultural studies (Bornstein et al., 1992; Fernald & Morikawa, 1993). For example, Fernald and Morikawa (1993) observed that in speech to 1-year-old children during a play session at home, Japanese mothers used nonsense or onomatopoeic words more frequently than did American mothers. In addition, cross-cultural studies that examined mother-child pretend play in more diverse cultures have shown some cultural differences. For example, Göncü et al. (2000) investigated mother-child interactions in play, including pretend play, among American, Turkish, Guatemalan, and Indian samples and found cultural group differences in the amount of maternal involvement in play, play styles, and theme of pretense episodes. However, most of these previous studies concerning mother-child pretend play (e.g., Farver & Howes, 1993; Göncü, et al., 2000; Haight et al., 1999) did not examine the contents of maternal pretense signals. Future research should examine what mothers in various societies use as culturally appropriate pretense signals generally speaking (i.e., what pretense signals are culturally universal or culture-specific).

The present study revealed that maternal pretense signals, as modifications of behavior during pretense, encouraged the later development of toddlers' understanding of pretense. Although our findings were obtained by a longitudinal approach that used correlational data and regression analyses, follow-up research is necessary to examine whether similar results would be produced by different methods. For example, it would be interesting to see whether a training program that teaches mothers how to signal pretense to their toddlers with smiles and sound effects, for mothers who are not skilled in behavior modifications during pretend play, might be found to encourage toddlers' understanding of pretense. An appropriate evaluation of the effects of mother-child pretend play on child development and comparison of findings based on interventions with different methodologies (Lillard et al., 2013) will be another important research task.

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REFERENCES

- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the Strange Situation*. Hillsdale, NJ: Erlbaum.
- Arakawa, A., & Suzuki, N. (2004). Shigusa to kanjyo no kankei no tansakuteki kenkyu [Hand movements and feeling]. *Japanese Journal of Research on Emotions*, 10, 56–64. doi:10.4092/jsre.10.56 (in Japanese with English abstract)
- Aronson, J. N., & Golomb, C. (1999). Preschoolers' understanding of pretense and presumption of congruity between action and representation. *Developmental Psychology*, 35, 1414–1425. doi:10.1037//0012-1649.35.6.1414
- Asao, T. (1996). *Fantasy to genjitu* [Fantasy and reality]. Tokyo, Japan: Kaneko Shobou.
- Bateson, G. (1972). *Steps to an ecology of mind*. New York, NY: Ballentine.
- Bornstein, M. H., Haynes, O. M., Legler, J. M., O'Reilly, A. W., & Painter, K. M. (1997). Symbolic play in childhood: Interpersonal and environmental context and stability. *Infant Behavior & Development*, 20, 197–207. doi:10.1016/S0163-6383(97)90022-9
- Bornstein, M. H., Tal, J., Rahn, C., Galperin, C. Z., Pêcheux, M.-G., Lamour, M., . . . Tamis-LeMonda, C. S. (1992). Functional analysis of the contents of maternal speech to infants of 5 and 13 months in four cultures: Argentina, France, Japan, and the United States. *Developmental Psychology*, 28, 593–603. doi:10.1037/0012-1649.28.4.593
- Bosco, F. M., Friedman, O., & Leslie, A. M. (2006). Recognition of pretend and real actions in play by 1- and 2-year-olds: Early success and why they fail. *Cognitive Development*, 21, 3–10. doi:10.1016/j.cogdev.2005.09.006
- Brand, R. J., Baldwin, D. A., & Ashburn, L. A. (2002). Evidence for 'motionese': Modifications in mothers' infant-directed action. *Developmental Science*, 5, 72–83. doi:10.1111/1467-7687.00211
- Brand, R. J., & Shallcross, W. L. (2008). Infants prefer motionese to adult-directed action. *Developmental Science*, 11, 853–861. doi:10.1111/j.1467-7687.2008.00734.x
- Csibra, G., & Gergely, G. (2009). Natural pedagogy. *Trends in Cognitive Sciences*, 13, 148–153.
- Davis, D. L., Woolley, J. D., & Bruell, M. J. (2002). Young children's understanding of the roles of knowledge and thinking in pretense. *British Journal of Developmental Psychology*, 20, 25–45. doi:10.1016/j.tics.2009.01.005
- Farver, J., & Howes, C. (1993). Cultural differences in American and Mexican mother-child pretend play. *Merrill-Palmer Quarterly*, 39, 344–358.
- Fenson, L., & Ramsay, D. S. (1981). Effects on modeling action sequences on the play of twelve-, fifteen-, and nineteen-month-old children. *Child Development*, 52, 1028–1036. doi:10.1111/j.1467-8624.1981.tb03145.x
- Fernald, A., & Morikawa, H. (1993). Common themes and cultural variations in Japanese and American mothers' speech to infants. *Child Development*, 64, 637–656. doi:10.1111/j.1467-8624.1993.tb02933.x
- Gaskins, S., Haight, W., & Lancy, D. F. (2006). The cultural construction of play. In A. Göncü & S. Gaskins (Eds.), *Play and development: Evolutionary, sociocultural, and functional perspectives* (pp. 179–202). Mahwah, NJ: Erlbaum.
- Gelman, S. A. (2009). Learning from others: Children's construction of concepts. *Annual Review of Psychology*, 60, 115–140. doi:10.1146/annurev.psych.59.103006.093659
- Göncü, A., Mistry, J., & Mosier, C. (2000). Cultural variations in the play of toddlers. *International Journal of Behavioral Development*, 24, 321–329. doi:10.1080/01650250050118303
- Gopnik, A., & Slaughter, V. (1991). Young children's understanding of changes in their mental states. *Child Development*, 62, 98–110. doi:10.1111/j.1467-8624.1991.tb01517.x
- Haight, W. L., & Miller, P. J. (1993). *Pretending at home*. Albany, NY: SUNY Press.

- Haight, W. L., Wang, X. L., Fung, H. H., Williams, K., & Mintz, J. (1999). Universal, developmental, and variable aspects of young children's play: A cross-cultural comparison of pretending at home. *Child Development*, 70, 1477–1488. doi:10.1111/1467-8624.00107
- Harris, P. L. (1994). Understanding pretense. In C. Lewis & P. Mitchell (Eds.), *Children's early understanding of mind: Origins and development* (pp. 235–259). Hove, UK: Erlbaum.
- Harris, P. L., & Kavanaugh, R. D. (1993). Young children's understanding of pretense. *Monographs of the Society for Research in Child Development*, 58 (1, Serial No. 231). doi:10.2307/1166074
- Hida, R., & Asada, H. (2002). *Gendai giongo gitaigo youhou jiten* [Dictionary of modern onomatopoeia and mimesis usage]. Tokyo, Japan: Tokyodou Shuppan.
- Joseph, R. M. (1998). Intention and knowledge in preschoolers' conception of pretend. *Child Development*, 69, 966–980. doi:10.1111/j.1467-8624.1998.tb06154.x
- Kudo, K. (2008). MeCab-0.97 [Computer software]. Retrieved from <http://mecab.googlecode.com/svn/trunk/mecab/doc/index.html>
- Leslie, A. M. (1987). Pretense and representation: The origins of 'theory of mind.' *Psychological Review*, 94, 412–426. doi:10.1037//0033-295X.94.4.412
- Lillard, A. S. (1993). Young children's conceptualization of pretense: Action or mental representational state? *Child Development*, 64, 372–386. doi:10.1111/j.1467-8624.1993.tb02915.x
- Lillard, A. (1994). Making sense of pretense. In C. Lewis & P. Mitchell (Eds.), *Children's early understanding of mind: Origins and development* (pp. 211–234). Hove, UK: Erlbaum.
- Lillard, A. S. (1996). Body or mind: Children's categorizing of pretense. *Child Development*, 67, 1717–1734. doi:10.1111/j.1467-8624.1996.tb01823.x
- Lillard, A. S. (1998). Wanting to be it: Children's understanding of intentions underlying pretense. *Child Development*, 69, 981–993. doi:10.1111/j.1467-8624.1998.tb06155.x
- Lillard, A. S. (2006). Guided participation: How mothers structure and children understand pretend play. In A. Göncü & S. Gaskins (Eds.), *Play and development: Evolutionary, sociocultural, and functional perspectives* (pp. 131–154). Mahwah, NJ: Erlbaum.
- Lillard, A. S., Lerner, M. D., Hopkins, E. J., Dore, R. A., Smith, E. D., & Palmquist, C. M. (2013). The impact of pretend play on children's development: A review of the evidence. *Psychological Bulletin*, 139, 1–34. doi:10.1037/a0029321
- Lillard, A. S., Nishida, T., Massaro, D., Vaish, A., Ma, L., & McRoberts, G. (2007). Signs of pretense across age and scenario. *Infancy*, 11, 1–30. doi:10.1207/s15327078in1101_1
- Lillard, A. S., & Witherington, D. C. (2004). Mothers' behavior modifications during pretense and their possible signal value for toddlers. *Developmental Psychology*, 40, 95–113. doi:10.1037/0012-1649.40.1.95
- McCune-Nicolich, L., & Fenson, L. (1984). Methodological issues in studying early pretend play. In T. Yawkey & A. Pelligrini (Eds.), *Child's play: Developmental and applied* (pp. 81–124). Hillsdale, NJ: Erlbaum.
- Mitchell, R. W., & Neal, M. (2005). Children's understanding of their own and others' mental states. Part A. Self-understanding precedes understanding of others in pretence. *British Journal of Developmental Psychology*, 23, 175–200. doi:10.1348/026151004X21107
- Murawaki, Y., & Kurohashi, S. (2008, October). Online acquisition of Japanese unknown morphemes using morphological constraints. *Proceedings of the Conference on Empirical Methods in Natural Language Processing, USA*, 429–437.
- Nichols, S., & Stich, S. (2000). A cognitive theory of pretense. *Cognition*, 74, 115–147. doi:10.1016/S0010-0277(99)00070-0
- Nishida, T. K., & Lillard, A. S. (2007). The informative value of emotional expressions: 'Social referencing' in mother-child pretense. *Developmental Science*, 10, 205–212. doi:10.1111/j.1467-7687.2007.00581.x
- Pellis, S. M., & Pellis, V. C. (1997). Targets, tactics, and the open mouth face during play fighting in three species of primates. *Aggressive Behavior*, 23, 41–57. doi:10.1002/(SICI)1098-2337(1997)23:1<41::AID-AB5>3.0.CO;2-W
- Piaget, J. (1962). *Play, dreams, and imitation in childhood*. New York, NY: Norton.
- Rakoczy, H. (2008). Pretence as individual and collective intentionality. *Mind & Language*, 23, 499–517. doi:10.1111/j.1468-0017.2008.00357.x
- Rakoczy, H., Tomasello, M., & Striano, T. (2005). On tools and toys: How children learn to act on and pretend with 'virgin objects.' *Developmental Science*, 8, 57–73. doi:10.1111/j.1467-7687.2005.00393.x

- Shwalb, D. W., Nakazawa, J., & Shwalb, B. J. (Eds.). (2005). *Applied developmental psychology: Theory, practice, and research from Japan*. Charlotte, NC: Information Age.
- Slade, A. (1987). A longitudinal study of maternal involvement and symbolic play during the toddler period. *Child Development*, 58, 367–375. doi:10.2307/1130513
- Striano, T., Tomasello, M., & Rochat, P. (2001). Social and object support for early symbolic play. *Developmental Science*, 4, 442–455. doi:10.1111/1467-7687.00186
- Sugimoto, N. (2008). Youji no huri ni okeru taishyou no chishiki to koui tonon kankei no rikai [Young children's understanding of pretense: Relations between knowledge and action]. *Japanese Journal of Developmental Psychology*, 19, 221–231. (in Japanese with English abstract)
- Takei, S., Ogino, M., Ohama, K., Tatsuno, T., & Saito, K. (1981). Seigo ni nen kan no dentatsu koudou ni okeru taijin taibutu koudou no hattatu [Person and object in the development of communicative behavior in the first two years of life]. *Japanese Journal of Educational Psychology*, 24, 112–122. (in Japanese with English abstract)
- Tamis-LeMonda, C. S., & Bornstein, M. H. (1994). Specificity in mother–toddler language–play relations across the second year. *Developmental Psychology*, 30, 283–292. doi:10.1037/0012-1649.30.2.283
- Tamis-LeMonda, C. S., Bornstein, M. H., Cyphers, L., Toda, S., & Ogino, M. (1992). Language and play at one year: Comparison of toddlers and mothers in the United States and Japan. *International Journal of Behavioral Development*, 15, 15–42. doi:10.1177/016502549201500102
- Toda, S., Fogel, A., & Kawai, M. (1990). Maternal speech to three-month-old infants in the United States and Japan. *Journal of Child Language*, 17, 279–294. doi:10.1017/S0305000900013775
- Tomasello, M. (1999). *The cultural origins of human cognition*. Cambridge, MA: Harvard University Press.
- Walker-Andrews, A. S., & Kahana-Kalman, R. (1999). The understanding of pretense across the second year of life. *British Journal of Developmental Psychology*, 17, 523–536. doi:10.1348/026151099165456
- Watson, M. W., & Fischer, K. W. (1977). A developmental sequence of agent use in late infancy. *Child Development*, 48, 828–836. doi:10.2307/1128331
- Yasukawa, M., & Yokoo, H. (2010, December). Composition and decomposition of Japanese Katakana and Kanji morphemes for decision rule induction from patent documents. *Proceedings of the 15th Australasian Document Computing Symposium, Australia*, 28–35.

APPENDIX

Action, Substance, Target, Outcome, and Cleaning Tool for Each Pretend Episode in Experiment 2

<i>Episode</i>	<i>Action</i>	<i>Substance</i>	<i>Target</i>	<i>Outcome</i>	<i>Cleaning Tool</i>
A	Pouring	Tea	Pig (right)	Wet/dry	Small towel
B	Pouring	Cereal	Floor (right)	Dirty/clean	Brush
C	Squirting	Toothpaste	Pig (left)	Wet/dry	Tissue
D	Pouring	Milk	Floor (left)	Dirty/clean	Sponge