

The Relationship between Pretend Play and False-Belief in 18-Month-Old Children

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Abstract—This experimental study examined the relationship between pretend play and false-belief. Eighteen-month-old children engaged in pretend play with an experimenter using various controlled behaviors and performed a false-belief task. The results showed that the children who understood pretend play performed better on the false-belief task. This suggests that pretended play and false-belief are related at the age of 18 months.

Keywords—18-month-old, pretend play, false-belief task.

I. INTRODUCTION

SINCE the 1980s, research in the field of cognitive development on infants' acquisition of theory of mind has advanced enormously. Theory of mind is defined as the ability to infer the mental activities of oneself and others. This helps children understand others' feelings and allows them to predict others' behavior. If a person did not understand others or his or her own thoughts, this person would behave inappropriately (e.g., if the person believed that it was raining, even on a sunny day he or she would go out with an umbrella), and his or her understanding of the surroundings would diverge from reality (e.g., even if the person's food contained poison, her or she would eat it). In addition, in order for children to understand others and themselves, they must have familiar others from which they can learn [1].

Adults who have acquired theory of mind can identify a sponge as a sponge even when it is colored like a rock. This is because they can alter their beliefs about the object (e.g., while it looks like a rock, it is in fact a sponge) at the same time as recalling beliefs acquired in the past (e.g., a sponge will always remain a sponge). However, children who have not yet acquired theory of mind would be unable to alter their beliefs in this fashion [1].

Reference [2] reported new insights into children's theory of mind. They found that three-year olds were unable to correctly understand others' false-beliefs. When the experimenter asked, "A boy went out to play after putting chocolate in a blue box. While he was away, his mother moved his chocolate to a green box. Then, the boy comes back from playing. Where do you think he will think to look for his chocolate?" many of the three-year-olds answered, "in the green box."

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This is an example of what are called "false-belief" or "false belief" tasks. In addition to [2] task, false-belief tasks exist, such as the Smarties and rock tasks. In the Smarties task, a child is first shown a Smarties box with a pencil inside. When the child is shown the box with the lid closed, he or she would say that it contained Smarties. Then, the child is shown the inside of the box and confirms that there is a pencil inside. The experimenter asks: "If you show this box to another child and did not show them what was inside, what do you think that he or she would say the box has in it? A pencil? Or Smarties?" In the rock task, after showing a sponge colored as a rock to a child, the experimenter asks the child, "What is this?" confirming that the child thinks it is a rock. After this, the experimenter shows the child that the sponge can be squeezed, and asks, "What is this?" again, after which the child would answer, "A sponge." Finally, after letting the child confirm that it is a sponge, the experimenter asks, "If a child who has not touched or squeezed this saw this, what do you think he or she would think it is? A rock or a sponge?" [3]. In all false-belief tasks, the child is asked how another child, who has not seen the truth of a particular situation, would react to the same question they were asked initially. In other words, in order to answer correctly in a false-belief task, the child has to assume the viewpoint of "another," and not of "oneself." Research has shown that it is difficult for three-year old children to give a correct answer on a false-belief task, and the rate of answering correctly improves as the children's ages increase [2],[3].

On the other hand, other researchers argue that theory of mind appears much earlier in life. The reason that false-belief tasks are difficult for infants is because its linguistic and cognitive loads are high [4]. Even three-year-olds or two-year-olds can give correct answers on a false-belief task if the task is modified [5]. In these modified tasks, for instance, an infant first witnesses a story. Then, the experimenter asks the infant an easy question, such as when the first character returns to the scene, where will he or she look first to find his or her toy. Many infants look at the correct position, showing that they already have the ability to understand others' behaviors and false-beliefs. Reference [6] found that 15-month-olds can understand false-beliefs, after they conducted an easier non-verbal task. They used the violation-of-expectations method, an indicator that can show the extent to which an infant understands another's intentions. The experiment revealed that infants can already anticipate that the other will look for the toy according to the other's false-belief. Furthermore, studies have reported a relationship between false-belief task performance and pretend play. Reference [7] examined the relationship between a ten-minute session of pretend play and performance

on a false-belief task in three- to five-year-old children. They found that children who put forward a collaborative proposal such as "let's make biscuits together" and allocate roles such as "you are the mother" during the ten-minute pretend play performed better on the false-belief task. In addition, Reference [8] conducted an experiment in which children took part in pretend play when they were 33 months old, and then took part in a false-belief task seven months later. They found that children who took on many roles other than themselves during the pretend play at 33 months old tended to perform better on the false-belief task seven months later. Similarly, Reference [9] found that children who frequently engaged in simulation and allocation of roles performed better on a false-belief task.

However, infants often start to engage in pretend play at around 18 months old; this reaches its peak at 24 months [10],[11] and becomes a major aspect of play at around three years old [12],[13]. According to [14], children need the ability to read intent, engage in joint attention, and be capable of social participation in order to pretend, meaning that they will only be able to engage in pretend play at the age of 18 months, when these three faculties have developed.

However, few experimental studies on pretend play have examined 18-month-olds. Moreover, no study has yet elaborated the relationship between pretend play and false-belief in 18-month-olds. Therefore, this study examined whether there is a correlation between pretend play and performance on a false-belief task among 18-month-old children.

However, as the majority of previous studies examined pretend play between children and their mothers, we also must consider that when examining 18-month-olds' ability to engage in pretend play, mothers might be influencing the child's behavior.

Play in infants, including pretend play, manifests more often as mother-child play than solitary play and the representational ability inherent to pretend play is thought to develop through learning from and interaction with adults [15]. In other words, early mother-child play is part of the interactions between mother and child, which forms the basis of the child's later play and social development. In pretend play, in order to ensure that the child does not misunderstand pretense as reality, the mother provides signals to the child that encourage understanding of pretense.

In fact, [14] examined behaviors particular to the mother that are necessary for the child to distinguish pretense from reality (i.e., the mother's pretense signals). The experiment was conducted with 18-month-olds and their mothers using two conditions: a pretend play condition in which the mother and child pretended to eat and a reality condition in which the mother and child in fact ate. The results showed that mothers gave pretense signals such as eating-related behaviors, smiling, and carefully gazing at the child's face more frequently in the pretend play condition than in the reality condition. They also examined which of these indicators was most related to the child's understanding of the pretense. They found that children appeared to understand best when their mothers gazed at their

faces or smiled at them. This shows that the most important signals for distinguishing pretense from reality for an 18-month-old infant are the mother's gaze and smile. In other words, in studying mother-child pretend play, there is a possibility that the child's pretend play is instigated by the mother's pretense signals. Accordingly, the present study examined children's understanding of pretend play by having them engage in pretend play with the experimenter rather than with their mothers, using a set of controlled behaviors without pretense signals. Thus, this study investigated whether there is a correlation between pretend play and performance on a false-belief task in 18-month-olds.

II. METHOD

Participants

Mothers and children who came to a health center in Kyoto for a check-up were asked to take part in the study. The experiment was conducted with 25 eighteen-month-olds (15 boys and 10 girls) and their mothers who consented to take part. The average age of children was 80.39 weeks ($SD = 1.52$ weeks).

Materials/equipment

A room with a wall-to-wall carpet was made into two rooms using a partition, and the tasks were carried out in both rooms.

The false-belief task room (550 cm \times 200 cm) had a table for the experiment (80 cm \times 80 cm) in the middle; on the table were two boxes, one green and the other yellow, and a fabric toy made with a fishing line attached. There was also a plastic door for covering the experimenter's face in certain experimental scenes. There was a plastic screen on one side of participants. Two video cameras were set up to observe the child's facial expressions and behavior. One (208C, Kyoritsu) was placed on the table to film the subject infant's gaze closely. The other camera (NV-GS200, Panasonic) filmed each child's whole body. The images filmed by the two cameras were then shown on one screen with a multi-viewer (MV-40F, FOR/A).

The pretend play task room (450 cm \times 200 cm) had a table for the participants (60 cm \times 60 cm \times 35 cm) in the middle and a child's chair (28 cm \times 28 cm \times 30 cm). In addition, before the commencement of the pretend play task, materials for the experiment, which included a pitcher, a red tray, paper cups and plates for the mother and child, and a cleaning cloth were placed on the table. Two video cameras (HDC-TM25 and HDC-TM700, Panasonic) were set up, with the counters set to allow filming at 0.01 second/second. One of the cameras was set at the height of the child's face when he or she was seated and filmed the child's facial expressions. The other camera was set near the ceiling in order to capture the overall image of the room. The images filmed by the two cameras were then shown on one screen with a multi-viewer (MV-40F, FOR/A).

Procedures

Participants first entered the false-belief task room, where the experimenter established a rapport with the child for five to

ten minutes, and the mother's consent to participate in the experiment was obtained. For the experiment, the false-belief task was carried out first, after which the pretend play task was conducted in the other room. After that, participants moved back to the first room, where they performed the false-belief task again.

The false-belief task

Participants and the experimenter sat face-to-face with the table in between them, with the child sitting on the chair and the mother sitting behind him or her. There were two boxes on the table in front of the child, one green, and the other yellow. The boxes had their openings facing each other and there was a watermelon toy (hereafter, the object) in the middle. Behind the boxes, there was a plastic door through which the experimenter could present himself or herself. The experimenter then conducted the habituation phase, wearing a sun visor so as not to gaze at the child (Fig. 1).

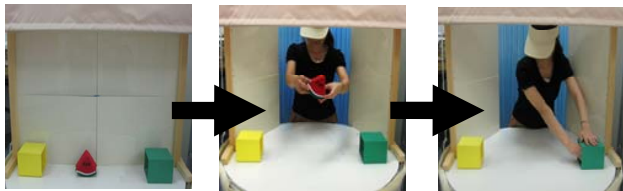


Fig. 1 False-belief task habituation phase

There were three parts to the habituation phase. First, the experimenter appeared at the scene by opening the door, played with the object for a few seconds, and then placed it in either the green or the yellow box. The number of times the object was placed in each box was counterbalanced. Until this part of the phase was finished, the experimenter kept one hand in the box that contained the object and stayed still for five seconds. When this part was complete, the screen on the child's side was closed. In the second and third parts of this phase, the screen was raised, and the experimenter appeared and placed one hand in the box that had contained the object in the earlier phase, and stayed still with his or her hand in the box for five seconds until the part was completed.

When the final part of the habituation phase was completed, the door on the experimenter's side was closed to produce a situation that the experimenter would be unable to see, thus beginning the false-belief task. The experimenter pulled the fishing line attached to the object from behind the door, moving the object from the box that it had been placed in originally to the other box, and making sure that the child could see the process (Fig. 2).



Fig. 2 False-belief task third phase

After that, the experimenter appeared and stayed still for ten seconds with one hand in the box that the object had been placed in originally or the one that the object had been moved into (test phase: Fig. 3).



Fig. 3 False-belief task test phase

After the false-belief task had been completed, the pretend play task was conducted. After that, the habituation phase and the false-belief task were repeated. At this point, during the test phase, the child saw the experimenter put his or her hand into a different box from earlier (Fig. 4).



Fig. 4 False-belief task test phase 2

After the false-belief task had been administered to the child twice, the experiment was complete. The order in which the experimenter placed their hand in the boxes was randomized, and care was taken to ensure that the child would not realize that the experimenter was manipulating the object during the test phase.

The pretend play task

The child was seated on the chair and the experimenter seated on the left hand side of the table from the child. The mother sat behind the child and was asked not to give any instructions to the child, but to observe him or her carefully. The experimenter repeated the pretend play acts of "eating," "drinking," "pouring and "wiping" by performing the act for

four seconds and waiting for five seconds. Each act was performed for three minutes in a total of five trials. Thus, in total, there were twenty trials. The four pretended play acts were counterbalanced. During this, the experimenter assumed a neutral expression, did not gaze at either the child or the mother, and did not utter any words.

Analytical method

False-belief task

Using the measurement method devised by [6] as a guide, the length of time and the number of times the child looked at the box that the experimenter had one hand in (before moving the object and after moving the object) were used as indicators. Although the child saw the object move, because the experimenter had not seen this, the correct answer was to look at the box that the object had been moved into (correct box), while it was incorrect to look at the box that the object had been moved from (incorrect box).

The indicator of false-belief task understanding was calculated by subtracting the length of time the child gazed at the incorrect box from the length of time the child gazed at the correct box. This was introduced in order to eliminate the possibility of classifying a child as understanding the false-belief task if they had just happened to gaze at the correct box by chance, which could occur if gazing time at the correct box was the only indicator. The hypothesis was that if the child understood the false-belief task, they would gaze longer at the correct box than they would at the incorrect box.

The pretend play task

Following [14], the child's pretend play behaviors (eating, pouring, drinking, and wiping) and smiles were coded, and the length of the act (in seconds) and the number of times the act was performed were measured. As for the child's smile, the length of time and the number of times that the corners of the child's mouth were raised and when he or she laughed were measured.

In addition, [14] used the total of the children's pretend play behaviors and smiles in the pretend play condition as indicators of their understanding of pretend play. If the children smile when they are engaged with pretend play, this indicates that they understand the pretense [14],[16]. According to this previous research, in this study, engaging in pretend play or smiling during the task were used as indicators of the child's understanding of pretend play. Such children were referred to as "children who understand pretend play."

Ethical considerations

This study was approved by the psychology department of the author's affiliated university as having no ethical problems. In addition, because the participants were infants, before the experiment the outline of the study and experimental procedures, that the experiment could be suspended at any time depending on the guardian's or the child's condition, and that personal information would be handled appropriately and data would be anonymous during analysis were explained to the

guardians both verbally and in writing. Their written consent was then obtained.

III. RESULTS

First, the results of the false-belief task were analyzed. In the false-belief task, the length of time that the child gazed at the incorrect box and the correct box were used as indicators. It was hypothesized that when the experimenter placed their hand in the correct box, the length of time that the child gazed would increase.

Table I shows the mean length of time that the children gazed at the two boxes.

TABLE I
THE LENGTH OF TIME THE CHILDREN GAZED EACH BOX
IN THE FALSE-BELIEF TASK

	Incorrect Box		Correct Box	
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)
Length of time the child gazed at the box	3.02	(1.60)	4.63	(2.48)
Number of times the child gazed at the box	1.48	(0.86)	1.92	(0.77)

In order to examine the differences in the children's gaze times (in seconds), a paired t-test was carried out. The results showed that 18-month-olds gazed significantly longer at the correct box than they had at the incorrect box ($t(24) = 3.65, p < .001$). Another paired t-test was carried out for the number of times the children gazed each box. The result shows that participants gazed significantly more frequently at the correct box than the incorrect box ($t(24) = 2.68, p = .02$).

Next, in order to examine if there was a correlation between the false-belief task and pretend play among 18-month-olds, an analysis on pretend play was carried out.

Table II shows the results of the pretend play with the experimenter.

TABLE II
THE CHILDREN'S BEHAVIOR DURING PRETEND PLAY

	<i>M</i>	(<i>SD</i>)
Total pretend play (seconds)	4.70	(11.23)
Total pretend play (frequency of incidence)	1.64	(2.78)
Smile (seconds)	1.31	(2.64)
Smile (frequency of incidence)	0.72	(1.37)

Furthermore, in order to examine the relationship between pretend play and performance on the false-belief task, those children who showed pretend play behavior or smiles during

play with the experimenters were labeled as “children who understand pretend play” and those children who did not as “children who do not understand pretend play.” Table III shows the number of children who showed pretend play behavior or smiles.

TABLE III
FREQUENCY OF UNDERSTANDING PRETEND PLAY

		Smile		Total
		Expression	Non-expression	
Pretend play	Expression	4	6	10
	Non-expression	3	12	15
Total		7	18	25

Unit: number of children

Thirteen children understood pretend play, whereas 12 children did not.

Table IV shows the means and standard deviations of the indicator of false-belief task understanding between the children who understood pretend play and those who did not understand pretend play.

TABLE IV
PRETEND PLAY UNDERSTANDING AND THE INDICATOR OF FALSE-BELIEF TASK UNDERSTANDING

	Children who understood pretend play (N=13)		Children who did not understand pretend play (N=12)	
	M	(SD)	M	(SD)
Indicator of false-belief understanding	2.47	(2.02)	0.82	(2.12)

Unit: seconds

A non-paired t-test was then carried out, and it was revealed that children who understood pretend play tended to gaze at the correct box (the indicator of false-belief task understanding) longer than the children who did not understand pretend play ($t(23) = 1.98, p = .06$).

Reference [6] used the length of time the child gazed at the correct box, measured in seconds, as the only measurement for the false-belief task; however, in this study, the number of times the child gazed at this box was also used as a measurement. Table V shows the means and standard deviations of the number of times the children gazed at the correct box during the test phase.

TABLE V
PRETEND PLAY UNDERSTANDING AND THE NUMBER OF TIMES OF GAZING AT THE CORRECT BOX

	Children who understood pretend play (N=13)		Children who did not understand pretend play (N=12)	
	M	(SD)	M	(SD)
Number of times the children gazed at the correct box	2.33	(0.77)	1.54	(0.77)

A non-paired t-test was then carried out, and it was shown that the children who understood pretend play gazed at the correct box more often than the children who did not understand pretend play ($t(23) = 2.55, p < .05$).

IV. DISCUSSION

This experiment examined whether pretend play and performance on a false-belief task among 18-month-olds are related. The false-belief task developed by [6] was used, and pretend play was conducted with only the experimenter using controlled behavior.

First, it was examined whether 18-month-olds understand false-beliefs. The study obtained a similar result to [6], which suggested that 18-month-old children do understand false-beliefs.

Next, regarding the results of the pretend play with the experimenter using controlled behaviors, 52.0% of the participants showed pretend play behaviors or smiles, behaviors that suggested an understanding of pretend play. In order to remove the possible influences of the mother's pretense signals, the experimenter did not show any pretense signals such as smiles or gazes, and showed only pretend play behaviors. Despite this, the fact that more than half of the 18-month-olds showed such behaviors indicates that 18-month-olds can understand pretend play even without the mother's pretense signals or without copying the mother's pretended play behaviors. Reference [17] has argued that because pretend play is a hypothetical behavior (behaving “as if ...”), then pretense by one or two-year olds is a hypothetical replacement for this behavior, and not a real understanding of the mental condition of pretense. Furthermore, [18] also argues that during the early stage of pretend play, children are unaware of the mental conditions of pretense, and therefore they do not understand it fully. However, the findings of this study suggest the possibility that 18-month-olds are just beginning to understand pretend play.

The main aim of this study was to identify whether there was a relationship between pretend play and false-belief task performance among 18-month-olds. It was found that the children who understood pretend play tended to gaze for longer at the correct box, which served as an indicator of false-belief understanding, suggesting that there is a relationship between pretend play and false-belief even among 18-month-olds. This expands on the findings from previous studies that there is a

relationship between pretend play and false-belief in young children.

Regarding the similarities between pretend play and false-belief, pretended play can only occur when the child understands both reality and pretense. In order to engage with pretend play, children must engage with the hypothetical representation that there is a biscuit on the plate even when in reality there is nothing there.

As for false-belief, children can only perform well on the false-belief task when they understand both their own beliefs and those of others. It is necessary for the child to represent the other's viewpoint, understanding that while he or she knows that the object has been moved, the other person does not. The ability to engage in reality and pretense, and understand the self and others, is what connects pretend play and the false-belief task. In both behaviors, children are asked to exercise the ability to understand others' beliefs and intentions. Reference [4] has pointed out that pretending is an expression of theory of mind. Thus, it can be suggested that because both tasks involved distinguishing between two points of view based on spontaneous representations, there is a relationship between pretend play and performance on the false-belief task among the 18-month-olds in this study.

Furthermore, in existing studies of pretend play and false-belief understanding, researchers have typically focused on young children, especially four-year-olds, but this study suggests that children as young as 18 months might be developing an understanding of false-belief—or more specifically, an understanding of others—by engaging with pretend play.

Children develop their sociability through play. Pretend play with peers reaches its peak during the toddler phase, and it is assumed that encouraging pretend play between the mother and child during the infant phase would promote the development of the child's ability to understand others. In addition, because it was demonstrated that there is a relationship between pretend play and understanding of false-belief at such an early age, pretend play could perhaps be an effective intervention for children with autism. Such children lack a fully functioning theory of mind and show difficulties in performing false-belief tasks. Even when a child cannot engage in pretend play, by encouraging the development of the three abilities that constitute pretend play—the ability to read intentions, engage in joint attention, and perform social referencing—children with autism may be able to engage in pretend play and thus begin to understand others.

In this study, the number of times the child gazed at the correct box was examined in addition to the length of time the child gazed at the correct box, which was used in [6]. The results showed that the children gazed at the correct box longer and more frequently, and that the children who understood pretend play gazed at this same box longer and more frequently than the children who did not understand pretend play. This indicates that the number of times the child gazes at the correct box can also be used as an indicator of false-belief understanding.

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