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Abstract

Pretend play is one of the earliest forms of children's imagination. While social pretend play (role play) may facilitate the development of theory of mind—including false belief understanding—theoretically, the reverse may be true; theory of mind may facilitate the development of role play. To clarify this relationship, the present longitudinal study examined whether toddler's implicit understanding of false beliefs predicted their role play during preschool years. We examined 18-month-old toddlers' looking time in an implicit false-belief task (Time 1). When the children were 4/5 years old (Time 2), children's parents answered a questionnaire on their child's engagement in role play, such as playing with an imaginary companion and impersonating an imagined character. Toddlers' looking time in the false-belief task at Time 1 predicted impersonation scores at Time 2. The results suggest that early theory of mind skills can facilitate children's role play.

Keywords: pretense, theory of mind, implicit false belief understanding, longitudinal study.

Introduction

Young children spend much time on engaging pretend play such as role play (pretend play with social content) and object substitution play (pretend play with an object). Research repeatedly suggests that pretend play is associated with the development of theory of mind (Friedman, 2013). Leslie (1987) proposed that the cognitive structures in pretend play and theory of mind are similar. This theorization implies that pretend play in general may be correlated with the development of theory of mind understanding. However, recent studies show that role play, and not object substitution play, are correlated with performances in theory-of-mind tasks (Giménez-Dasí, Pons, & Bender, 2014; Roby & Kidd, 2008; Taylor & Carlson, 1997).

Young children enjoy engaging with role play, such as playing with personified objects, inventing invisible characters, and impersonating imagined characters. The first two are termed Imaginary Companions (ICs). About half of the children tend to have ICs (Bouldin & Pratt, 1999; Gleason, 2004; Moriguchi, Sakata, Ishibashi, & Ishikawa, 2015; Moriguchi & Shinohara, 2012; Taylor, 1999; Taylor, Carlson, Maring, Gerow, & Charley, 2004; Taylor, Sachet, Maring, & Mannering, 2013). Cross-sectional and longitudinal research shows that children with IC performed better on theory-of-mind tasks compared to those without IC (Lillard & Kavanaugh, 2014; Taylor & Carlson, 1997). Harris (2000) suggested that children have to simulate mental states of an imaginary person for both themselves (impersonation) and others (IC) during role play and may extend such skills when speculating another person’s mental states in a false-belief task.

Existing evidence suggests that pretend play may affect the development of theory of mind, but theory of mind may also facilitate the development of pretend play (Jenkins & Astington, 2000; Lillard, 1993; Moriguchi et al., 2016). As Lillard and colleagues reviewed (Lillard et al., 2013), the evidence was not conclusive. Early studies examined the

relationship between pretend play and representational (or explicit) theory of mind, measured by verbal false-belief tasks that can be performed at around 4 years (Callaghan et al., 2005; Wellman, Cross, & Watson, 2001).

Recently, studies using violation of expectation or eye-tracking methods have shown that infants may develop an implicit understanding of false beliefs (Baillargeon, Scott, & He, 2010; Low & Perner, 2012; Onishi & Baillargeon, 2005; Ruffman & Perner, 2005; Senju, Southgate, Snape, Leonard, & Csibra, 2011). In their pioneering study, Onishi and Baillargeon (2005) showed 15-month-old toddlers a scene where an experimenter hid a toy in one location (A) that had been moved to another location (B) during her absence. In the subsequent test phase, toddlers looked longer when the experimenter searched location B—implying a violation of expectation—compared to when the experimenter searched location A. There is still controversy regarding the interpretations of the implicit understanding of false beliefs (Baillargeon, et al., 2010; Low & Perner, 2012; Perner & Ruffman, 2005). Indeed, some researchers suggest that looking time may indicate infants' implicit knowledge about behavior, and not mental states (Ruffman, 2014, for details see Discussion). Nevertheless, the results suggest that toddlers may implicitly attribute false beliefs to another person's actions (Baillargeon, et al., 2010; Senju, et al., 2011).

Recently, research has shown sequential development of theory of mind during early childhood (Wellman & Liu, 2004; Yamaguchi, Kuhlmeier, Wynn, & VanMarle, 2009). Specifically, the implicit understanding of false beliefs showed conceptual continuity with the explicit understanding (Thoermer, Sodian, Vuori, Perst, & Kristen, 2012), even when controlling for gender and verbal IQ (Sodian et al., 2016). However, few studies examined the relationship between implicit understanding of false belief and other measures than explicit understanding of false belief.

We believe that the implicit understanding of false belief may contribute to the

development of role play. Toddlers with better mental state reasoning may be more likely to attribute psychological states to another person, non-human objects, and themselves. Such toddlers may develop a tendency to engage in more role play, especially since it often involves imagining or simulating psychological properties of non-human objects (e.g., a doll or puppet) and themselves (e.g., impersonation of Batman). Research shows that toddlers tend to attribute false beliefs to other people, non-human animals, and geometric shapes (Surian, Caldi, & Sperber, 2007; Surian & Geraci, 2012). Moreover, recent studies have identified early social predictors of role play; the frequency of parental mental-state language and goal attribution during infancy was found to predict children's IC status in their preschool years (Moriguchi, et al., 2016; Motoshima, Shinohara, Todo, & Moriguchi, 2014). We therefore hypothesized that toddlers' implicit false belief understanding may influence their engagement of role play in their preschool years. The present study tested the hypothesis using longitudinal method (Aschersleben, Hofer, & Jovanovic, 2008; Wellman, Phillips, Dunphy-Lelii, & LaLonde, 2004).

In this longitudinal study, children were assessed at 18 months (Time 1) and in their preschool years (Time 2). At Time 1, children participated in implicit false-belief tasks similar to Onishi and Baillargeon's procedure (2005). Children were shown a familiarization scene wherein an experimenter hid a toy in one location (location A), after which the toy had been moved to another location (location B) in the experimenter's absence. Subsequently, two types of test scenes were presented to each child. In the correct version, the experimenter searched location A, such that, the experimenter's behaviors were based on the false belief about the location of the toy. In the incorrect version, the experimenter searched location B, wherein the experimenter searched the correct location of the toy, even though she had not observed the change in location. We calculate false belief scores by dividing infants' looking time in the incorrect version by the looking time in the correct version. At Time 2, we

examined children's role play based on parental reports. In addition, we assessed children's fantasy thinking to examine whether implicit false belief understanding influences children's general fantasy orientation.

Methods

Participants

Children were recruited from a registry of families maintained in the Child Development Lab at Doshisha University, Kyoto, Japan. Informed consent was obtained from the children's parents prior to participation. The study was conducted in accordance with the principles of the Declaration of Helsinki and the study design was approved by the local ethics committee.

Thirty-eight children (15 boys and 23 girls) from middle socioeconomic backgrounds participated in this longitudinal study. Three out of 38 children participated in Time 1, but not in Time 2. The mean age at Time 1 was 18.5± 0.5 months. All children were around 4 years (50.1±6.3 months) at Time 2.

Research Design

At Time 1, the study was conducted in an experiment room at Doshisha University. At Time 2, the questionnaire was mailed to parents.

Implicit false-belief test

The false-belief experiment procedure was based on Onishi and Baillargeon's (2005) study with an exception that each child participated in both conditions (correct and incorrect). Two video cameras videotaped the child's facial expressions and behavior. Each child was presented a correct and incorrect version of the false-belief task. They were first presented one version of the false-belief task in an experiment room, after which they played with the experimenter and their mother in another room and were then presented the other version in the experiment room. The order of conditions (correct vs. incorrect) was randomized.

The child sat on a chair facing the experimenter, sitting across a table. The child's mother sat behind the child. Two boxes, one green and the other yellow, were placed on the table in front of the child. The boxes' openings faced each other, with a watermelon toy (hereafter, the object) placed between the boxes. The apparatus had plastic doors behind the boxes through which the experimenter could access the scene. A curtain divided the child from the apparatus. The experimenter wore a sun visor to prevent any eye contact with the child.

In the first familiarization trial, after the curtain was raised, the experimenter opened the doors to appear at the scene. She played with the object for a few seconds and placed it in one of two boxes (e.g., the green box). The experimenter paused with her hand inside the box for five seconds until the curtain was lowered. The boxes in which the object was placed were counterbalanced. In the second and third familiarization trials, after the curtain was raised, the experimenter opened the doors and placed one hand in the box that had contained the object in the first trial, and stayed still with his/her hand in the box for five seconds until the curtain was lowered.

After the familiarization phase, the children participated in a single belief-induction trial, wherein they witnessed a change of the toy's location that resulted in the experimenter holding a false belief about the toy's location. In this trial, while the opening in the back wall remained shut, the toy moved from one box (e.g., the green box) into the other box (e.g., yellow box). This change in toy location was only visible to the child, implying that the experimenter would have a false belief about the toy's location.

After the belief-induction trial, the children received a single test trial for each version. In the correct version, the experimenter opened the doors, reached into the box that contained the object at the familiarization trial (e.g., green box), and paused until the curtain was lowered. In the incorrect version, the experimenter opened the doors, reached into the

box that contained the object at the belief-induction trial (e.g., yellow box), and paused until the curtain was lowered. Children's looking time for each version were measured.

Imaginary companion

Parents completed the questionnaire about ICs and other forms of role play at Time 2. For IC, we used Motoshima et al.'s (2014) questionnaire, which had been used in interviews with parents. Since parental reports on IC status match children's imaginary behavior (Gleason, 2004), we expected that the questionnaire responses would be valid. Moreover, a previous study showed that IC can be discriminated from a transitional object (Motoshima et al., 2014). An IC was defined as a vivid imaginary character that does not actually exist but is treated as real by the child, with whom the child interacts during daily activities. Examples of incidents involving personified-object ICs and invisible ICs were listed for clarity. Parents indicated whether their child had ICs similar to the examples and answered questions about the number of ICs; age of the child when the IC appeared and, if relevant, disappeared; age, sex, name, appearance, and personality of the IC; scenes and activities in which the IC was engaged; and child's attitude toward the IC. Children were regarded as having ICs if parents at Time 2 answered that 1) their child had ICs; 2) the ICs were the same over time; 3) the ICs had names; and 4) the child and ICs interacted for more than one month.

Impersonation

Additionally, parents completed a 9-item questionnaire on impersonation (4 items; e.g., your child likes to impersonate an animation character or a protagonist) and fantasy thinking (5 items; e.g., your child believes that an animation character really exists) based on some previous studies (Bouldin, 2006; Singer & Singer, 1990). Items were scored on a 7-point scale ranging from 1 "almost never" to 7 "almost always," indicating the degree to which they were characteristic of the child (see Appendix). The questionnaire was validated on 159 mothers of children with normal development (mean age = 52.7 months; 80 boys, 79

girls) who did not participate in the main study. Confirmatory factor analyses yielded two underlying factors for impersonation (4 items; mean score (*SD*): 5.3 (1.1); α = .64) and fantasy thinking (3 items; mean score (*SD*): 2.7 (1.3); α = .67). Two items were excluded due to small eigenvalues. We did not use the items in the main analysis. The comparative fit index, (*CFI*) = 0.94; goodness of fit index, (*GFI*) = 0.96; and root mean square error of approximation, (*RMSEA*) = 0.07 in the pilot study demonstrated acceptable fit. Thus, we used a two-factor model in the main analysis.

Results

Implicit false-belief test

One participant's data were eliminated due to a looking time of more than 3*SD*. Therefore, we analyzed data of 37 participants. The mean looking time (*SD*) was 3.27 (1.60) in the correct version and 4.52 (2.05) in the incorrect version. No significant effects of sex on looking time in the correct (t (35) = 0.083, p = .93, d = .03) and incorrect versions were observed (t (35) = -0.121, p = .90, d = .03). We examined whether toddlers had an implicit understanding of the experimenter's false belief at Time 1 by conducting a paired t-test to compare the mean looking times in the correct and incorrect versions. If toddlers were able to understand another person's false beliefs, they would have been surprised by the experimenter's attempt to search the incorrect box, but not the correct box. We found significant looking time differences between versions (t (36) = -3.233, p = .01, d = .78), showing that children reliably looked longer for the incorrect version compared to the correct version. Thus, consistent with previous research, the present study suggests that toddlers may be sensitive to another person's false belief (Onishi & Baillargeon, 2005).

Imaginary companions

Since two parents failed to complete the questionnaire, 35 participants were included in the final analysis. We examined the characteristics of each IC group. One child had both

invisible friends (IF) and personified objects (PO), two children had IF, 17 children had PO, and 15 children did not have any ICs. The number of children with ICs was consistent with previous studies in Japan (Moriguchi & Shinohara, 2012). Examples of ICs are presented in Table 1. IFs were all people. Most POs were animal puppets (e.g., bear, dog, rabbit), but four children had personified dolls. We examined the effect of sex, birth order, and age in months on children's IC status. Fisher's exact tests revealed that sex significantly affected children's PO (p = .01), but not IF (p = .32). Thus, girls were more likely to have PO than boys. There was no significant effect of birth order on children's PO (p = .36) or IF (p = .50). Spearman's correlation calculated between age in months and IC status revealed a significant correlation between age and IF status (r = .38, p = .03), but not between age and PO status (r = .19, p = .25).

Given that only a few children had IFs, we used IC status in the subsequent analyses. That is, children were regarded as having an IC if the children had either IF or PO.

Impersonation and fantasy thinking

The mean impersonation score was 4.9 (SD = 1.2; α = .60) and mean fantasy thinking score was 2.2 (SD = 1.3; α = .64). Both, scores and reliability coefficients, were consistent with the pilot study. Correlations between age and impersonation/fantasy thinking (ps > .10) and between IC status and impersonation/fantasy thinking were not significant (ps > .10).

Relationship between implicit false belief understanding and role play

We calculated false belief scores to assess individual differences in implicit false belief understanding for the analyses below. The false belief scores should indicate how long infants looked at test trial in the incorrect version compared to the test trial in the correct version. Thus, we divided infants' looking time in the incorrect version by the looking time in the correct version. The mean false belief scores were 1.56 (SD = 0.96). The score was

significantly from 1 (i.e., looking time in the incorrect version was the same as the looking time in the correct version) (t (35) =3.487, p = .002, d = .83).

We conducted Pearson's partial correlations to examine the relationship between implicit false belief understanding and several measures of role play, after controlling for age (at Time 2, because age at Time 1 did not vary), sex and birth order (Table 2). We found a significant correlation between the false belief scores and impersonation scores (r (30) =.37, p = .04), but not between the false belief scores and other measures (IC, r (30) =.03, p = .85, fantasy thinking, r (30) =.18, p = .32). Given that IC and fantasy thinking were weakly correlated with the false belief scores, we did not consider these variables further.

We conducted hierarchical regression analyses to examine the relation between implicit false belief understanding and impersonation scores. We entered age in months, sex, and birth order in Step 1, and the false belief scores in Step 2 as potential predictors of impersonation scores. Age (B =.175, $SE\ B$ = .130, β = .237, p = .18), sex (B =.257, $SE\ B$ = 1.667, β= .027, p = .87), and birth order (B =.764, $SE\ B$ = 1.609, β= .084, p = .63) were not significant predictors in Step 1. In Step 2, the false belief score was a significant predictor (B = 1.820, $SE\ B$ = .843, β= .374, p = .04).

Discussion

The present study examined whether toddlers' implicit understanding of false belief at 18 months predicted role play and fantasy thinking during preschool years. The results revealed that toddlers' false belief performances predicted impersonation scores. That is, toddlers who looked longer in the incorrect version compared to the correct version tended to impersonate characters as preschoolers, suggesting that toddlers who were sensitive to an experimenter's false belief were more likely to engage in one form of role play (impersonation) during their preschool years, partially supporting our hypothesis.

Regarding the relationship between pretend play and theory of mind, most

researchers assume that pretend play influences the development of theory of mind. Harris (2000) proposed that children's role play, such as interaction with ICs, may affect the development of theory of mind (Giménez-Dasí, et al., 2014; Harris, 2000). However, it is theoretically possible that children's mental state reasoning could facilitate pretend play. Toddlers with better mental state reasoning may be more likely to attribute psychological status to another person and themselves, which could facilitate role play. Nevertheless, few studies have directly examined the direction of the influence.

This study may be the first step to understand that implicit false belief understanding may be related to children's role play. The present results showed that toddlers' looking time for the incorrect version relative to the correct version at 18 months, a measure of false belief understanding, was a significant predictor of the tendency for impersonation at four years. The reason why the measure of false belief understanding predicted impersonation, but not IC status, was unclear. One possible reason was that IC status was binomial data, and therefore may be difficult to index individual differences in children's role play.

The results may be in line with the recent longitudinal evidence of the development of socio-cognitive skills (Aschersleben, et al., 2008; Wellman, et al., 2004). Nonetheless, we have to interpret these results with caution because it is still unclear whether looking time can index toddlers' false beliefs (Baillargeon, et al., 2010; Buttelmann, Over, Carpenter, & Tomasello, 2014; Carruthers, 2013; Perner & Ruffman, 2005; Ruffman, 2014; Ruffman & Perner, 2005; Senju, et al., 2011). While several researchers have suggested that infants under two years are sensitive to another person's false beliefs (Baillargeon, et al., 2010; Onishi & Baillargeon, 2005; Senju, et al., 2011), others propose that looking time may indicate infants' implicit knowledge about behavior, and not mental states (Ruffman, 2014). According to this theorization, the present results may indicate that toddlers' understanding of another person's behaviors predicted role play in their preschool years. That is, infants who have better

knowledge about another person's behaviors may attribute the knowledge to themselves, thereby facilitating impersonation. Both interpretations suggest that toddlers' sensitivity to another person's behaviors predicted their role play during preschool years.

It should be noted that we did not disconfirm the hypothesis that role play, including IC status, predicts later theory-of-mind skills (Harris, 2000). Several studies support this hypothesis (e.g., Lillard & Kavanaugh, 2014). We propose that role play and theory-of-mind understanding are interdependent. Perhaps, implicit understanding of false beliefs—indexed by looking time— may affect children's role play, which may in turn facilitate explicit understanding of false belief, indexed by verbal false-belief tasks. Future longitudinal studies should be conducted to assess these relationships from a developmental perspective.

The present results may be important for our understanding of cross-cultural differences in the development of theory of mind. A previous study has shown that the Japanese children may perform worse compared to children in other cultures in the verbal false belief tasks (Naito & Koyama, 2006). However, Moriguchi et al. (2010) reported that the Japanese preschool children improved their performances in a non-verbal false belief task, and their performances in the non-verbal task may be comparable with those of children in other cultures. Our results may be consistent with the evidence in that the Japanese infants showed the implicit understanding of false belief (or behaviors) as did the Western infants during the second years.

Finally, we have to consider the limitations of the present study. First, we did not assess mediator variables (e.g., language skills) between pretend play and theory of mind. Previous studies have shown that role play is often correlated with age, sex, and birth order (e.g., Taylor, 1999). Therefore, we have controlled age, sex, and birth order in our analyses. Moreover, children in this study were not given any verbal tasks (e.g., verbal false belief tasks), and parents completed questionnaires of role play. Therefore, we did not include any

language measures. However, language skills can be correlated with role play. We should include such variables to address the specificity of the relations between early theory of mind skills and later role play. Second, the present study did not assess pretend play at Time 1 and performances in theory of mind tasks at Time 2. Such data would lead to a better understanding of the exact relationship between pretend play and theory of mind. Third, one item of our impersonation scores may not be appropriate (i.e., “your child likes to make up stories”). We need to devise better measures to index children’s impersonation (Pierucci, O’Brien, McInnis, Gilpin, & Barber, 2014). Forth, we used one task to index implicit understanding of false belief. Multiple measures including an active paradigm may be more reliable. Future research should use several measures of implicit understanding of false belief. Fifth, the sample size in this study was relatively small for the regression analysis, and we need to assess whether the same results were replicated in bigger sample size. Finally, we did not collect data between Time 1 and Time 2, so developmental progress during this period is unknown. Despite the limitations, our results may contribute to our understanding of the relationship between early theory of mind skills and the development of pretend play.

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Appendix

Questionnaire on impersonation and fantasy thinking

1. Your child likes to impersonate an animated character or a protagonist
2. Your child likes to pretend to be an animal or a real person
3. Your child likes role play, such as playing “doctor”
4. Your child sometimes smiles at a place where no one is present
5. Your child likes to make up stories
6. Your child likes daydreaming
7. Your child believes that Santa Claus really exists
8. Your child believes that an animated character really exists
9. Your child sometimes talks to a place where no one is present

Note: The impersonation factor includes item 1, 2, 3, 5. The fantasy-thinking factor includes item 4, 6, and 9. Items 7 and 8 were excluded.