Development of Sharing in Preschoolers in Relation to Theory of Mind Understanding

Zhen Wu [1, 2] (zhen-wu@uiowa.edu)
[1] Department of Psychology, Peking University
Beijing, 100871, China
[2] Department of Psychology, E11 Seashore Hall
Iowa City, IA, 52246 USA

Yanjie Su (yjsu@pku.edu.cn)
Department of Psychology, Peking University
Beijing, 100871 China

Abstract

This study aimed to explore the relationship between children's sharing behavior and Theory of Mind (ToM) understanding. Seventy-four 2 to 4 years old Chinese children participated in 3 tasks using toys that could be shared with a puppet that was animated by a female experimenter. On each task, the puppet expressed her desire for the items using a series of cues that progressively became more communicative. Children's ToM understanding was assessed with the scale of ToM tasks (Wellman, Fang, Liu, Zhu, & Liu, 2006). There were two main findings: (1) younger children relied on more explicit communicative cues to share resources with the puppet, while older children shared more spontaneously and (2) children's sharing behavior was positively correlated to their ToM scores, independent of age. Findings suggest that preschoolers' sharing behavior is enhanced by their ToM understanding and explicit communicative cues provided by a social partner.

Keywords: preschoolers; sharing behavior; Theory of Mind understanding.

Introduction

Sharing is an important aspect of human cooperative activities with roots very early in life. Studies have shown that infants as young as 8 months old show spontaneous offering of food and other objects to parents (e.g., Hay & Murray, 1982; Hay, 1979; Rheingold, Hay, & West, 1976). Though sharing emerges early, it appears to be a unique challenge for young children. Sharing resources is a much less frequent activity compared to other cooperative activities in young children, such as empathy-related responding, helping and instrument collaboration (Eisenberg, 2005; Grusec, 1991; Warneken & Tomasello, 2007, 2009). Toddlers share toys with others rarely, though the rate of sharing increases from 12 to 30 months of age (e.g., Brownell, Svetlova, & Nichols, 2009; Hay, Castle, Davies, Demetriou, & Stimson, 1999; Levitt, Weber, Clark, & McDonnell, 1985). Other work has shown that preschoolers also share little. For example, three- to five-year-old children reserved 10 pieces of food for themselves while sharing only one piece of food with their peers (Birch & Billman, 1986). Sharing is difficult for children probably because it results in a sacrifice of something valued for the welfare of someone else. There is evidence suggesting that children share more if there is no sacrifice compared to identical circumstances with sacrifices (Svetlova, Nichols, & Brownell, 2010; Thompson, Barresi, & Moore, 1997).

Though numerous studies have been conducted on sharing behavior, it remains difficult to depict the development of sharing, partially because many studies do not control the circumstances under which sharing was observed. For example, we do not know whether early social acts of offering items to others are primarily other-oriented unless we control for the social partner's behavior. In these cases, infants may just be seeking attention or reaction from the social partner, or may be complying with the request of others. Previous studies have shown that 2-year-old children shared food with an adult only when the adult actively communicated directly about what she wanted (Brownell et al., 2009), or reached toward the child with palm up while alternating gaze between the child and the food (Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011). Therefore, it is unclear to what extend children's "sharing" acts are truly sharing behavior with the intention to benefit others if the recipient's behavior is not controlled. By systematically manipulating the social partner's behavior, we might get a comprehensive understanding of the development of other-oriented resource sharing (see also Brownell, Iesue, Nichols, & Svetlova, 2012). Therefore, the first goal of the present study was to examine how the social partner's communication supports young children's sharing. To do this, we systematically manipulated the expressive cues provided by the partner in the sharing task such that the partner made her needs progressively more explicit with a fixed sequence of cues. We then aimed to see at what point children would share.

Another unaddressed question is how we explain the development of sharing in children. Current theories have proposed various underlying mechanisms of sharing, such as the basic imitative tendencies toward people (Grusec, 2006; Hay & Cook, 2007; Rheingold, 1982), the ability to differentiate self's and other's internal states (e.g., Moore, 2007), the sympathetic ability to relate self's emotions and feelings to other's (e.g., Eisenberg, 2007; Zahn-Waxler & Radke-Yarrow, 1990), the understanding of ownership

(Brownell et al., 2012), and an innate biological preposition for empathy and altruism in infants (Tomasello, 2008; Warneken & Tomasello, 2009b; Zahn-Waxler, Robinson, & Emde, 1992). These different theoretical perspectives emphasize the social-cognitive and motivational components of early pro-social responding at different levels. Yet they agree, to different extents, that the origins of altruistic pro-social behavior are based on universal norms of fairness and reciprocity in combination with our understanding of other people's needs or wants (e.g., Fehr & Fischbacher, 2004). This 'understanding of others' needs and wants' can be manifested in the Theory of Mind (ToM) understanding, which refers to the ability to attribute mental states - beliefs, intents, desires, pretending, knowledge, etc. - to oneself and others and to understand that others have beliefs, desires and intentions that are different from one's own (Premack & Woodruff, 1978). From this perspective, is it possible that ToM understanding has an impact on pro-social behavior?

ToM understanding and pro-social behavior are both undergoing significant developmental changes during the preschool years (Benenson, Pascoe, & Radmore, 2007; Blake & Rand, 2010; Fehr, Bernhard, & Rockenbach, 2008; Rochat et al., 2009; Wellman et al., 2006; Wellman & Liu, 2004). Evidence suggests that these two abilities may share the same underlying neural processes (McCabe, Houser, Ryan, Smith, & Trouard, 2001). That is, studies using functional magnetic resonance imaging (fMRI) found that as adult participants behaved cooperatively in a trust game, brain areas related to ToM (medial prefrontal cortex) were activated (McCabe et al., 2001). Moreover, previous studies have shown that preschoolers' ToM negatively predicted aggressive or disruptive behavior for boys and positively predicted pro-social behavior for girls after controlling for age (Walker, 2005). In addition, ToM has been suggested to be a facilitator of fairness-related behavior (Sally & Hill, 2006), such as higher proposed offers in the Ultimatum Game (Takagishi, Kameshima, Schug, Koizumi, & Yamagishi, 2010). These studies suggest that children with more advanced ability of understanding others' mental states may need less explicit supports from the social partner in interpreting his/her desires or needs, thus may be more likely to perform pro-social behavior. The second aim of the present study is to test this hypothesis in preschoolers.

Methods

Participants

Seventy-four Chinese children from two kindergartens in Beijing, China participated in the study. Both kindergartens largely served children of university staff and faculty in urban Beijing. There were twenty-five 2-year-olds (M = 28.86 months, SD = 3.16, range: 24.46 – 34.43 months; 14 girls), twenty-five 3-year-olds (M = 39.49 months, SD = 2.21, range: 34.92 – 42.69 months; 12 girls), and twenty-four 4-year-olds (M = 47.30 months, SD = 2.51, range: 43.02 – 51.08 months; 14 girls). An additional 3-year-old boy was excluded from the study due to experimenter error.

Materials and Procedure

Each child participated in both the sharing task and the Theory of Mind task in a quiet separate room adjacent to the child's classroom. Testing was conducted by a female experimenter (E) performing a hand puppet (a brown bear) named "Maomao" along with the help of a female assistant (AE). The session began with a warm-up and familiarization period during which Maomao (animated by E) and AE played with the child for several minutes to ensure that the child was comfortable approaching and interacting with both of them. The order of the sharing tasks and the theory of mind tasks were counterbalanced. All the sessions were video recorded.

Sharing Tasks. Three sharing tasks were administered with order counterbalanced across participants. Each task featured different items to be shared: there were 2 stickers in the 'sticker' task, 2 toy watermelons and 2 knives in the 'watermelon' task, 4 colorful beads and 2 strings in the 'bead' task. Therefore, there were 12 items in total across these three sharing tasks. These items were shown to be equally liked by children in a pilot study. Children thus had multiple opportunities to share different types of toys. This aimed to provide a relatively comprehensive measurement of sharing behavior. During the test, Maomao sat across a child-sized table from the child, and AE sat to one side of the table, at a 90-degree angle to the child and the puppet. After a short familiarization, AE brought out toys, and showed the child and the puppet how to play with these toys. AE then left the room, asking the child, "Could you please take care of these toys when I am gone? I'll be back soon. You can play with them by yourself, or with your new friend Maomao. Thanks, bye!" She then left the room. After AE left, Maomao provided three progressively more explicit cues about her needs and desires. The cues were presented in three phases: (1) Commenting phase: when the child was exploring toys, Maomao positively commented on the toys, such as "these are so beautiful!" She then repeated this 2 times, pausing for about 10 seconds between each. (2) Desiring phase: Maomao expressed her desires for these toys, such as "I like these toys! I want to play with them" in the same manner as the first phase. (3) Requesting phase: Maomao made an explicit request by asking the child for these toys, such as "would you please give me some to play with" in the same manner as the other phases. If the child shared at any point, Maomao discontinued the cues, thanked the child, and played with the toy(s) for about 10 seconds, and then signaled AE that the task ended by knocking the table. If the child did not share in the final phase, E signaled AE in the same way. AE then came back and moved on to a second sharing task with new toys.

Scale of Theory of Mind Tasks. These tasks were modeled after the Chinese version of the five core ToM

understanding tasks (Wellman et al., 2006; Wellman & Liu, 2004). A small toy figure with Chinese visages and dark hair, whose name was Feifei, served as the target protagonist for the tasks. Although formats and general ideas were not different from the tasks used by Wellman and his colleagues (2006), task materials were modified in several places so that they were familiar and appropriate for our sample.

Diverse Desires: The participant was presented with pictures of an apple and a pear, and was asked to pick one that s/he liked better. Then s/he was told that Feifei likes X better where X was always the opposite of the child's answer. The subsequent question for the child was which one Feifei would choose if she was hungry.

Diverse Beliefs: The participant was presented with pictures of a schoolbag and a drawer along with a picture of a car, and was told that Feifei was looking for her car. Then the child was asked to choose where (schoolbag vs. drawer) s/he believed the car was. The experimenter (E) then stated that Feifei thinks the car is in X, where again X was always the opposite of the child's answer. The subsequent target question asked of the child was where Feifei was going to search for her car.

Knowledge Access: the participant saw a box with a fork inside. E then told the child that Feifei had never opened this box before. The target question was whether Feifei knew what was inside the box.

Contents False Belief: E presented the participant with a box with pictures of cookies on it. E then asked the child what s/he thought was inside the box. She then showed the child that it was actually a small pencil inside. After showing the child the real contents of the box, she told the child that Feifei had never opened this box. The target question was what Feifei thought was inside the box.

Real-Apparent Emotion: the participant saw a sheet of paper with three faces on it – a happy, a neutral, and a sad face. After ensuring that the child understands these emotional expressions, E told the child a story about a boy expecting a toy gun as his birthday gift, but actually getting a boring book. But he did not want to behave impolitely, so he decided to hide his feelings. The child was then asked how this boy really felt and how he tried to appear to others by pointing to the pictures with faces.

Coding and Scoring

Each child received a score of sharing from 0-3 for each task, corresponding to the phase during which sharing occurred: 0 = did not share at all; 1 = shared in the requesting phase; 2 = shared in the desiring phase; 3 = shared in the commenting phase. Higher scores thus indicated quicker sharing with less explicit cues from the recipient. Scores were averaged over the three tasks to create an average sharing score for each child. In addition, the number of items shared by each child in all three sharing tasks (0-12 items in total) was also coded.

Children got a score of 1 for each ToM understanding task they passed. Thus, the range for ToM scores was 0-5.

The first author coded all of the videos, and another coder blind to the research goal rated 25% of these videos. Cohen's kappa was computed to measure inter-rater reliability. Values for Cohen's kappa were 1.00 for the number of items shared in the sharing tasks as well as scores in the TOM task, and were 0.98 for the sharing score.

Results

Preliminary analysis using the sharing score and the number of items shared by children showed that there were no significant main effects of task order or sex, nor was there an interaction between task order and sex. Therefore, the following analyses were conducted by collapsing the data across these factors.

Age Differences in Sharing and ToM

An ANOVA test was conducted with the average sharing score as the dependent variable and age as the independent variable. Results showed that older children shared more spontaneously than did younger children, F (2, 71) = 6.38, p = .003, partial η^2 = .15 (see Table 1 for means and standard deviations). Bonferroni corrected post-hoc tests showed that 4-year-old children had significantly higher sharing scores than 2- and 3-year-olds, p = .006, .011, respectively, yet there was no significant difference between children of the two younger groups, p = 1.00.

Another ANOVA test was conducted with the total number of items shared as the dependent variable. Interestingly, no significant age effect was found, F (2, 71) = 1.36, p = .26, partial η^2 = .04 (see Table 1).

Table 1: Means (Standard Deviations in Parentheses) for Primary Measures as a Function of Age

Measure	2 years	3 years	4 years
Sharing			
Average sharing score (0-3)	1.73(0.84)	1.77(0.79)	2.40(0.52)
Total number of items shared (0-12)	4.32(2.70)	3.96(1.79)	4.92(1.41)
ToM			
Total ToM	1.52(0.77)	2.16(0.80)	2.88(1.03)
Diverse Desires	0.92(0.28)	0.96(0.20)	0.96(0.20)
Diverse Beliefs	0.20(0.51)	0.76(0.44)	0.83(0.38)
Knowledge Access	0.08(0.28)	0.40(0.50)	0.67(0.48)
Contents False Belief	0.00(0.00)	0.04(0.20)	0.33(0.48)
Real-Apparent Emotion	0.00(0.00)	0.00(0.00)	0.08(0.28)

In addition, children's total ToM score also increased significantly with age, F (2, 71) = 14.73, p < .001, partial η^2 = .29. More specifically, the age effect was significant in children's score on the task of Diverse Beliefs [F (2, 71) = 3.33, p = .04, partial η^2 = .09], the task of Knowledge Access [F (2, 71) = 11.41, p < .001, partial η^2 = .24], the

task of Contents False Belief [F (2, 71) = 9.09, p < .001, partial η^2 = .20], but not on the task of Diverse Desires [F (2, 71) = .24, p = .79, partial η^2 = .01] or the task of Real-Apparent Emotion [F (2, 71) = 2.18, p = .12, partial η^2 = .06], as shown in Table 1.

Associations between Sharing and ToM

Since significant age effects were found in both scores of sharing and ToM understanding tasks, Pearson partial correlational analyses were conducted to investigate whether sharing was associated with ToM understanding after controlling for age. Results showed that the total score of ToM, Diverse Beliefs and Knowledge Access were both positively correlated to children's sharing scores and the number of items shared with age being controlled for, *r's* ranged .26 - .36, *p's* < .05 (for details, see Table 2). However, the scores of Diverse Desires and Real-Apparent Emotion did not correlate significantly to sharing.

To further examine the effect of ToM understanding on children's sharing behavior, we conducted a series of multiple regression analyses. We first regressed age on the sharing score and found that age had a significant effect on the sharing score (β = .30, p = .01), but the model only explained 8.7% of the variance in the sharing score, F (1, 72) = 6.87, p = .01. This age effect became non-significant (β = .06, p = .65) as the total ToM score was added as another independent variable. The effect of ToM was significant (β = .42, p = .002), and increased the variance accounted by 11.8%, F_{change} (1, 71) = 10.55, p = .002. After adding ToM as the predictor, the full model explained 20.5% of the variance in sharing score, F (2, 71) = 9.17, p < .001.

Table 2: The relationships between ToM and sharing after controlling for age (N = 74)

	Average sharing score	Total number of items shared
Total ToM	0.36**	0.34**
Diverse Desires	0.04	0.19
Diverse Beliefs	0.29*	0.22^{+}
Knowledge Access	0.26*	0.28*
Contents False Belief	0.14	0.11
Real-Apparent Emotion	0.09	0.03

Note: ^{+}p <.10, *p < .05, **p < .01.

Similarly, we conducted another regression analysis with the total number of items shared as the dependent variable. Results showed that age alone had no significant effect on the number of items shared (β = .07, p = .54), and the model only explained 0.5% of the variance in the number of shared items, F (1, 72) = .38, p = .54. After adding ToM as the independent variable, the full model explained 12.3% of the variance in the number of items shared, F (2, 71) = 4.98, p = .01. The effect of ToM was significant (β = .42, p = .003), and increased the variance accounted by 11.8%, F_{change} (1, 71) = 9.54, p = .003. The results of the above regression analyses indicate that preschoolers' performance on the ToM tasks, rather than age, was responsible for both the average sharing score and the number of items shared over three sharing tasks.

Discussion

First, consistent with our hypothesis, we found that 4-year-old children needed less communicative cues to share than 2- and 3-year-old children did. Four-year-old children generally shared when the partner was just commenting on the toys, whereas the majority of the other two younger groups of children shared when the partner verbally requested the items. This result suggests that older children might need less scaffolding from a social partner to perform sharing behavior (Brownell, Iesue, et al., 2012; Brownell et al., 2009; Svetlova et al., 2010). It also implies that older children might have a more robust intention to benefit others as they shared spontaneously and quickly with a partner who had no toys, while younger children might only share under pressure or to comply with another's request (e.g., Hay, Caplan, Castle, & Stimson, 1991). Our results thus add new evidence to previous findings that toddlers need more explicit cues to perform sharing and helping behavior (Brownell et al., 2009, 2012; Svetlova et al., 2010).

Interestingly, we found that even though 2- and 3-year-old children needed more communicative support in order to perform sharing behavior (their sharing scores were lower), once they shared, they shared as many objects with the social partner as older children did. Blake and Rand (2010) also found that even though 6-year-old children were more likely to donate stickers than 3-year-old children did, once they shared, they gave the same amount of stickers at all ages. These results imply that children may engage in two separate decisions when interacting with a social partner: (a) whether to share and (b) how much to share. As proposed by Blake and Rand (2010), the different developmental trajectories of these two choices may imply different processes involved in those two different phases of sharing behavior. More studies are required to identify these differential underlying processes.

More importantly, we found that children's Theory of Mind understanding correlated to their sharing behavior, independent of age. The regression analyses showed that ToM was a significant predictor of how spontaneously and quickly children shared, as well as how many items children shared, whereas age did not predict these sharing measures. These results suggest that ToM understanding might be a potential underlying mechanism of children's age-related increase in sharing.

This finding is consistent with and extends previous research demonstrating associations between theory of mind ability and pro-social behavior. For example, prior studies have shown that theory of mind ability correlates to pro-social behavior (e.g., Sally & Hill, 2006; Walker, 2005), and there is evidence suggesting that these two abilities may share the same underlying neural processes (McCabe et al., 2001). Furthermore, studies of nonhuman primates have

found that chimpanzees, which do not have as well of a developed theory of mind as compared to humans, are rational maximizers in that they make unfair offers and accept unfair offers in the Ultimatum Game (Jensen, Call, & Tomasello, 2007). Likewise, children who had more advanced theory of mind abilities proposed more fair offers in the Ultimatum Game than children with less advanced theory of mind (Takagishi et al., 2010). These results suggest that fairness-related behavior is related to the ability to infer the mental states and intentions of others. Our findings thus further support this hypothesis by showing that more advanced theory of mind ability was positively associated with children's spontaneous sharing and the amount of items shared with others.

In sum, the present study showed that sharing behavior may be more likely to occur when the partner makes his/her needs, desires and emotions more apparent, thus reducing the need for complex inferences about others' internal states, especially for young children whose ability to infer others' psychological states are immature. For older children who have more advanced ToM understanding, the requirement of the provision of ostensive cues from the recipient may not be necessary, thus they shared more spontaneously, more quickly and shared more items.

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