The Cognitive Basis of Future-oriented Prosocial Behavior

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Abstract

Two experiments examined the development of future-oriented prosocial behavior in relation to developing theory of mind and executive functioning. Children from 3;0 to 4;6 were given a series of trials in which they had to make a choice between immediate and delayed sticker rewards, where these rewards accrued either to self, to a play partner, or were shared. They also were presented with standard theory of mind tasks (in Experiment 1) assessing the understanding of belief and desire and an executive function task (in Experiment 2) in which the children had to inhibit pointing to a baited box in order to win the cookie within. Results showed that for 4-year-olds, the tendency to opt for delayed rewards in order to share with the partner was correlated with theory of mind. For younger 3-year-olds, the children's ability to inhibit pointing to the baited box was significantly correlated with the tendency to choose delayed over immediate sticker rewards. These results indicate that children's ability to show future-oriented prosocial or sharing behavior is linked developmentally both to the ability to imagine conflicting noncurrent mental states and the ability to inhibit responding to perceptually salient events.

Keywords: Prosocial behavior; future-oriented; theory of mind; executive function

Towards the end of infancy and during the preschool period, children show the capacity to respond to the needs of others even when such a response may require some personal sacrifice. For example, when confronted with another person in distress, infants change during the second year of life from seeking comfort for themselves to showing some kind of other oriented behavior, perhaps physical attention, such as hugging or kissing, or giving a favored toy (Hoffman, 1976; Howes & Farver, 1987; Zahn-Waxler & Radke-Yarrow, 1990; Zahn-Waxler, Radke-Yarrow, & Wagner, 1992). Toddlers of one to two years of age will also share toys with peers even when such resources are rare (Hay, Caplan, Castle, & Stimson, 1991). One major focus of research on prosocial behavior has been on individual differences and

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their links with social environmental and personality variables. Thus, responding to others' distress has been found to be related to maternal warmth (e.g. Robinson, Zahn-Waxler, & Emde, 1994) and to child's temperament (e.g. Farver & Brandstetter, 1994; Robinson et al., 1994).

A second focus has been on the psychological mechanisms that make prosocial behavior possible. There is no doubt that prosocial behavior has an important emotional basis. Empathic identification with the target of one's altruistic act is necessary for motivating that act and it is clear that prosocial behavior has its developmental origins, in part, in empathy (Hoffman, 1976; Zahn-Waxler & Radke-Yarrow, 1990). However, it seems equally necessary that prosocial behavior also requires a certain level of cognitive competence. It has been argued, for example, that the change during the second year from self-comforting to other-comforting noted above depends on the capacity for secondary representation (Perner, 1991). According to this kind of account, the child must be able to appreciate that the empathically felt distress has its origins in the other person.

Recently, it has been suggested that a further change in prosocial behavior occurs later in the preschool period when the child becomes capable of showing future-oriented reasoning and delay of gratification (Thompson, Barresi, & Moore, 1997). In their study, Thompson et al. presented 3– to 5-year-old children with a number of two alternative choices in the context of putting stickers in a sticker book with a play partner. The choices contrasted an immediate reward of stickers with four different alternatives. Three of the choices included as the alternative sharing two stickers with the partner. As a simple measure of the tendency to share, there was a choice between one sticker for self now or one each for self and partner now (sharing). A second choice examined sharing when there was a cost to self (sharing with cost). Here the choice was between two stickers for self now or one each for self and partner now. Thus, opting to share involved sacrificing a material reward for self. The shared delay was a choice between one sticker for self now or one each for self and partner later (delayed sharing). While the subject did not lose any material reward by delaying, he or she had to forego immediate self-gratification in order that the other might benefit. The final choice was a simple delay of gratification choice in which the child had to choose between one sticker for self now or two stickers for self delayed until later. Here the subject could forego immediate gratification for a greater later reward. This latter choice type has been studied extensively as 'delay of gratification' (see Mischel, 1974; Mischel, Shoda, & Rodriguez, 1989), although Thompson et al. (1997) refer to it as 'prudence'.

Thompson et al. (1997) found that at all ages the children chose to share in the no delay choice situations. While this tendency to share was reduced somewhat in the case where there was a cost to sharing compared to the case where there was no such cost (65% sharing compared to 85% sharing respectively), there was no difference in the tendency to share in either condition across age—3-year-olds shared as much as 5-year-olds. Consistent with earlier findings, these results indicate that the basic capacity to engage in prosocial behavior is in place by three years of age.

A different pattern of results was seen in the choices involving a delay. Here the 3-year-olds tended to opt for the immediate self-gratification in the two delay choices. They were much less likely to choose the shared option in the delayed sharing condition compared to both immediate sharing conditions (sharing and sharing with cost). Thus, while 3-year-olds shared a reward with another person even when it involved some material cost to self, they had considerable difficulty engaging in such

prosocial behavior when that involved giving up immediate gratification. This difficulty was not particular to other directed behavior however, because 3-year-olds also had great difficulty foregoing the immediate reward in order to win two stickers for themselves later (prudence condition). Indeed Thompson et al. (1997) found significant correlations in the three year old group between the tendency to opt to delay in order to share and the tendency to delay in order to maximize own future reward. By about 4 years, however, the children were able to resist immediate gratification and more often chose the delay option both to benefit themselves (prudence) and to benefit the other (delayed sharing).

In explaining their results, Thompson et al. (1997) argued that in opting to delay either for self alone or to share, children must choose to forego an immediate reward in favour of an imagined future reward for someone, where that someone can be either themselves or another person. The motivation to choose to delay comes from empathizing with the individuals in the imagined future situation. In a sense, then, choosing to delay is similar whether it is the future self or a future other that benefits because in both cases the choice rests on the imagination of *someone's* future interests and empathy with those interests. Thus, as with the earlier development of prosocial behavior towards another's expressed distress, both emotional and cognitive factors are implicated.

There is good reason to believe that such future-oriented behavior is of considerable importance for social and personality development. Mischel and colleagues (Mischel, Shoda, & Peake, 1988; Shoda, Mischel, & Peake, 1990) found that in long-term follow-ups of their preschool samples, the children who performed best in delay of gratification tasks at 4 years scored more highly on a variety of parental ratings of social competence, as well as cognitive competence, in adolescence. For example, children who performed well on delay of gratification were rated as more helpful and cooperative and less jealous and envious of others. It is worth pointing out that Mischel and colleagues only studied delay of gratification for self. It is conceivable that the more socially oriented delay task used by Thompson et al. (1997) would be an even better predictor of long-term social competence.

This paper examines the cognitive basis of the future-oriented behavior reported by Thompson et al. (1997) using choice tasks. In order to show future-oriented behavior, one might argue that along with the emotional capacity for empathy, two interrelated cognitive abilities are required. First, it is necessary to imagine (or represent) a mental state appropriate to the future. This cognitive ability might correspond to what is known commonly as 'theory of mind'. Second, it is necessary to inhibit the response to the immediate situation in favour of the future situation. Such a skill would come under the heading of executive functioning. Interestingly, these two abilities are known to show developmental changes at about 3 to 4 years of age and it has been argued that they are developmentally linked (Russell, Mauthner, Sharpe, & Tidswell, 1991).

Over the last decade, considerable research attention has been directed to the development of theory of mind (for a selection of volumes dedicated to the topic, see Astington, Harris, & Olson, 1988; Frye & Moore, 1991; Lewis & Mitchell, 1994; Perner, 1991; Wellman, 1990; Whiten, 1991). Although there is not the space to review this literature here, a few relevant issues will be considered. First, although there is not full consensus, there is some general agreement that significant changes occur at about 3 to 4 years of age. In what those changes consist has been the source of varied theoretical speculation. One recent view is that it is at about four years that

children become capable of simultaneously considering two conflicting mental states, where a to-be-imagined mental state conflicts directly with the child's own current mental state (see e.g. Barresi & Moore, 1996). Thus, for example, in standard false belief tasks, children are asked to represent either their own previous or another child's belief about some object or event in the world when the content of this belief is in direct contradiction with what the child currently holds to be true. Three-year-old children routinely fail these tasks, attributing their own current beliefs to either themselves at a previous point in time or to another person, not privy to the same information.

This cognitive failure of 3-year-olds is not limited to the representation of beliefs. Recently Moore et al. (1995) have shown that the same can hold true for desires. For example, if young children themselves have a strong preference but have to try to judge another character's preference which differs, they frequently impute their own desire to the other character. In short, children younger than about 4 also have difficulty representing another's or their own previous desire when that desire directly conflicts with what the children currently desire. The conclusion from such studies is that at about four years children become capable of representing (or 'holding in mind', Olson, 1989) both a current mental state and a conflicting imagined one.

Recent research has also implicated so-called executive functioning in the cognitive changes seen at about 4 years of age. Russell and his colleagues have shown that younger 3-year-olds have great difficulty inhibiting a prepotent response to a salient stimulus in favour of a recently acquired or weaker response (Russell et al., 1991; Russell, Jarrold, & Potel, 1994). In the 'windows' task of Russell and colleagues, children are presented with two opaque boxes side-by-side in one of which is hidden a reward. Over a series of trials, the child has to point to one of the boxes in order to make a competitive player (a hand puppet) look in the indicated box. If the chosen box contains the reward, then the competitor keeps it; if the box is empty then the reward is taken from the other box and given to the child. Initially, the boxes are opaque, so that the child's guess cannot be governed by their knowledge of which box is baited. Nevertheless, they are exposed over a series of trials to the contingency that if they point to the empty box they will win the reward. Once the child has understood this contingency, the original boxes are replaced by two with windows facing the child so that now the child, but not the competitor, can see in which box the reward is hidden. The game then continues over a series of trials with the child pointing to one of the boxes in order to lead the competitor to that box. Russell et al. (1991) found that children younger than about 3 years and 6 months had great difficulty inhibiting their pointing to the baited box when they could see the contents even though they had previously learned the rule that if the competitor looked in the baited box, they would not receive the reward. In contrast, 4-year-olds have no difficulty pointing to the empty box in the task in order to maximize their own reward.

Although the windows task was originally designed as measure of strategic deception and theory of mind, in a later study, Russell et al. (1994) found the same pattern of behavior in young 3-year-olds even when there was no competitor present and the goal was simply to win as many rewards as possible. From this result, the authors concluded that the younger children's difficulty is not so much in deception or theory of mind but in inhibiting a prepotent response (pointing) to a salient stimulus (the reward).

Similarly, Frye, Zelazo and colleagues have shown problems in inhibition and perseverative responding in a card-sorting task where two rule sets have to be kept in

mind (e.g. Frye, Zelazo, & Palfai, 1995). Three-year-olds persisted in sorting according to an old rule even when the game had been switched to a new sorting rule with which the children were familiar. These authors also showed significant relationships between card-sorting performance and performance on standard theory of mind tasks. Like Russell and colleagues, Frye, Zelazo and colleagues have argued that these executive functioning difficulties may be directly related to the theory of mind deficits mentioned earlier.

Given the very similar results on age differences reported by researchers working on measures of theory of mind, executive functioning and delayed prosocial behavior, and the putative theoretical links between them, we decided to examine possible relationships between these kinds of tasks. Two experiments were conducted. In the first we tested children on a number of prudence and sharing choice pairs in the manner employed by Thompson et al. (1997) and on a selection of theory of mind tasks. In the second experiment, we presented children with an overlapping but not identical set of prudence and sharing choice pairs and with the executive functioning task used by Russell et al. (1991).

Experiment 1

In order to investigate the relationship between theory of mind and delayed prosocial behavior, we presented children in this study with standard tasks assessing the understanding of belief and desire and with future-oriented prudence and sharing tasks. The belief tasks were standard false belief and representational change tasks which assess the understanding of false beliefs in others and in self respectively (Gopnik & Astington, 1988, Moore, Pure, & Furrow, 1990). The desire tasks were adapted from earlier work by Gopnik and Slaughter (1991).

The format of the future-oriented prudence and sharing task allowed for a number of pairs of choices to be presented to the child. In this study we adopted, for the purposes of replication, two of the choices that Thompson et al. (1997) had used and added two new choices in order to investigate children's sensitivity to the competing interests of immediate versus delayed gratification in others. Like Thompson et al. we used the simple prudence choice whereby the child has to choose between one sticker for self now or two later. We also used their delayed sharing choice in which the child has to choose between one sticker for self now and one for self and partner later. To these two choices, we added a choice in which the child has to make a choice between one for the other now or two for the other later. Finally, in order to complete a symmetrical design, there was a choice between one for the other now or one for both self and other later. The design of the choice pairs is shown in Table 1.

Method

Participants. The participants in this experiment were 40 preschool children equally divided in two contiguous age groups. Children were recruited from preschools in the area of Halifax, Nova Scotia, and represented a cross-section of socioeconomic levels. The younger group ranged in age from 3;6 to 4;0 with a mean age of 3;9. The older group ranged from 4;1 to 4;6 with a mean age of 4;3. Approximately equal numbers of boys and girls were included at each age.

Procedure. Children were tested individually in a quiet room in their preschools. The order of the two categories of task was Theory of Mind followed by Sticker Choice.

Table 1. Design of Sticker Choice Types in Experiment 1

	Self now	Other now
Delay of gratification	1 self now or 2 self later	1 other now or 2 other later
Delayed sharing	1 self now or 1 each later	1 other now or 1 each later

Theory of mind tasks. For the belief tasks, three misleading objects were employed, a candle that looked like an apple, a small flashlight in the shape of a pen, and a Smarties box containing rocks. For each stimulus, the child was first shown the object. The real nature of the object was then demonstrated to the child and he or she was told what it really was (or what was really in it). Two test questions were then asked. For example:

Own belief: 'What did you think this was before you held it in your hands—a candle or an apple?'
Other's belief: '[name of a peer, e.g. Peter] hasn't held this in his hands before. What will he think it is when he first sees it—a candle or an apple?'

The desire tasks were modelled after Gopnik and Slaughter (1991). Three pairs of containers were used, and each held a different object. Two small bottles (orange and yellow) contained a toy cow and a toy walrus; two small boxes (pink and blue) contained buttons and seashells; two small purses (green and red) contained a chestnut and a pine cone.

On each trial, the child was shown the pair of containers and asked (for example), 'Which bottle do you want to open—the orange or the yellow one?' After opening one, the child was allowed to manipulate the object within for a few minutes. The object was then replaced in the container, and the child was asked, 'Now which bottle do you wish to open—the orange or the yellow one?' Then before the child was allowed to look in the second container, he or she was asked, 'When I first asked you, before we opened any bottles, which bottle did you want to open then—the orange or the yellow one?'

Sticker choice task. In addition to the female experimenter, there was present for the sticker game a teenage female confederate who served as the other person involved in the sticker choice tasks. The confederate was not known to the children prior to the session. A series of choices involving stickers was presented to the child. There were four different choices each presented three times. The four choice types were as follows (see Table 1).

1. (a) 1 for self now or (b) 2 for self later
2. (a) 1 for other now or (b) 2 for other later
3. (a) 1 for self now or (b) 1 each later
4. (a) 1 for other now or (b) 1 each later

The choices were presented in three blocks, each with one of each of the different choice types. Order of presentation was randomized within each block with the constraint that the same choice type could not occur twice in succession. The order of presentation of the two alternatives within choice was counterbalanced.

At the start of the session, the teenage confederate interacted briefly with the child before the game was explained and testing began. During this time, both players

chose and labelled their sticker books. The child was told that they were going to be asked some questions about the stickers and that they would be able to pick some stickers for themselves and for their partner. The script of the session followed closely that used by Thompson et al. (1997) and is reproduced in appendix A. The test questions were asked slowly and carefully and were repeated once or twice, as necessary until the child made a choice.

If the child chose an immediate reward, the sticker was given to the recipient so that it could be placed in the sticker book. When a preference for a delayed reward was indicated, the stickers were placed in an envelope assigned to that recipient. These envelopes were otherwise kept out of sight until the end of the game. No matter what the child's decision, the partner responded in a uniform, mildly positive manner. Upon completion of the 12 trials, the stickers in the envelopes were given to the recipients to be placed in their sticker books.

Results

Theory of mind tasks. Performance on each of the three theory of mind tasks ranged from no correct answers to three. An 2 × 3 mixed analysis of variance with age (younger, older) as a between subjects variable and task type (desire, own belief, other's belief) as a within subjects variable showed no significant effects, although the main effect for age approached significance, $F(1, 76) = 3.17$, $p = .083$. The means and standard deviations are shown in Table 2.

Table 2. Means Scores (and Standard Deviations) for Three Theory of Mind Tasks for Each Age Group in Experiment 1

Age group	Desire	Own false belief	Other's false belief
3;6–4;0	1.25 (1.48)	1.40 (1.27)	1.45 (1.05)
4;1–4;6	2.30 (1.08)	1.75 (1.16)	1.60 (1.19)

Note: N = 20 for each age group. Maximum possible score = 3.

The correlations among the three theory of mind task types for the two age groups are shown in Table 3. Performance on the desire task was significantly correlated with that on the own belief task for the younger group ($r(18) = .530$, $p < .05$) and with that on the other belief task for the older group ($r(18) = .713$, $p < .001$). Interestingly, understanding own belief and other belief were not correlated in either group.

Sticker choice task. Participants received a score of one for each time they chose to delay. The mean scores for each choice pair for each age group are shown in Figure 1. Because the choice pairs were organized in a 2 by 2 design, we first conducted a three way mixed ANOVA on the data with age (2 levels: younger and older) as a between subjects variable and self/other now (2 levels: self now and other now) and task type (2 levels: delay of gratification and delayed sharing) as within subjects variables. Note that the self level of the self/other now variable corresponds to a replication of the delay choices from Thompson et al. (1997). This analysis revealed a marginally significant effect of age, $F(1, 38) = 3.63$, $p = .064$, a significant main effect

Table 3. Correlations Among Performances on Theory of Mind Tasks in Experiment 1

	Own false belief	Other false belief
Younger group		
Desire	.530*	.330
Own false belief	1.000	.213
Older group		
Desire	.230	.713**
Own false belief	1.000	.114

Note: N = 20; * = $p < .05$; ** = $p < .001$.

of self/other now, $F(1,38) = 4.26$, $p = .046$, and a significant interaction effect between age and task type, $F(1,38) = 4.72$, $p = .036$. In addition, the three way interaction was significant, $F(1,38) = 19.46$, $p = .001$.

In order to investigate these effects further, a 2-way mixed ANOVA with age as a between subjects variable and task type (delay of gratification and delayed sharing) as a within-subjects variable was carried out on each level of the self/other now variable. The two-way ANOVA for the self now choices (those choices replicating Thompson et al., 1997) revealed a marginally significant effect of age, $F(1, 38) =$

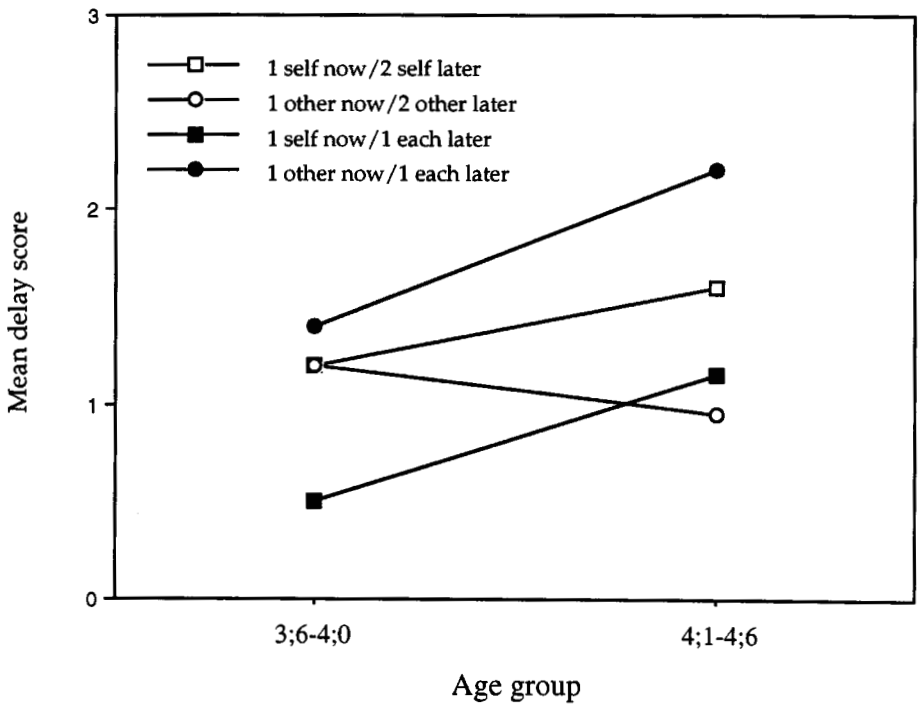

Figure 1. Mean delay scores for different choices in sticker choice task for two age groups in Experiment 1.

3.55, $p = .067$, with older children choosing the delay option more often, and a significant main effect of task type, $F(1,38) = 8.79$, $p = .005$, with the delay option being chosen more often in the delay of gratification choice. The interaction was not significant, $F(1, 38) = .416$, NS.

The ANOVA for other now choices showed no effect of age, $F(1, 38) = 1.26$, NS, but a significant main effect of task type, $F(1, 38) = 10.38$, $p = .003$. There was also a significant interaction, $F(1, 38) = 5.44$, $p = .025$. Investigation of simple age effects showed that the tendency to delay increased significantly with age for the delayed sharing choice, but there was no age effect for delay of gratification.

Individual differences in performance on the different choice pairs were also investigated via correlational analysis. Table 4 shows the correlations among the choice pairs for each age group. In the younger group the only correlations which were of noteworthy size were two involving the choice between one sticker for self now or one sticker each later. Performance on this choice was significantly correlated ($r(18) = .483$, $p < .05$) with the simple delay of gratification for self choice and was marginally significantly related to performance on the choice between one for the other now or one each later ($r(18) = .422$, $p < .1$). At the older age, the choice between one for self now or one each later was also involved in the only significant correlation. Although the correlation between delay of gratification for self and the one for self now or one each later choice was not significant at the older age, there was a significant correlation between one for other now or two for other later and one for self now or one each later ($r(18) = .491$, $p < .05$).

Relationship between sticker choice tasks and theory of mind tasks. Finally, correlations between the various sticker choice pairs and the theory of mind tasks were examined. Because no differential *a priori* predictions were made for the different

Table 4. Correlations Among Performances in Sticker Choice Tasks in Experiment 1

a) Younger age group (3;6–4;0)

	1 SN/2 SL	1 ON/2 OL	1 SN/1 EL	1 ON/1 EL
1 self now/2 self later	1.000	.127	.483*	.054
1 other now/2 other later		1.000	–.048	.131
1 self now/1 each later			1.000	.422†
1 other now/1 each later				1.000

Note: N = 20; † = $p < .1$; * = $p < .05$.

b) Older age group (4;1–4;6)

	1 SN/2 SL	1 ON/2 OL	1 SN/1 EL	1 ON/1 EL
1 self now/2 self later	1.000	–.164	.229	.208
1 other now/2 other later		1.000	.491*	.013
1 self now/1 each later			1.000	.371
1 other now/1 each later				1.000

Note: N = 20; † = $p < .1$; * = $p < .05$.

theory of mind tasks, we constructed aggregate measures of theory of mind. First, we combined scores for all three theory of mind tasks and examined correlations with the four choice tasks. Second, because the patterns of correlations among the theory of mind tasks was different for the two age groups, we combined the scores for the two tasks that were correlated with each other at each age. Thus, for the younger group the two task aggregate score was for the desire and own belief tasks and for the older group the two task aggregate score was for the desire and other belief tasks. These correlations are shown in Table 5 for the two age groups. There were no significant relationships between theory of mind scores and choice task scores for the younger age group. For the older children, however, there were noteworthy relationships between the theory of mind measures and the sticker choice tasks. Success on the desire and other belief tasks was significantly correlated with the tendency to delay to share on the one other now or one each later choice ($r(18) = .493$, $p < .05$) and close to significantly so with the tendency to delay to share on the one self now or one each later choice ($r(18) = .421$, $p < .07$). In addition, a marginally significant correlation was found between the three task aggregate score and the delay of gratification for other ($r(18) = .381$, $p < .1$).

Table 5. Correlations Between Performance on Sticker Choice Tasks and Theory of Mind Measures in Experiment 1

	Younger age		Older age	
	Aggregate of 3 tasks	Aggregate of desire and own belief	Aggregate of 3 tasks	Aggregate of desire and other belief
1 self now/2 self later	.056	.008	–.238	–.156
1 other now/2 other later	–.069	–.182	.381†	.274
1 self now/1 each later	.153	.104	.300	.421†
1 other now/1 each later	.307	.272	.377	.493*

Note: N = 20; † = $p < .1$; * = $p < .05$.

Discussion

The sticker choice task in the present experiment included two choices that replicated two from the earlier study by Thompson et al. (1997). These two choices presented the child with a choice between one sticker for self now and either two for self later (delay of self gratification) or one each later (delayed sharing). The result for these replication conditions were similar to those of Thompson et al. (1997) in terms of the age effect observed in that in both studies older children were more likely to delay both for self and for sharing. Furthermore, as in Thompson et al. (1997), there was a correlation between performance patterns in these two choices in the younger group, indicating that both depend upon the same underlying developmental advance. The present study differed from Thompson et al. (1997) in that in this study the tendency to delay was greater in the delay of gratification condition than in the delayed sharing condition at both ages. This difference might be explained by a

difference in the other conditions that were included. In the Thompson et al. (1997) study, the two other conditions both guaranteed the child some reward. However, in this study the two other conditions yielded a lower payoff for the child and more for the other. As a result, there may have been a tendency for the children in this study to opt more often for the greater reward in the delay of self gratification condition, and to accept a current reward for self when delay would only increase the reward for the other.

Of the two new conditions in this experiment involving a choice for the other now, only that in which there was the possibility of a shared reward later showed an effect of age. Furthermore, this effect was similar in size as the age effect for the two choices involving one for self now, suggesting that the same cognitive advance might be responsible. The reason for the lack of an effect on the delay of gratification for other choice is unclear, but it may be that the children were just less motivated to consider carefully cases in which there was no self-interest. It is also possible that the cognitive demands of considering only the mental states and preferences of another were too taxing for children in these age groups.

The results for the theory of mind tasks showed that the younger children had difficulty representing their own previous desires when these contrasted with their current desires. Similarly, the children had trouble representing both their own previous and another person's beliefs when these conflicted with what they currently knew to be true. Furthermore, there were significant correlations between desire task performance and belief task performance in both age groups. These results support the contention of authors such as Moore et al. (1995) who have argued that 3-year-olds have difficulty representing both a current mental state and a noncurrent, or imagined, one, and that this difficulty applies not only to beliefs but also to desires. Surprisingly, we did not find significant correlations between understanding own belief and understanding other's belief. It is difficult to know what to make of this result and it stands in contrast to a number of other studies reported in the literature using very similar methodology (e.g. Gopnik & Astington, 1988; Moore, Pure, & Furrow, 1990).

This experiment also resulted in noteworthy correlations between theory of mind and choosing to delay. Three points should be made about these correlations. First, they were seen only for the young 4-year-olds, not for the younger children. Second, they were strongest with the sticker choice tasks in which the delay option was for sharing. There was weak evidence of an association with the delay of gratification for the other, but no association with the choice in which the child alone would benefit from delaying. Third, there was no evidence for associations with the own belief task. Overall, these results support the idea that theory of mind is linked to future-oriented prosocial behavior. Those four year old children who had a better understanding of others' belief and desire were the ones who tended to delay in order to benefit, or share with, the partner.

In the only other study known to us that examined the relationship between self-interest and theory of mind, Dunn, Creps, & Brown (1996) found a decrease from 33 to 69 months in children's self-interested communicative interactions with their mothers and older siblings. They also tested the children on simple measures of theory of mind at 40 months. Of most relevance for the present discussion was their finding that although self-interested talk did decline significantly over the period studied especially in sibling conversations, there was no significant relationship between performance on the theory of mind task and the tendency to engage in self-

interested talk over the period of the study. Inevitably, there were many differences between the Dunn et al. (1996) study and the present experiment, including the fact that, unlike that of Dunn et al., our work was experimental in format and carried out with the children in interaction with relative strangers. In addition, however, it must be pointed out that our finding concerns only future-oriented behavior and the significant relationships between prosocial behavior and theory of mind were only evident in the young four-year-olds.

Experiment 2

In this experiment, we examined the possible relationship between future-oriented prosocial behavior and developing executive functioning as manifested by inhibitory control. To maintain consistency with the previous experiment, we again presented children with the delay of gratification for self (one for self now or two for self later) and with the delayed sharing (one for self now or one each later) choices. We also added two new choice pairs in order to extend our knowledge of children's choice behavior. Both of these two new choices were included in order to explore the child's willingness to benefit the partner now when some future benefit for self was at stake. In one new case we offered the child the choice between one each immediately or two for self later. This new case is like the delay of gratification for self in that there is a choice between one for self now and two for self later. The difference is that in the new case, the other benefits from the immediate gratification. Our prediction was that this choice would make the children even less likely to opt to delay than the simple delay of gratification for self.

In the other new case we offered the choice between two for the other immediately or one for self later. This case was included to see whether it would be possible to see evidence for altruism when the prospects for the child's own reward were significantly attenuated (in both time and quantity) compared to the other's reward.

In order to examine the relationship between performance on the sticker task and executive functioning we also tested the children on Russell et al.'s (1991) 'windows' task. We used the original version of the task with the competitive puppet in order to keep it motivating for the children but adapted the task in order to shorten it somewhat. At the time when this study was designed and carried out, we were unaware of the failure by Samuels, Brooks, and Frye (1996) to replicate Russell et al.'s (1991) result.

Method

Participants. Sixty new children between 3;0 and 4;6 recruited from local preschools participated. Five of these were not included in the final sample because they failed to meet criterion during the training phase of the windows task (see procedure section). The final sample was divided into three age groups: Young 3s (N = 19, mean = 3;3, range, 3;0 to 3;5); Old 3s (N = 19, mean = 3;8, range, 3;6 to 3;11); Young 4s (N = 17, mean = 4;4, range 4;0 to 4;6). At each age there were approximately equal numbers of girls and boys.

Procedure. Children were tested in a quiet room or area of their preschools. The Sticker Choice task was presented first, followed by the Windows task. The same teenage girl as in experiment 1 acted as the partner for the sticker task. The

procedure for the sticker task was exactly as in experiment 1 except that two of the choices were substituted. The choices were as follows.

1. (a) 1 for self now or (b) 2 for self later
2. (a) 1 for self now or (b) 1 each later
3. (a) 1 each now or (b) 2 for self later
4. (a) 2 for other now or (b) 1 for self later

Windows task. The puppet character (Mickey the monkey) was initially introduced to the child. The child was also shown the two boxes and told that a cookie (animal cracker) would be hidden in one of the boxes. On each trial, the child and Mickey were told to close their eyes while the cookie was hidden. After hiding the child was told to point to one of the boxes. That box was then opened first, and, if it contained the cookie, the cookie was placed in a pile corresponding to Mickey. If that box was empty, then the other box was opened and the cookie placed in the child's pile. At the end of the session, the child's cookies were placed in a small bag to be taken home.

During the training phase, fully opaque boxes were used. A cookie was hidden at the start of each trial and the child encouraged to point to one of the boxes to tell Mickey where to look. Mickey was made to look in the box pointed to by the child and appropriate feedback was given. From training trial four through the remainder of the training trials, three questions were asked in order to ascertain whether the child understood what would happen after Mickey searched. The first two questions were asked after the child pointed but before Mickey looked in the box. The third question was asked after Mickey had looked in the box,

(1) What happens if Mickey finds the cookie?
(2) What happens if Mickey doesn't find the cookie?
(3) So, who keeps the cookie this time?

Training ended when the child answered these three questions correctly on three trials. If this criterion was not met within 10 trials, the child was not included in the sample. One 4-year-old and four older 3-year-olds failed to meet criterion.

After the child met training criterion, the boxes with windows were introduced. These boxes were identical in size and shape to those used during training; the only difference was that the side of each facing the child was transparent. The child was told, 'Now it will be easier for you to win the cookie and point so Mickey doesn't get the cookie.' Ten test trials proceeded in the same way as during training. Before each trial, the child was encouraged to win as many cookies as possible, 'Remember, try to win as many cookies as you can, and point so that Mickey doesn't get the cookie.'

Results

Sticker choice task. Participants received a score of one for each trial on which they chose to delay in the sticker task. The means and standard deviations for the four choice types for each age group are shown in Figure 2. A two way mixed ANOVA with age group (young 3s, old 3s, young 4s) as the between subjects variable and choice type as the within subjects variable showed only a significant main effect of choice type, $F(3, 156) = 12.2$, $p < .001$). Comparison of least square means showed that all means were significantly different from each other except for the one self now or one each later choice and the one each now or two self later choice.

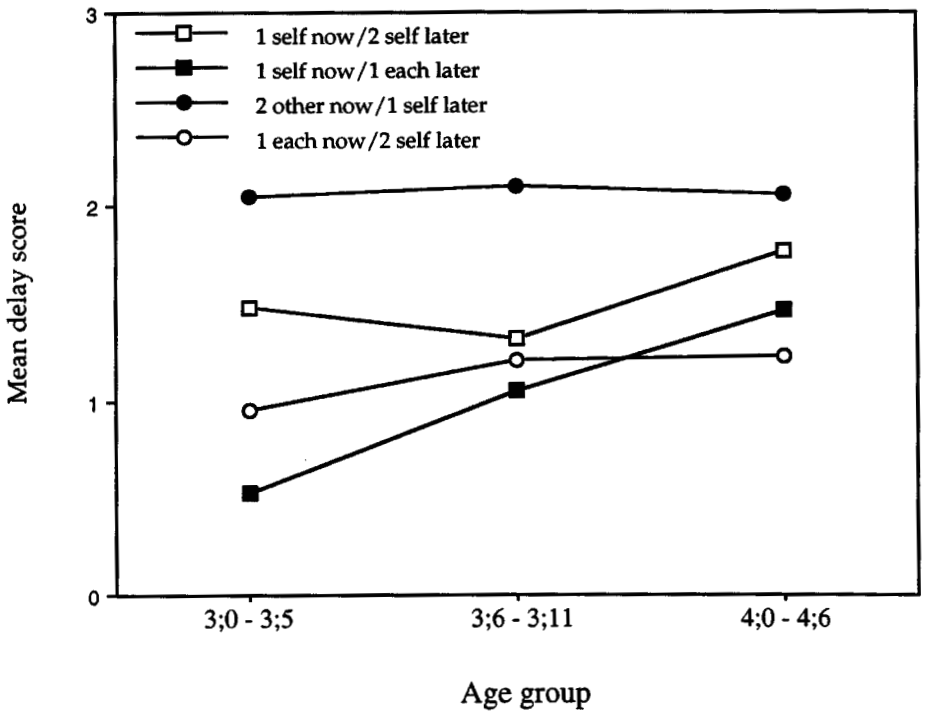

Figure 2. Mean delay scores for different choices in sticker choice task for three age groups in Experiment 2.

Based on *a priori* considerations, performance on the different choice types across age was analyzed using one-way ANOVAs with three age levels of the independent variable. Only the shared delay choice type (one self now or one each later) was close to showing a significant effect of age, $F(2, 52) = 3.093$, $p < .054$.

As with experiment 1, correlations among the four choice types were examined for each age group. These correlations are shown in Table 6. Very few of the relationships were significant. At the youngest age, the relationship between delay of gratification and delayed sharing approached significance ($r(17) = .430$, $p < .07$) as did the relationship between delay of gratification and the one each now/two self later choice ($r(17) = .398$, $p < .1$). For the older 3s, the relationship between two other now or one self later and one each now or two self later was marginally significant ($r(17) = .432$, $p < .07$). Finally, for the young 4s, the relationship between delay of gratification and one each now/two self later was significant ($r(15) = .628$, $p < .01$).

Windows task. For the windows task, the child's score was the number of times out of ten that they pointed to the empty box on the test trials. The mean (and standard deviation) scores for the young 3s, old 3s, and young 4s groups were 3.47 (4.26), 7.12 (3.91), and 9.12 (1.41). The standard deviations indicate that performance of the participants on the windows task was not normally distributed. Most children scored either very well or very poorly; there were few scores at any age in the 3 to 7 range. Indeed comparing the mode performance across age gives a better indication of the results on the windows task—0, 10, and 10 for young 3s, old 3s and young 4s respectively.

Table 6. Correlations Among Sticker Choice Tasks in Experiment 2

a) Young 3s (3;0–3;5)

	1 SN/2 SL	1 SN/1 EL	1 EN/2 SL	1 ON/2 SL
1 self now/2 self later	1.000	.430†	.398†	.022
1 self now/1 each later		1.000	.218	.071
1 each now/2 self later			1.000	–.085
2 other now/1 self later				1.000

Note: N = 19; † = $p < .1$.

b) Old 3s (3;6–3;11)

	1 SN/2 SL	1 SN/1 EL	1 EN/2 SL	1 ON/2 SL
1 self now/2 self later	1.000	.364	.401†	–.134
1 self now/1 each later		1.000	.263	–.273
1 each now/2 self later			1.000	.366
2 other now/1 self later				1.000

Note: N = 19; † = $p < .1$.

c) Young 4s (4;0–4;6)

	1 SN/2 SL	1 SN/1 EL	1 EN/2 SL	1 ON/2 SL
1 self now/2 self later	1.000	–.096	.662**	.013
1 self now/1 each later		1.000	.134	.282
1 each now/2 self later			1.000	.198
2 other now/1 self later				1.000

Note: N = 17; ** = $p < .01$.

Relationship between sticker choice tasks and windows task. Performance on the two types of task was correlated for each age group (see Table 7). There were no significant correlations between performance on the windows task and on the sticker choice tasks in the two older groups. In the young 3s, however, windows task score was significantly correlated with score on delayed sharing ($r(17) = .476$, $p < .05$), and with score on the one each now or two self later choice ($r(17) = .491$, $p < .05$). There was also a marginally significant correlation ($r(17) = .420$, $p < .08$) between windows score and score on delay of gratification. The relationship between windows task score and score on the two other now or one self later choice was not significant ($r(17) = .064$). In short, for the youngest age group, there were significant or close to significant correlations between executive functioning score and performance on those sticker choices where delaying entailed giving up an immediate reward for self.[1]

Table 7. Correlations Between Windows Task Score and Sticker Choice Task Score at Each Age in Experiment 2

Sticker choice task	Young 3s (N = 19)	Old 3s (N = 19)	Young 4s (N = 17)
1 self now/2 self later	.420†	–.370	.149
1 self now/1 each later	.476*	–.001	.169
1 each now/2 self later	.491*	–.256	.184
2 other now/1 self later	.064	.059	.036

Note: N = 17; * = $p < .05$; † = $p < .1$.

Discussion

The results of the sticker choice task from this experiment were somewhat less clear cut than those from either experiment 1 or Thompson et al. (1997). The only sticker choice type to show any indication of an age effect was that between one sticker for self now or one each later, which was consistent with earlier studies. Surprisingly, performance on the choice between one for self now or two for self later did not show an age effect in this experiment.

The two new choice types did provide some new information. First, as predicted, the children were less likely to delay when the choice was between one each now or two for self later than when it was between one for self now or two for self later. Thus, the addition of an immediate reward for the other made this choice more attractive even though there was no additional material benefit for the child. This result is comparable to a similar finding in Thompson et al. (1997) where the child had to choose between one each now or two for self now. In both cases, the sharing alternative was preferred to self-interest. Second, and in contrast, performance in the two for other now versus one for self later choice showed high levels of delay at all ages. This result indicates that even a relatively large reward for the other does not exert much pull for immediate gratification when the self is left out. The pure benefit of others now is a weak motivator compared to the future benefit of self.

The results for the windows task were highly consistent with previous work with this task by Russell and his colleagues (Russell et al., 1991; Russell et al., 1994). Children below about 3;6 had enormous difficulty inhibiting pointing at the baited box even though they knew that if the puppet found the cookie he would get to keep it. As noted, performance on this task was essentially bimodal. Children either did very well or very poorly, with the majority of children in the youngest group doing very poorly. These children would, in many cases, point at the baited box on all 10 test trials despite losing the cookie each time. According to Russell and colleagues, this pattern of performance reflects the problem in executive functioning whereby the children's action is controlled by the salience of the stimulus and their prepotent response set. They are unable to disengage from the stimulus and inhibit the normal response in favour of a more goal-directed action.

As noted earlier, there has been a reported failure to replicate Russell and colleagues' finding (Samuels et al., 1996). Samuels et al. failed to find evidence of

perseveration in a number of conditions using the windows task, some of which conditions closely matched the original Russell et al. (1991) procedure. We cannot say for sure what accounts for the discrepancy between their results and ours. However, it is worth noting that we found the perseverative pattern to be reliably present only in the 3-year-olds of 3;5 and below, as did Russell et al. (1991). Samuels report results for 3-year-olds as a group and did not examine whether within this age group there were differences between younger and older children. It is possible, therefore, that the few children who did appear to show perseverative behavior in their study were from the younger end of the 3-year-old range.

The pattern of relationships between the windows task and the sticker choice task allows some inferences to be drawn about the younger children's performance. Those children in the youngest group who tended to perform poorly on the windows task also tended to choose the immediate alternative on those sticker choices where there was an immediate reward for self available. This correspondence implies that part of the reason for these children's failure to delay was the inability to disengage from the immediate reward. It is interesting to note that this effect occurred both in the cases where there would be a gain to self in delaying (the choice between one for self now and two for self later and the choice between one each now and two for self later) and in the case where there would only be a gain for the partner in delaying (one for self now or one each later).

It is also interesting to note that no such correlations were found for the older children. This lack of a relationship is perhaps not surprising for the oldest group because there was low variability in performance on the windows task at this age. Most children performed very well, indeed 15 of 17 children pointed to the empty box on at least 8 of 10 test trials. There was more variability in the older 3-year-olds but again no evidence of a relationship between executive functioning and tendency to delay in the sticker choice tasks. It is possible, therefore, that the role of executive functioning or inhibition is more important early on in the development of future-oriented behavior.

General Discussion

The main purpose of these two experiments was to examine the relationship between two aspects of cognitive development—theory of mind and executive functioning—and future-oriented prosocial behavior. The results generally support the hypothesized links. Experiment 1 produced noteworthy correlations between young 4-year-old children's understanding of mental states and their tendency to delay in order to share rewards with another. Experiment 2 produced significant correlations for young 3-year-old children in their ability to inhibit pointing to and thereby losing a reward and their tendency to opt for superior future rewards, even if these only benefitted the other person, over inferior immediate rewards for self.

One possible interpretation of these results is that in choosing the delay option the children have to imagine the noncurrent mental states of both themselves and the other person and at the same time inhibit the strong immediate desire for the sticker. In interpreting the results, however, it is important to consider the general methodological strategy used here. Our approach in these experiments was to use correlations to make inferences about the cognitive basis of future-oriented prosocial behavior. We started with the assumption that theory of mind and executive functioning were, in some sense, 'more basic' cognitive abilities than future-oriented

choice behavior. But correlations can never, in and of themselves, provide direct evidence on such matters. It is equally possible that the changes in executive functioning and theory of mind depend in some way on the development of the ability to engage in future-oriented behavior. Or, perhaps, future-oriented prosocial behavior depends on one cognitive ability but once in place, it facilitates other cognitive changes.

In order to decide unequivocally among these possibilities, it would be necessary to examine experimentally conditional relationships between the various kinds of abilities. However, in the context of these different interpretations, it is worth reiterating that the observed relationships occurred approximately a year apart. The significant relationships between executive functioning and future-oriented behavior were seen in the younger 3-year-olds in Experiment 2, while the significant relationships between theory of mind and future-oriented behavior were seen in the younger 4-year-olds in Experiment 1. Although it is potentially dangerous to compare across studies, it is possible that while executive functioning plays a role in future-oriented prosocial behavior early on in development, developing theory of mind is more important later.

This difference in correlational patterns observed in these experiments is perhaps most consistent with the interpretation that while future-oriented behavior depends on developing executive functioning, it facilitates the development of theory of mind. It has been shown in this work and in previous research (Russell et al., 1991; Russell et al., 1994) that inhibition of a prepotent response to salient information becomes easier around the middle of the fourth year. Perhaps such inhibition facilitates the kind of future-oriented behavior studied here and by Thompson et al. (1997), because in order to show such behavior the child has to be able to inhibit choosing the immediate alternative. Once children can engage in inhibition and thereby reliably consider simultaneously the consequences of each alternative in choice situations such as those studied here, they may be in a position to consider the relevance of such choices for the mental states of both self and other, and thereby come to conceptualize more firmly the idea that different people, and they themselves at different times, can have different and conflicting mental states.

Such an account appears inconsistent with the idea that understanding mental states is required for executive functioning as some have claimed (e.g. Perner, in press). The picture is not at all simple, however, because there is evidence that an implicit understanding of mental states may be in place before reliably successful performance on standard theory of mind tasks such as those used in the present work (e.g. Clements & Perner, 1994). If so, then there may still be a sense in which future-oriented behavior depends upon both executive functioning and the understanding of mental states, even if the latter understanding is not verbalizable or robust.

A final possibility, worth mentioning, is that all of the patterns of correlations seen here are the result of some even more general changes in cognitive development, such as changes in working memory capacity, with the age effects being due to differences in more 'superficial' task performance variables. Again, we are not presently in a position to assess the likelihood of this suggestion. The empirical strategy is clear—are changes in performance in the tasks studied here correlated with developmental changes in performance in more general cognitive tasks, such as general memory performance?

Inevitably, the present results do not allow us to choose finally between the various theoretical possibilities. At the very least, however, we have shown that there are

reasonably clear relationships between the child's developing ability to act in order to benefit others' (and their own) future interests, their ability to inhibit a prepotent response to a salient perceptual stimulus and their developing theory of mind. As such, these results provide evidence of the possibility of important links between the development of cognitive abilities and advances in prosocial behavior in the preschool period.

There is increasing recognition of the importance for long-term adaptive behavior of the development of skills such as those investigated in the present work (see e.g. Goleman, 1995). The advances in prosocial behavior documented here and by Thompson et al. (1997) likely play a critical role in social and personality development. Mischel and colleagues (Mischel et al., 1988; Shoda et al., 1990) have demonstrated the significance of delay of gratification for social development. The expansion of the study of future-oriented thinking to include prosocial contexts may provide an even more effective early predictor of long-term social functioning. With the demonstration of associations between future-oriented behavior and social cognition and executive control processes, there is the potential for an integrated account of how psychological development in the preschool years impacts on the development of the child's social relations.

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Appendix A

Protocol for sticker choice task

[Child's name (CN)], in this game, I'm going to show you some stickers and ask you questions about them. You'll get to pick who gets the stickers. Sometimes you might want that just you get a sticker, and sometimes you might want that [research assistant's name (RA)] will get a sticker. And you'll also get to pick how many stickers you want, and when you want to get the stickers. Sometimes, you might want to have your stickers right away so you and [RA] can put them in your sticker books, and sometimes you might want to wait and get your stickers at the end of the game. When you think you want to wait for your stickers, I'll put your stickers right here in this envelope to save them for you, and I'll put [RA's] stickers in this other envelope to save them for her. Then at the end of the game, I'll take the stickers out of the envelopes and give them all back to you and [RA] so you can put them in to your sticker books. Then you can take your stickers and sticker books home with you. Are you ready to play?

Example of choice: one for self now or one each later

Here are two stickers. If you want to, you can have one sticker for you right now; or, you can wait till the end of the game, and then you can have one sticker and [RA] can have one sticker. What will we do: give one sticker just to [CN] right now; or, wait till the end of the game and give one sticker to [CN] and one sticker to [RA]?

Note

1. Because the distribution of scores in the windows task was not normal, as a check we created a categorical variable by combining windows task scores of 0–2 into one category and scores of 8–10 into a second and then conducted point biserial correlations between windows task peformance and choice tasks performance. These correlations made no essential difference to the pattern of results: windows with delayed sharing, $r(15) = .454$, $p < .07$; windows with one each now/two self later, $r(15) = .512$, $p < .05$; windows with delay of gratification, $r(15) = .486$, $p < .05$; windows with two other now/one self later, $r(15) = 0$, NS).