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## To share or not to share: When do toddlers respond to another's needs?

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### Abstract

The developmental origins of sharing remain little understood. Using procedures adapted from research on prosocial behavior in chimpanzees, we presented 18- and 25-month-old children with a sharing task in which they could choose to deliver food to themselves only, or to both themselves and another person, thereby making it possible for them to share without personal sacrifice. The potential recipient, a friendly adult, was either silent about her needs and wants or made them explicit. Both younger and older toddlers chose randomly when the recipient was silent. However, when the recipient vocalized her desires 25-month-olds shared whereas younger children did not. Thus, we demonstrate that children voluntarily share valued resources with others by the end of the second year of life, but that this depends on explicit communicative cues about another's need or desire.

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As humans we can appeal to the kindness of strangers because our compassion for others motivates a host of prosocial behaviors such as cooperating, helping, comforting, and sharing. We routinely act together with and on behalf of others, including unrelated individuals, based on our understanding of their needs or wants in combination with universal norms of fairness and reciprocity, even at costs to ourselves (Fehr & Fischbacher, 2004; Henrich, Boyd, Bowles, et al, 2005). Children, too, engage in norm-based sharing, cooperation, and moral behavior by middle childhood (Eisenberg & Fabes, 1998; Harbaugh & Krause, 2000).

What are the origins of prosocial behavior? Both descriptive and experimental evidence suggests that early forms of prosocial behavior appear in the second year of life when young children begin to respond with empathic concern to others' distress (Zahn-Waxler, Radke-Yarrow, Wagner & Chapman, 1992), to help adults who have dropped or misplaced things that they need (Liszkowski, Carpenter, Striano & Tomasello, 2006; Warneken & Tomasello, 2006, 2007), to assist with common household tasks (Rheingold, 1982), and to cooperate instrumentally with adults and peers (Brownell, Ramani, & Zerwas, 2006; Warneken, Chen & Tomasello, 2006). The emergence of these capacities has been attributed to advances in emotion and desire understanding (Mascolo & Fischer, 2007; Repacholi & Gopnik, 1997), altruistic motivation (Warneken & Tomasello, 2006), and self-other differentiation (Brownell & Carriger, 1990; Brownell, et al, 2006; Hoffman, 2007; Zahn-Waxler, et al, 1992), all of which also develop over the second year of life. These early behaviors represent first steps toward the more complex normative, reciprocal, and altruistic forms of prosocial behavior that are apparent in childhood.

The developmental course of sharing is less clear, however. Parents encourage their infants to share food and to give them toys, and infants are observed to do so by 12 to 18 months of

age (Hay, 1979; Rheingold, Hay & West, 1976). By two years of age children also show and offer toys to one another in naturally occurring play, but sharing is infrequent unless requested by an adult (Hay, Castle, Davies, Demetriou, & Stimson, 1999; Levitt, Weber, Clark & McDonnell, 1985). Even in the preschool years spontaneous sharing of valued resources remains difficult for children and occurs relatively rarely, especially in contrast to helping and cooperating (Eisenberg, 2005; Grusec, 1991). For example, in an experimental study of food-sharing in preschoolers, three- to five-year-old children shared only one piece of food with their peers, reserving 10 pieces for themselves (Birch & Billman, 1986). When sharing stickers with an adult, preschool children were less likely to share when it resulted in a reduced number of stickers for themselves than when there was no cost for sharing (Thompson, Barresi & Moore, 1997). Such data suggest that sharing may be more challenging for young children than some other forms of prosocial behavior and may emerge later.

However, to our knowledge there have been no experimental studies of the development of sharing in very young children. Although much can be learned from observations of naturally occurring sharing behavior, conclusions about the early development of sharing are limited without control of important factors such as the cost of sharing to the child, the social and communicative cues from others that may direct or reinforce sharing, what is to be shared, the need or desire of the potential recipient and other recipient characteristics, or the sharing context. The purpose of the current study is to begin to address this gap by examining sharing experimentally in one- and two-year-old children.

One important feature of the procedures used in the current study is that sharing is not costly for the child. That is, children are not required to make a sacrifice in order to share with someone else, but only to consider the other person's desire or need. Toddlers are known for their possessiveness (e.g., Hay, 2006), which may make giving up something they value to someone else, even temporarily, especially difficult. Young children might be more likely to share under no-cost conditions, allowing us to observe the earliest instances of this core aspect of prosocial behavior.

We presented one- and two-year-old children with a food-sharing task adapted from experimental procedures used to study prosocial behavior in non-human primates. We focus on this age period because developmental advances have been documented in a number of other forms of prosocial behavior during the second year as noted previously. Children could choose between two alternatives: 1) to deliver food both to themselves and a friendly adult, or 2) to deliver food to themselves alone. In either case children received a food snack for themselves, permitting them to share a valuable resource with another person without incurring personal cost. As we were interested in children's spontaneous preferences for sharing (or not), they received no rewards or social reinforcement for sharing. We manipulated whether the potential recipient waited silently, or whether she verbally indicated her liking and desire for some food. Thus, children's sharing decisions could be unprompted or could occur in response to explicit information about the recipient's desire. As a final control, children were given the same two choices when there was no recipient present. We evaluated under which conditions, if any, very young children systematically chose to share.

## Method

### Participants

Participants were 28 healthy, typically developing children. Half were 18 months old ( $M = 18.5$  months;  $SD = .76$  months), and half were 25 months old ( $M = 25.1$  months;  $SD = 2.1$  months). The 17 boys and 11 girls were approximately equally distributed across ages.

Families were recruited from a medium-sized city and surrounding suburbs, and were predominantly Caucasian (95%). An additional eleven children were tested but their data eliminated due to experimenter error, attention problems or developmental delay, parental interference, or oppositional behavior.

### Task

The task was adapted from the apparatus used by Silk, et al (2005) to investigate prosocial, other-regarding behavior in chimpanzees. A child-sized table (90cm long × 60cm wide × 40cm high) was designed to deliver a small snack (e.g., cracker or raisin) when the child pulled a handle attached to a pair of food trays (see Figures 1 & 2). The child stood at one end of the table, with the potential recipient seated at the opposite end. At the child's end of the table a window with two openings permitted the child access to two handles, one through each opening. The construction of the task prevented the child from reaching both handles at once, forcing a choice. Pulling either handle brought a food tray containing a snack into the child's reach, and simultaneously delivered the paired food tray to the person seated opposite. The food trays could be loaded so that pulling one handle delivered a snack to both the child and the recipient (1/1) whereas the other delivered a snack to the child alone (1/0).

### Procedure

The procedure took place in a 3m × 4m room equipped with a one-way mirror through which the session was videotaped. The task was introduced about 45 minutes after the beginning of a longer session so that it occurred in mid-morning when children were mildly hungry. A 5 – 10 minute warm-up play period began the session during which the child became comfortable with the primary experimenter (E1) and a female assistant (E2). A parent was present throughout, completing questionnaires or reading a magazine.

**Training**—Children received a minimum of 10 training trials administered by E1. The purpose of training was to: 1) teach children how to use the apparatus to obtain a snack for themselves; 2) ensure that children understood the recipient role by permitting them to serve as a recipient; 3) ensure that they knew how to deliver a snack to a waiting recipient. First, E1 showed the child how to pull each of the two handles to move a food tray up to the opening in the window and how the paired tray moved to the other side of the table. She then drew the child's attention to the snack while she placed it in one of the two trays nearest the child and encouraged the child to get it. This part of the training continued, alternating left and right sides, until the child chose the correct handle immediately on two successive trials without coaching or assistance; every child received at least three such initial training trials ( $M_s = 4.4$  &  $3.6$  trials for younger and older children, respectively). Three additional training trials were then administered to determine whether children had either a side preference or a preference for the side with the most food; no child exhibited a systematic preference. A final set of four training trials was administered to ascertain that children knew about the recipient role and how to deliver a snack to the recipient. In two of these, the child served as the recipient while E1 delivered the snack to the child, saying "Now I'm giving you a snack! Look, I get one too!" After the second trial, the child returned to the other end of the table, and E2 entered the room; she greeted the child, and then sat at the end of the table opposite the child. For the final two training trials E1 loaded all four food trays so that regardless of the child's handle choice, a snack would be delivered both to E2 and to the child. When the child pulled a handle E2 drew the child's attention to the fact that she had gotten a snack by exclaiming, "I got one too! I got a [cracker] too!" and eating it enthusiastically while making eye contact. The child then pulled the second handle to repeat this event. No praise or thanks were provided during training.

**Test**—Immediately following training, children were administered 12 test trials. For each test trial, the two food trays closest to the child were loaded with a snack, but only one of the two trays closest to the recipient was loaded. The child thus chose between the 1/1 snack arrangement (sharing) and the 1/0 arrangement (nonsharing). The 1/1 side (either L or R) was alternated over trials, and the starting side for the 1/1 arrangement (L or R) was counterbalanced over participants. E1 stood adjacent to the snack table and drew the child's attention to the loading of the trays on each trial, making sure that the child watched her place all three of the snacks in their respective trays. Once the child pulled a handle, E1 removed the food remaining in the other tray to prevent the child from obtaining both snacks. The next trial was begun once the child had eaten the snack. Mean latency to pull the handle on the first test trial was 5.2 sec ( $SD = 5.4$  s), and mean duration of the test session was 471.4 sec ( $SD = 204.3$  s).

Test trials were administered in 3 blocks of 4 trials each, in fixed order. In the first trial block, the recipient (E2) was silent, waiting with a pleasant, neutral facial expression, looking at the snack and occasionally making eye contact with the child. In the second trial block E2 additionally verbalized her liking and desire for a snack before each trial, saying "I like [crackers]. I want a [cracker]." She did not express other internal states such as hunger, nor issue commands such as "give me a [cracker]." Nor did she reach for the snack or ostensibly alternate gaze between the snack and the child; this was to preclude the child's interpretation of her behavior as a command or explicit request. If the child shared, E2 ate the snack enthusiastically while smiling and making eye contact, but she neither thanked nor praised the child. After the second trial block E2 announced that she had to leave and told the child goodbye to be sure the child knew that she was no longer available as a potential recipient. The final block of 4 trials was then administered with no recipient. The recipient trials were administered first to maximize children's interest in and attention to the recipient; silent recipient trials were administered before vocal recipient trials to avoid carryover of the recipient's desire expressions (and any associated sharing responses) into the silent condition. Thus, by necessity, the no-recipient trials were always last.

Children's handle choice (sharing/nonsharing) was scored from videotape by coders blind to hypotheses and the children's ages. Reliability was calculated on 20% of the tapes (% agreement = .91;  $kappa = .88$ ), with disagreements resolved by consensus.

## Results

Preliminary analyses revealed no significant sex differences or side preferences. There was also no significant overall trial effect, thus fatigue was not a factor. Finally, there were no age differences in latency to pull the handle on the first test trial ( $M_s = 6.1$  &  $4.3$  secs for younger and older children, respectively;  $F < 1$ ), or on duration of the test session ( $M_s = 487.3$  &  $452.9$  secs for younger and older children, respectively;  $F < 1$ ). Substantive analyses addressed three separate questions: 1) whether children shared more often than chance in any of the three trial blocks; 2) whether sharing rates differed as a function of recipient behavior; 3) whether average differences at the level of the group were reflected in performance at the individual level. We also conducted two supplemental analyses to address questions about task demands and language competence as factors in children's performance.

To determine whether children shared more often than chance in any trial block, one-sample *t*-tests were conducted for each trial block separately, using 50% as the test criterion. At 25 months of age, children delivered a snack to the recipient more often than chance in trial block two, when the recipient vocalized her desire for a snack,  $t(13) = 2.86$ ,  $p = .01$  (see Figure 3 for means). However, during trials when the recipient was silent, 25-month-olds

pulled the sharing and non-sharing handles equally often, at a rate that did not differ significantly from chance,  $t(13) = .69$ , *ns*. Eighteen-month-old children pulled the two handles randomly regardless of the recipient's behavior ( $t's < 1.5$ , *ns*). On the control trials for which there was no recipient, children at both ages responded randomly, as would be expected ( $M_s = .51, .62$  at 18 and 25 months, respectively;  $t's < 2$ , *ns*). In sum, the only condition in which children systematically shared was the vocal recipient condition, and this was true only for 25-month-olds.

Because older children were found to respond systematically in the vocal recipient condition, we contrasted the effects of recipient behavior on children's rate of sharing directly using a two-way repeated measures ANOVA with recipient condition (silent recipient; vocal recipient) as the within-subjects factor and age as the between-subjects factor (18 months; 25 months). A significant interaction between age and condition was found,  $F(1, 26) = 7.09$ ,  $p = .013$ ,  $\eta^2 = .214$ . Post-hoc analyses showed that the difference between silent-recipient and vocal-recipient trials was significant for 25-month-olds,  $t(13) = 3.02$ ,  $p = .01$ , but not for 18-month-olds,  $t(13) = 0.89$ , *ns*. Thus, the older children shared significantly more often when the recipient made her desires explicit, whereas the younger children did not.

Finally, to examine the number of individual children at each age who shared in response to the vocal recipient, we categorized children based on whether they pulled the sharing handle more often than chance (i.e., on 3 or 4 trials out of the 4 possible). Only 14% of 18-month-olds shared when the recipient vocalized her liking and desire for a snack, compared to 57% of the 25-month-olds, a significant difference, *Pearson chi-square* (1) = 5.60,  $p = .02$ .

### Supplemental analyses

To ascertain that the younger children were able to consider the location of the recipient's snack in deciding which handle to pull, thereby ruling out this task-specific explanation for their poorer performance, we collected data from five additional 18-month-olds. After training, these children were administered eight no-recipient trials in which food was placed in one of the two recipient trays only (side alternated over trials) and they were encouraged to retrieve the snack for themselves. This required children to determine the correct handle to pull when food was delivered to the opposite end of the table. On average, children pulled the correct handle 93% of the time (range = 75% - 100%), a rate well above chance.

Some of the children also participated in another study for which language data were collected ( $n = 17$ ; 9 younger, 8 older children). This permitted us to evaluate whether language competence might have accounted for differences in performance when the recipient verbalized her desire for the snack. The rate of sharing in the vocal recipient condition was marginally associated with the child's total language score on the MacArthur Communicative Development Inventory (Fenson, Dale, Reznick, et al, 1994),  $r = .34$ ,  $p < .09$ , as would be expected since language competence is also age-related. Once age was controlled, however, the correlation became non-significant ( $r = .17$ ). Children's production of internal state words as reported by mothers using the State Words Checklist (Brownell, et al, 2006) was also significantly correlated with the rate of sharing in the vocal recipient condition,  $r = .52$ ,  $p = .01$ , and remained marginally so once age was controlled,  $r = .39$ ,  $p < .06$ . Thus, although general language competence was not related to the likelihood of sharing with a vocal recipient for either younger or older children, children at both ages who more often talked specifically about emotions, desires, and other mental states were more likely to share with a clearly desirous recipient.

## Discussion

The results from the current study, to our knowledge the first controlled experimental study of sharing in infants, show that by the age of two years children voluntarily share valued resources with unrelated individuals when there is no cost to them for doing so. Notably, however, this depended on the recipient making her desire explicit. In contrast, 18-month-old children did not share even when the potential recipient indicated that she liked and wanted what the toddler controlled. The younger children thus appeared to be operating on the basis of self-concern only, without considering the desires or needs of the other person. These experimental findings extend and strengthen the observational literature that documents early, but infrequent, sharing with adults and peers in natural settings (see Hay & Cook, 2007, for a review).

Age differences in the propensity to share valued resources are unlikely to be based on motivational factors as several studies have shown that one-year-olds are willing to help adults and to share or comply with them when the adults make requests or when behavior occurs in the context of well-established routines (Kochanska, Tjebkes, & Forman, 1998; Rheingold, 1982; Warneken & Tomasello, 2006, 2007). Empathic responding, one of the motivational roots of prosocial behavior, also appears by 18 months of age or earlier (Hoffman, 2007; Zahn-Waxler, et al, 1992). Crucially, the task used in the current research relies not only on children's motivation for sharing with someone else, but also on their ability to infer the other's liking and desire for the food, and to do so from rather limited social and communicative cues. Thus, we believe that the age differences observed here are more likely a product of growth in the ability to infer others' internal states between 18 and 24 months of age, especially in relation to one's own. In particular, the desire to mitigate another's need is grounded in sympathy, which depends on the ability to distinguish one's own emotional states from others' and to take others' emotional states into account independent of and in relation to one's own (Eisenberg, 2005). If the child attends only to her own needs, prosocial motivational processes will not be activated. The ability to consider others' needs and emotions in relation to one's own emerges over the latter part of the second year in concert with developments in objective self-awareness and the corresponding awareness of the subjectivity of others' internal states (Hoffman, 2007; Moore, 2007).

Children this age do sometimes share in naturalistic contexts, but it is difficult to identify the basis for sharing in uncontrolled settings beyond children's interest in simple social engagement or their past history with or instruction by the recipient. Hence, it is not clear that such naturalistically-observed sharing in very young children is grounded in other-oriented concern. Although in the current study it appears that two-year-olds, but not one-year-olds, were considering the recipient's needs and desires in deciding what to do, young two-year-olds are still limited in their mentalizing and perspective-taking abilities; thus they had to rely on the recipient's communicative behavior to inform them of her desire. This suggests that infants' ability to act prosocially in response to others' needs and desires may initially depend on explicit social and communicative supports provided by adults. As infants' understanding of internal states progresses, they become more proficient at making inferences about others' needs and desires from more subtle behavioral and situational cues and thus more independent of adults' assistance and scaffolding.

Technical demands of the task did not account for the age differences in sharing identified in the current study, since the younger children were easily and reliably able to pull the correct handle to deliver food to themselves even when it was located in the recipient's trays at the distal end of the table. Furthermore, training procedures ensured that children knew how to deliver food to the recipient and that the recipient was happy about getting it, and the trial

order maximized children's attention to and interest in the recipient. Yet in spite of these optimal conditions one-year-olds did not systematically share. Nor was more advanced performance due to greater language facility. Supplemental analyses showed that when age was controlled, children's language competence was not associated with sharing when the recipient vocalized her desire. However, we did find that children who produced more internal state language shared more often with the vocal recipient, even with age controlled. This suggests that regardless of age, greater understanding of others' needs and desires, as indicated in the ability to talk about emotions and other internal states, may be an ingredient in children's decision to share. Of course, these findings can be only suggestive and this argument speculative, since the number of children for whom language data were available was quite small. Such possibilities should be examined more directly in future research.

Other factors might have contributed to the age differences in sharing observed here and are also worth pursuing in future research. Perhaps children interpreted the adult's verbalizations as compliance requests and older children were more likely to obey, or perhaps the attentional demands of the task made it more difficult for the younger children to attend to the recipient's communicative cues about her needs. Although we believe that our procedures and the supplemental data and analyses militate against these alternatives, they cannot be ruled out except by additional experimental manipulations. Research could also profitably address whether sharing differs as a function of the partner or the child's history with the partner, e.g., with parents, siblings, or peers as potential recipients, or the recipient's prior generous or selfish behavior toward the child. Finally, it is possible that the results of this study are unique to this fairly select sample and/or to the condition order, thus the findings need to be replicated with a larger, more diverse sample and a fully counterbalanced design.

Interestingly, the results for the two-year-olds in the current study contrast with results from similar studies with non-human apes. Three independent laboratories, using tasks very similar to the task used here, have shown that adult chimpanzees (*Pan troglodytes*) do not share resources with familiar conspecifics even when there is no cost to themselves (Jensen, Hare, Call & Tomasello, 2006; Silk, et al, 2005; Vonk, Brosnan, Silk, et al, in press). When given the opportunity to share food with a familiar conspecific, chimpanzees respond randomly, operating on the basis of self-interest rather than other-concern. The capacity for other-regarding prosocial behavior and compassionate concern for others may thus be uniquely human (Tomasello, Carpenter, Call, Behne, & Moll, 2005; Tomasello & Carpenter, 2005; Vonk, et al, in press; but see Warneken, Hare, Melis, Hanus & Tomasello, 2007, for an alternative argument).

It could be argued that the procedure used in the current study does not provide a true test of early prosocial behavior precisely because it unconfounds self-concern and personal gain from concern for the outcomes to another. That is, sharing was not costly – children (and chimpanzees, in prior research) always received a snack for themselves whether they chose to share or not. But it must be kept in mind that it is only a strict definition of altruistic sharing that requires sacrificing one's own gain to benefit another. I may share my large bowl of grapes with you knowing that you like grapes and I won't be able to finish them all myself, and possibly with the expectation that you will later share something with me. By most definitions, this constitutes prosocial behavior even though there is no personal sacrifice and there is some prospect for personal gain (e.g., Hastings, Utendale & Sullivan, 2007). For children in the current study to respond systematically rather than randomly on the task means that they must have actively considered the wants or needs of the recipient in addition to being motivated to meet them. This degree of other-regarding, prosocial behavior is inherently costly in terms of perceptual, attentional, cognitive, and emotional resources even if not in terms of immediate physical resources.

When, during ontogeny, is it likely to be adaptive for a very young child to incur personal costs in the service of sharing valuable resources with others, especially unrelated others? Perhaps it would be more sensible when others' intentions and motivations are better understood, when the probability of future reciprocity can be evaluated, and when social norms play a role in regulating social exchange. These latter abilities become evident with expansion of the child's social network, developments in understanding of mental states, and emergence of norms and norm-governed behavior (Carpendale & Lewis, 2004; Chapman, Zahn-Waxler, Cooperman & Iannotti, 1987; Froming, Allen, & Jensen, 1985; Harris, Nunez & Brett, 2001; Wellman, Cross, & Watson, 2001). Thus, sharing that requires the sacrifice of physical resources may be a special case of altruistic behavior which develops later in childhood and arises out of a more fundamental prosocial disposition to act on behalf of others that appears in late infancy.

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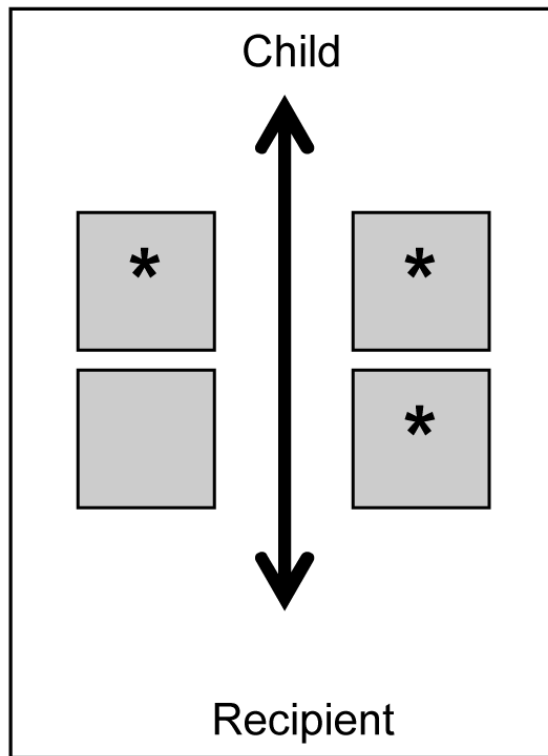
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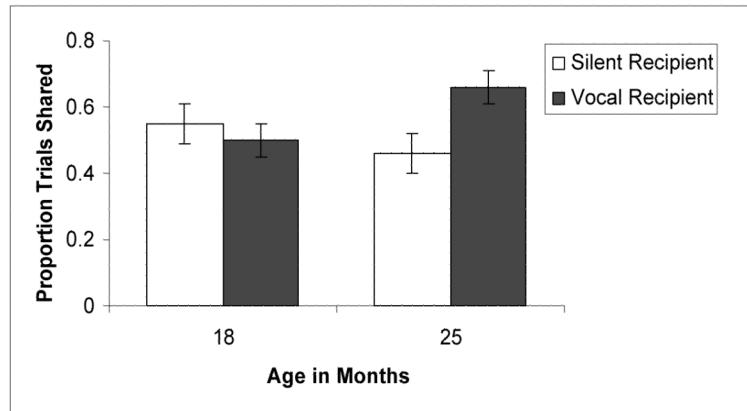


**Figure 1.** Schematic diagram of the sharing task showing the 0/1 (non-sharing) option on the left and the 1/1 (sharing) option on the right. Handles attached to the two trays closest to the child permitted the child to control each pair of trays. As the child pulled a tray toward himself, the paired tray simultaneously moved toward the recipient.



**Figure 2.**

An 18-month-old child pulling a handle to obtain a snack for herself, choosing the 0/1 (non-sharing) option in which she delivers an empty food tray to the recipient. The recipient is seated at the end of the table closer to the viewer, off camera.



**Figure 3.** Proportion of trials on which sharing occurred as a function of child's age and recipient's behavior.