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Sharing with collaborators versus competitors: Relations with executive functioning and mentalizing ability

Abstract

While children show an appreciation for fairness, their sharing does not always reflect such principles. This work examined how contextual factors (competition/cooperation; self/other perspective) and socio-cognitive skills impact children's sharing. Children (4- to 6-year-olds and 7- to 9-year-olds) set up games played either with (cooperative) or against (competitive) peers. The set up involved allocating resources necessary to completing the task (e.g., blocks used to build towers). Children also completed measures of executive functioning and mentalizing skills. Children who focused on the perspective of their social partner prior to allocating resources shared fewer items than those who reflected on their own perspective. Fewer items were shared in the competitive (versus cooperative) context and younger (versus older) children shared fewer items. Age moderated the relationship between executive functioning and sharing: younger children with more proficient executive skills tended to share more items, whereas this pattern did not emerge in the older group. (150 words)

Keywords: sharing, fairness, executive functioning, theory of mind, social behaviour, prosocial

Introduction

As disappointing as it may be for many children, resources (e.g., toys, items of food, stickers) are not limitless and, thus, there are numerous situations in which they must decide who is the recipient of particular desired items. Though young children may know what is considered to be fair, actually behaving according to such principles is a more difficult challenge that may require the support of cognitive skills. Past work has charted the development of children's sharing behaviour (e.g., Brownell, Iesue, Nichols, & Svetlova, 2013; Brownell, Svetlova, & Nichols, 2009; Dunfield, Kuhlmeier, O'Connell, & Kelly, 2011; Paulus & Moore, 2012; Rheingold, 1982; Warneken & Tomasello, 2006). However, the contextual factors that influence sharing, as well as the mechanisms underlying such behaviour, have received less focus (Paulus, 2014). The present investigation sought to explore these factors by examining children's sharing within a cooperative context, where a researcher informed them they would be working collaboratively with a peer, as well as within a competitive context, where the researcher told them they would be competing against a peer. To understand the degree to which reflecting on one's own versus a social partner's goals may impact behaviour, children reflected on what they/their partner wanted to happen. Children's ratings of fairness, predictions of the peer's actions, and sharing behaviour in both contexts were examined in relation to their mentalizing skills and executive functioning (EF). Uncovering the nature of prosocial behaviour, such as sharing, within early childhood is important given its strong relations to later social and academic success (Caprara, Barbaranelli, Pastorelli, Bandura, & Zimbardo, 2000).

Contextual Factors that Impact Sharing

There are a number of situations that children will encounter within their broader social environment. These include cooperative contexts, in which their goal is convergent or shared

with another individual, as well as competitive ones, in which their goals are at odds with those of another individual. Social competence entails recognizing the social context and mobilizing appropriate behaviours for this context. Past work has shown that children show sensitivity to these varied situations at a young age and moderate their behaviour accordingly. For instance, 5 to 8 year old children show more cooperative behaviours (e.g., sharing game items) with peers during a collaborative task versus during a competitive task (Huyder & Nilsen, 2012). While not a manipulation of the context per se, work examining cultural factors also highlights the influence of the backdrop on which social behaviour is embedded. For example, preschool-age children (aged 3-5 years) from more collectivist cultures (e.g., China, Peru, Fiji) show more spontaneous sharing and less self-interested biases than do preschoolers from more individualistic backgrounds (e.g., America, Brazil; Rao & Stewart, 1999; Rochat et al., 2009).

The context in terms of social partner also impacts children's sharing behaviour, with 3- to 8- year-old children sharing more with a classmate versus a stranger (with this pattern strengthening with age; Fehr, Bernhard, & Rockenbach, 2008; also see Fehr, Glätzle-Rutzler & Sutter, 2013). Indeed, children infer friendship when they see someone preferentially distributing resources to an individual (Liberman & Shaw, 2017). Together, this research suggests that it may be the case that children are more willing to share resources with an individual whom they see as a collaborator as opposed to someone whom they see as a competitor. Adding to this assumption, children are less likely to share when it is seen as costly (Paulus, 2014), as would be the case in a competitive context. Moreover, 3-year-olds are more likely to share with someone with whom they have recently collaborated to obtain resources (Hamann, Warneken, Greenberg, & Tomasello, 2011). Research with adults highlights an interesting pattern whereby individuals are more likely to share with people they are collaborating with than competing against. However,

the act of thinking about the other person's perspective differentially influences their behaviour in that thinking about a collaborator's motivations increases the sharing of resources, whereas thinking about the motivations of a competitor increases more selfish behaviours (i.e., the latter pattern is termed "reactive egoism"; Epley, Caruso, & Bazerman, 2006). Thus, in some contexts, thinking about another's actions may lead to less sharing behaviour. Consistent with this notion, children who were better able to predict the behaviour of a character in a false belief task were more likely to show "poaching" behaviour in a competitive context (Priewassler, Roessler, & Perner, 2013). While such findings speak to contextual factors that influence sharing, they also highlight that there may be individual differences in children's skills which influence their sharing.

Skills Associated with Sharing

Socially competent behaviour requires that children appreciate and use cues within their social environment, identify their own goals as well as the goals of their social partners, and coordinate their behaviour accordingly (Huyder & Nilsen, 2012). Thus, for children to demonstrate context-appropriate behaviour, they must be able to reason about the intentions of social partners, as well as possess the skills to make use of such information to guide behaviour (Nilsen & Fecica, 2011). Given this, it is likely that a complex set of skills is required for children to engage in context appropriate sharing behaviour, such as mentalizing skills (Theory of Mind, or ToM) and EF. Such associations are considered in the present study, and the relevant literature for each area is discussed below.

ToM allows for children to attribute independent mental states to others and use information about others' intentions to interpret and predict their actions (Ashiabi, 2007; Bosacki & Astington, 1999; Decety, Jackson, Sommerville, Chaminade, & Meltzoff, 2004). While there

are different aspects of the general capacity of ToM (e.g., intuitive versus reflective; decoding versus reasoning; cognitive versus affective, etc.; Hughes, 2011; Sabbagh, 2004), there is the general recognition that appreciating another's thoughts and emotions is crucial to a child's ability to interact with peers (Bosacki & Astington, 1999; Hughes, Fujisawa, Ensor, Lecce, & Marfleet, 2006; Hughes & Leekam, 2004; Grueneisen, Wyman, & Tomasello, 2015; Razza & Blair, 2009). This pattern includes children's sharing behaviour. For example, 5- to 10-year-olds' ToM skills (i.e., first- and second-order false belief) were found to relate to increased cooperative behaviours within both ultimatum and prisoner's dilemma games. More specifically, in the ultimatum game, wherein children were asked to allocate candy to themselves and their partner, children who passed false belief tasks proposed higher offers than those who failed (Sally & Hill, 2006; Takagishi, Kameshima, Schug, Koizumi, & Yamagishi, 2010). Young preschoolers who showed more advanced ToM skills spontaneously shared more often and shared more items than preschoolers who had weaker skills (Wu & Su, 2014). Moreover, 3- to 9-year-old children who had more sophisticated ToM more accurately inferred the intentions of a resource allocator who was naïve to the (in)equity present (Li, Rizzo, Brukholder & Killen, 2017). However, a reverse pattern of results has also been demonstrated wherein children who passed a false belief task were found to share significantly less resources during a dictator game than those children who failed a false belief task (Cowell, Samek, List, & Decety, 2015). Thus, while ToM may enable children to recognize and behave according to equal distribution in some contexts, it may also allow children to appreciate that in other contexts there is no consequence for hoarding their resources.

In addition to ToM, the development of prosocial behaviours rests on the ability to regulate one's own negative emotions (Decety & Svetlova, 2012). It follows then that children's

capacities for prosocial actions is related to their ability to regulate themselves (Eisenberg et al., 1996). Indeed, children's EF (i.e., their higher-order, self-regulatory cognitive processes that facilitate goal-directed behaviour; Carlson, 2005; Hughes, 1998; Pennington & Ozonoff, 1996) has been found to play a role in promoting social competence (Decety et al., 2004; Nigg, Quamma, Greenberg, & Kusche, 1999; Riggs, Jahromi, Razza, Dilworth-Bart, & Müller, 2006). For instance, better inhibitory control in children relates to more cooperation with peers (Ciairano, Visu-Petra, & Settanni, 2007; Giannotta, Burk, & Ciairano, 2011) and fewer competitive behaviours (Huyder & Nilsen, 2012). With respect to sharing behaviour more specifically, children who were reported to have better inhibitory control skills at 30 months old shared more stickers when they were 5 years old (Paulus et al., 2015).

The skills that facilitate sharing behaviour may also depend on the person with whom the child is sharing. For instance, Yu and colleagues (Yu, Zhu, & Leslie, 2016) found that 3- to 9-year-old children's ToM was an important prerequisite for sharing towards a stranger, but was not a significant predictor of sharing behaviour towards friends. Similarly, Paulus and colleagues (2015) found that children's goal encoding at 7 months old predicted their sharing towards a disliked other at 5 years old, but not sharing with a friend.

Current Study

In sum, children modify their social behaviour according to situational context (i.e., cooperative versus competitive; e.g., Huyder, Nilsen, & Bacso, 2017), however, the impact that such contextual factors have on children's resource sharing has not been directly examined. Moreover, it is unclear whether asking children to reflect on their own or a social partner's intentions will influence their sharing behaviour within each context, as has been found with adults (Epley et al., 2006). ToM and EF have been found to facilitate children's sharing

behaviour (e.g., Takagishi et al., 2010; Paulus et al., 2015). However, these individual differences have not been examined in relation to sharing within different situational contexts. Also, studies which examined individual differences focused on one particular skill rather than exploring a number of EF skills and/or EF while controlling for ToM or vice versa. Although, there are a few instances of studies that measure both EF and ToM (e.g., Paulus et al., 2015; Cowell et al., 2015). Finally, no work to date has explored whether there are differences in the strength of relations between (socio)cognitive skills and sharing at different developmental stages.

Addressing gaps in the existing literature, the present work had a number of research objectives. The first aim was to examine whether the context (i.e., cooperative or competitive) and the degree to which children focused on their own or their social partner's perspective influenced their sharing behaviour. To meet this aim, children completed a resource allocation task wherein they were asked to decide who, between them and a (fictional) social partner, would receive items that were important to completing a task. The context varied in that they were told they would be either working on the same team with the peer or competing against the peer. Children completed this task in a condition wherein they were asked to focus on either their own goals, or the goals of their social partner. It was expected that children would share more in the cooperative context than the competitive context and that this difference between conditions would be greatest for those children who focused on the goals of their social partner. A second aim was to examine how children's determinations of fairness and predictions of their social partner's behaviour related to their sharing behaviour. Thus, children were asked to indicate what they thought was fair prior to making their resource allocations.

Due to the developmental changes that have been found in the literature (e.g., Benenson, Pascoe, & Radmore, 2007; Harbaugh et al., 2003), two age groups (i.e., preschool and school-age) of children were assessed. Past work has found that it is during the preschool years that children tend to show an awareness of fairness norms. However, this insight does not always translate to behaviour in that they continue to keep resources rather than sharing equally with others (Smith, Blake, & Harris, 2013). As they get older, children show more willingness to share with others and their behaviour demonstrates greater adherence to principles of fairness and equality. For instance, Benenson and colleagues (2007) found that 9-year-olds shared more with anonymous classmates than did 3-year-olds, and Harbaugh, Krause, and Liday (2003) found that late school-age children offered more during ultimatum games than did the younger school-age children (although House, Henrich, Brosnan, & Silk, 2012, did not find that sharing increased with age within a group of 3- to 8-year-olds). Such findings suggest that in the present study the older children would generally share more. Moreover, it was expected that while all children would show a sensitivity to equity (as per the fairness ratings), the older children relative to the younger children, would show behaviour that was more consistent with such principles.

A final goal was to explore the relations between children's ToM and EF skills in relation to their resource allocations in both contexts and to determine whether these relations differ across the developmental groups. It was expected that children with better socio-cognitive and cognitive skills would show sharing behaviour that was close to equity. However, as past work has found differing relations between (socio)cognitive skills and social behaviour (Huyder et al., 2017; Im-Bolter, Agostino, & Owens-Jaffray, 2016), it was anticipated that age may moderate the relations between children's (socio)cognitive skills and their sharing.

Method

Participants

Participants were 86 children recruited from the community in a mid-sized Canadian city. Participant data was excluded when participants had difficulty completing the social task (i.e., responded the majority of the time with "I don't know"; $n = 1$), or if they were reported to have been diagnosed with neurodevelopmental concerns ($n = 2$). The resulting sample consisted of 83 children; 40 children aged 4 – 6 years old (20 girls; $M = 59.62$ months, $SD = 5.61$) and 43 children between the ages of 7– 9 years (25 girls, $M = 94.98$ months, $SD = 7.08$). Of the parents who provided information on the open-ended question regarding their child's ethnic background ($n = 78$), 30% identified their child as Canadian (with no additional information), 63% indicated their child was Caucasian, White, or from a European background, and 15% indicated they were from a Middle Eastern, Asian, or South Asian background (with some participants listing multiple backgrounds across these general groupings). Ninety-nine percent of parents indicated that English was the predominant language spoken at home. Seventy-eight percent of mothers and 62% of fathers had a university degree or higher.

Materials and Procedure

Participants completed tasks in a laboratory setting in a standardized order (i.e., sharing task, mental state understanding tasks, inhibitory control task, working memory task) during a 30-minute session. Children received a small toy for their participation. The study was approved by the Research Ethics Committee at the University of Waterloo.

Sharing task. The design of the task was 2 (Context: cooperative versus competitive) X 2 (Perspective: self versus other), where Context was within subjects and Perspective was

between subjects. Modeled after Epley and colleagues' (Study 4, 2006) chocolate chip experiment, the experimenter informed children that they would be participating in four activities with two other children of the same gender and age who had yet to arrive at the lab. The experimenter explained that while they were waiting, they would get things set up for the games that they would be playing when the other children arrived (see Figure 1 for task set-up). In the cooperative context, the experimenter told participants that they and another child, shown in a photo, were on the same team and that if they, together, won the game against other teams, they would both win prizes (i.e., two wrapped prizes were visible to the child). To emphasize the team nature of the cooperative condition, the experimenter asked each participant to generate a team name, which the experimenter wrote on a scoreboard. In the competitive condition, the experimenter informed children that they would be playing a game against another child, shown in a photo, and that they were on different teams, competing against each other for a prize (i.e., only one wrapped prize was visible). To highlight the competitive nature of the game the experimenter wrote both the participant's and the other child's name on the scoreboard. Children completed the activities in either a self-perspective condition, where they focused on their own goals, or an other-perspective condition, where they focused on the other child's goals (described below).

There were four trials (i.e., "games"; two in each context). Each task involved children setting up a game through the allocation of game pieces. For instance, in the Tower game the experimenter told children that they would be building a tower as fast as possible and that the highest tower would win. The experimenter indicated that the children had to decide who would get to have which blocks prior to the game starting. In the Puzzle game, the experimenter told participants they would be putting together as much of a puzzle as possible, that the most

completed puzzle would win, and that they were to decide who would receive the puzzle pieces. In the Sticker game, the experimenter informed children they would be decorating a picture using stickers as fast as possible, with the picture with the most stickers winning, and that the child was to decide who would get to use which stickers. In the Bead game the experimenter explained that participants would be making a string of beads, that the longest string of beads would win, and the child was to decide who was going to use which beads. The instructions differed according to the condition in which the task was presented. For example, in the Tower game, cooperative context the experimenter said, "In this game you and X are going to be building a tower together using only these blocks as fast as possible. Right now, you will have to decide who, between you and X gets to use which blocks. After the game, I'll compare your team's tower to the other teams' towers. The tower that is the biggest will win." Whereas, in the competitive context the experimenter said, "In this game you and X are each going to be building your own tower using only these blocks as fast as possible. Right now, you will have to decide who, between you and X gets to use which blocks. After the game, I'll compare your tower to X's tower. The tower that is the biggest will win."

There were 60 items for each game (e.g., 60 beads for bead game, 60 blocks for the block game) that were visible to the child during the initial instructions. However, prior to making allocations, the experimenter provided instructions based on the perspective condition the child was in. In the self-perspective, the experimenter asked children to think about their own goals (i.e., "What would you want to happen?"). In the partner perspective condition, the experimenter asked children to think about their partner's goals (i.e., "Let's take a minute to think about X, he

(or she) might have different thoughts on what he (or she) wants to happen. What does X want to happen?").[1]

Participants then rated what was fair for them to take on a 5-point Likert scale, with pictures, from 1 (*You get all the beads and X gets none*) to 5 (*X gets all the beads and you get none),* with 3 (*You get some of the blocks and X gets some of the blocks*) in the middle (i.e., Fairness Rating). Following this rating, the experimenter provided participants with two baskets, with the location on the table held constant across all games, and asked children to decide who gets which items (i.e., Sharing Behaviour). Each basket was labeled with either the participant's name or the other child's name. After the child placed all the beads in the baskets, the experimenter asked him/her to predict what the other child would have done if he/she had been able to allocate the items (i.e., Prediction of Partner Behaviour; "If X got here first, and he/she got to choose, what do you think X would do?"). A similar scale to that of the fairness ratings was used to answer this question. Responses ranged from 1 (*X would keep all the blocks and you would get none*) to 5 (*X would keep no blocks and you would get all of them*).

Children experienced two games in one context with the same social partner and then they were "introduced" to another child and administered two other tasks in the other context. The order of contexts, as well as the order of the games within each context, was counterbalanced across the participants. After each child completed all the tasks in the study (including the ones below), the experimenter informed them that, unfortunately, the time had run out and that they would not get to play the games with the other children. However, children received a prize and had the opportunity to play a game with the experimenter instead.

[1] This question was asked to create the manipulation rather than as a measured variable. The majority of children's responses involved indicating the person being asked about (self/other) wanted to win or complete the task.

ToM tasks. The children in the younger age group completed the ToM tasks from Wellman and Liu (2004). This measure was developed to assess the sequence children typically go through when developing an understanding of the mind, and it is viewed as being a reliable measure of children's understanding of mental states (Wellman, Fang, & Peterson, 2011). The administration of the five tasks was in accordance with the original description with appropriate props for the tasks (i.e., pictures and figures). During the Diverse Desire task, which assessed children's understanding that two people may have different desires about objects, the experimenter showed children two items (carrot and cookie), asked which one they liked the best, then told them a toy figure liked the other one. The experimenter then asked which snack the character would choose to eat. To be correct, children had to indicate that the figure would choose the alternative to what they themselves would eat. The Diverse Belief task, assessing children's appreciation that individuals can hold different beliefs about a situation, involved an experimenter showing the children a picture of a garage with adjacent bushes. The experimenter then showed children a toy figure of a girl, told them that this girl had lost her cat, and asked them where they (the child) thought the cat was (i.e., in the garage or in the bushes). The experimenter then explained that the girl thought the cat was in the other location and asked where the girl would look for her cat. To be correct children needed to indicate the girl would look where she believed the cat to be, not where they thought the cat was. The Knowledge Access Task assessed children's appreciation that different people can have different knowledge. This task involved an experimenter asking children what they thought was inside a nondescript box and then showing them it was a toy dog. The experimenter then closed up the box and asked the child whether a toy girl who had not seen inside the box knew what it contained. To be correct, children had to indicate that this girl did not know the contents. The Contents False

Belief task, assessing children's understanding that a person may have a false belief, involved an experimenter showing children a Band-Aid box, asking them what they thought was inside, and then showing them that there was a small pig inside. Then children were asked to indicate what a toy boy who had not seen inside the box thought it contained. To be accurate children had to indicate that the boy thought there were Band-Aids inside the box. Finally, the Hidden Emotion task assessed children's appreciation that someone can feel something that is different to what they show. This task involved an experimenter telling the children about a boy who hid his true emotions and asking children to indicate the emotional reaction of the boy. To be accurate, children had to specify, by way of pointing to emotion faces, that on the inside the boy was feeling more negative than the look he was displaying on his face. Children received a total score based on the number of tasks that they accurately answered (i.e., with scores ranging from 0 to 5).

So as to have an age-appropriate measure of mental state understanding for the older children, a different measure that assessed more advanced mentalizing skills was required. Children's second order false belief (SOFB) understanding was assessed through stories from Coull, Leekam, and Bennett (2006), modified from original stories by Perner and Wimmer (1985) and Sullivan, Zaitchik, and Tager-Flusberg (1994). The experimenter presented stories through videos depicting puppet characters. The experimenter asked children a second-order false belief question for each story (scored out of 1) wherein, to be successful, children had to recognize that one character was incorrect in their thinking about another character's belief (i.e., that a girl who does not see a boy watch her move a toy will look in the toy's original location, and that a mother who tells her son that he is getting a toy for his birthday, and does not know the boy found the surprise birthday puppy, will think he thinks he's getting a toy). In addition,

the experimenter asked children to provide a justification of their response (scored out of 1). To be correct, this justification had to include reference to the character not knowing about another character's mental state. Given the conceptual similarity between the content and questions for each story, children's scores were summed across the two stories and thus, ranged from 0 to 4. As the measures used to assess children's mental state understanding differed for the two age groups, participants' scores were standardized within each age group.

EF tasks.

Working memory. The Digit Span subtest from the Wechsler Intelligence Scale for Children - Fourth Edition (WISC-IV; Wechsler, 2003) provided a measure of verbal working memory. Span tasks, such as this one, tend to load on working memory factors in factor analytic studies (Fournier-Vicente, Larigauderie, & Gaonac'h, 2008; Pennington, 1997). The experimenter first administered the Digit Span Forwards task, which involved reading a string of digits that participants repeated in the identical order. Then the experimenter administered the Digit Span Backwards subtest, which required that children repeat the digit string in the reverse order. Each digit span task (i.e., forward and backward) consisted of 8 items, with 2 trials per item. The task was discontinued after a child provided an incorrect response on both trials of an item. A total digit span score was calculated by adding two scores together (yielding a total possible range from 0 – 32).

Inhibitory control. Children's inhibitory control skills were assessed through the Red Dog – Blue Dog task. This Stroop-like task (modified from Beveridge, Jarrold, & Pettit, 2002; Stroop, 1935) has been used in previous studies with a sample of 4- to 5-year-olds (Bacso & Nilsen, 2017; Nilsen & Graham, 2009) and with a sample of 6- and 8-year-olds (Beveridge et al., 2002). In factor analytic studies, Stroop tasks have been found to load onto factors of inhibition

(Miyake et al., 2000). In this task, participants saw a card depicting a red dog, which they were told was named "Blue", and a card depicting a blue dog, which they were told was named "Red." Children completed two practice trials and received corrective feedback. The experimenter then showed them 28 cards depicting red and blue dogs, one at a time, at a rate of one card per second. As the cards were presented, children provided the dogs' names. To be accurate, participants were required to inhibit their natural response of saying the colour of the dog. Participants received a total score (ranging from 0 to 28) that reflected the number of accurately named dogs. Higher scores on this task reflected stronger inhibitory control.

Composite EF score. A composite was created in order to capture both EF elements and reduce the number of predictors in the regression analyses. As shown on Table 2 these measures were significantly correlated in both age groups (*p*s < .05).

Results

Preliminary Analyses

First, the data were examined for outliers. Two outliers (±3 *SD*) were revealed when analyzing the data (Red Dog/Blue Dog Task, *n* = 1; sharing behaviour, *n* = 1), and were subsequently removed from analyses. Preliminary analyses revealed no significant differences with respect to condition order (i.e., cooperative or competitive condition appearing first; *p*s > .30) or gender (*ps* > .10) for any of the dependent variables. For the EF tasks, no gender effects were found (*p*s >.23). Within the younger age group, girls outperformed their male counterparts on the ToM tasks (*p* = .03). The mean performances on children's EF and ToM tasks by age are documented in Table 1. Inspection of the data revealed relatively normal distributions for all independent and dependent variables, as the values for skewness and kurtosis fell within the

acceptable ranges (Kline, 1998). Therefore, the data remained untransformed and all remaining data points were included in the analyses.

Social Task Analyses

The first research aim was to examine the impact of context and perspective on preschool and school-age children's sharing behaviour, ratings of fairness and predictions of another's behaviour. Thus, data were analyzed in a 2 (Age Group) X 2 (Perspective) X 2 (Context) mixed design ANOVA.

Sharing behaviours. The number of items the children shared (i.e., out of 60 possible items in each task) was examined (see Figure 2). Children who were asked to consider their partner's perspective (M = 23.49, SE = 1.11) shared less compared to those who were asked to think about their own perspective (M = 26.84, SE = 1.17), $F(1, 76) = 4.32$, p =.04, η^2_p = .05. A main effect of context also emerged, wherein children shared more items in the cooperative context (M = 26.32, SE = .87) than in the competitive context (M = 24.00, SE = .89), $F(1, 76)$ = 10.71, p = .002, η^2_p = .12. The younger age group showed significantly less sharing behaviour (M = 20.82, SE = 1.15) than the older age group (M = 29.50, SE = 1.13), $F(1, 76) = 29.04$, p <.001, η^2_p = .28. There were no significant interactions, all ps > .10.

Children's sharing behaviour was examined in relation to an equal distribution (i.e., 30 items). Younger children shared significantly fewer items than chance in both the cooperative context (M = 22.67, SE = 1.77) and competitive context (M = 19.44, SE = 1.81); cooperative context: $t(38) = -4.15$, $p < .001$, d = .66; competitive context: $t(38) = -5.82$, $p < .001$, d = .93. The older children's sharing was not significantly different from an equal distribution for the cooperative condition (M = 30.05, SE = .30), p = .87. However, the older children shared

significantly less than an equal distribution when the context was competitive (M = 28.84, SE = .46), $t(40) = -2.50$, $p = .02$, $d = .39$. Thus, younger children made unequal distributions to their advantage across both contexts, whereas the older children did so only within the competitive context.

Fairness ratings. Children provided ratings as to what would be fair for them to keep on a rating scale where higher numbers reflected keeping less / distributing more. A main effect of age emerged, $F(1, 77) = 14.35$, $p < .001$, $\eta^2_p = .16$, wherein younger children reported that it would be fair for them to keep more items (M = 2.42, SE = .10) than the older children thought it fair to keep (M = 2.93, SE = .10). There was also a main effect of context, $F(1, 77) = 7.79$, p = .007, $\eta^2_p = .09$, such that in the cooperative condition, children thought it would be fair to keep fewer items (M = 2.76, SE = .07) than in the competitive condition (M = 2.59, SE = .08). There were no other significant main effects or interactions, ps > .10.

Children's ratings relative to an equal distribution (i.e., rating that it was fair for them to take half) were examined. The younger group indicated that it was fair for them to keep more than half the items in both the cooperative context (M = 2.53, SE = .13) and the competitive context (M = 2.34, SE = .16); cooperative context: $t(39) = -3.58$, $p = .001$, $d = .57$; competitive context: $t(39) = -4.21$, $p < .001$, $d = .67$. In contrast, the older group's ratings in the cooperative context did not differ from an equal distribution (M = 3.00, SE = 0.03), p = 1.00. However, they indicated that it would be fair to keep more than half for themselves in the competitive condition (M = 2.87, SE = .05), $t(40) = -2.90$, $p = .006$, $d = .45$. Thus, younger children indicated that it would be fair for them to keep more items in both contexts, but the older children only indicated this sentiment within the competitive context.

Predictions of partner's behaviour. Children indicated what they thought the other child would do if he/she had been tasked with setting up the games (on a scale where higher numbers reflecting thinking the other child will share more). There was a main effect of age in that the younger children (M = 3.29, SE = 0.11) thought that their gameplay partners would share more than the older children (M = 2.67, SE = 0.11), $F(1, 77) = 14.49$, $p < .001$, $\eta^2_p = .16$. There was a main effect of context in that children reported that the other child would share more items in when playing cooperative games (M = 3.18 SE = .08), compared to competitive games (M = 2.78, SE = .11), $F(1, 77) = 13.51$, $p < .001$, $\eta^2_p = .15$. There were no other significant main effects or interactions, ps > .15.

Compared to an equal distribution, the younger children thought that the other child would share more than half in the cooperative condition (M = 3.40, SE = .16), $t(39) = 2.51$, , p = .02, d = .40. However, they thought the other child would share roughly half in the competitive condition (M = 3.13, SE = .18), p = .50. A different pattern emerged for the older children, wherein they felt that the other child would share approximately half in the cooperative condition (M = 2.93, SE = .06), p = .21, but would share less than half in the competitive condition (M = 2.41, SE = .12), $t(40) = -4.79$, $p < .001$, d = .75. Thus, in contrast to the younger children, the older children predicted their social partner would make self-serving allocations within the competitive context, but not the cooperative context.

Relations Among the Sharing Task Measures

The second research aim was to examine how children's determinations of fairness and predictions of partner's behaviour related to their behaviour. To meet this aim, bivariate correlations were conducted between the ratings and sharing behaviour. As can be seen in Table 3, preschoolers' sharing behaviour was related to their understanding of fairness. Those children

who said it was fair to keep fewer items, which reflected a more equal distribution, tended to share more items with their partners across all contexts. This pattern was similar in the school-age group, with the exception of the cooperative, self-perspective group where this relationship did not exist. With respect to predicting their social partner's behaviour, preschool-age children who shared fewer items thought that their partner would share more, but only within the cooperative contexts. In contrast, school-age children who shared fewer items predicted that their partner would keep more for themselves, but only in the competitive context.

Relations Between (Socio)Cognitive Factors and Sharing

The third research aim was to examine the relations between EF, ToM, and children's sharing behaviour and to determine whether the strength of the relations differed across the two age groups. First, bivariate correlations were conducted between EF, ToM and children's behaviour and ratings during the Sharing Task (see Table 4). Second, regression analyses were conducted to examine unique relations between ToM and EF and sharing behaviour, as well as to determine whether age moderated such relations. The analyses were conducted on children's sharing behaviour in the cooperative and competitive context separately in the following way: age group and perspective condition were entered in the first step; a standardized mentalizing score (i.e., the z-score of the ToM task, or the SOFB score, depending on the age group) as well as the EF composite at the second step; interaction terms between ToM and age group, and EF and age group were entered at the third step. Linearity was established by visual inspection of scatterplots, and there was no indication of multicollinearity, as evidenced by tolerance values greater than 0.27. The regression analyses are presented in Table 5.

Cooperative context. As shown in Table 5, there was a significant increase in the variance explained once the interaction terms were added to the model. In particular, the

interaction between EF and age group was significant. Simple slopes analyses, shown in Figure 3, revealed that there was a statistically significant positive linear relationship between items shared in the cooperative condition and EF composite scores in younger children, β =.78, *SE* = 1.39, $p < .001$. However, there was not a statistically significant linear relationship between items shared in the cooperative condition and EF composite scores for older children, β =.001, *SE* = .956, $p = .99$.

Competitive context. Similar to the pattern in the cooperative context, at the final step, the interaction between EF and age group was significant. When the simple slopes were analyzed, it was found that there was a statistically significant positive linear relationship between items shared in the competitive condition and EF composite scores in younger children, β =.66, *SE* = 1.46, $p < .001$. However, there was not a statistically significant linear relationship between items shared in the competitive condition and EF composite scores for older children, β = -.08, *SE* = 1.01, $p = .49$ (see Figure 4).

Thus, in both contexts, age moderated the relation between EF and sharing, such that EF related to preschool-age, but not school-age, children's resource allocations.

Discussion

Children are continually faced with decisions about what, and with whom, to share. The first aim of the current study was to examine the contextual factors that influenced children's allocations. The second aim was to explore relations between children's ratings of fairness and actual behaviour. Finally, the present investigation examined relations between children's socio-cognitive skills and their sharing behaviour. Both preschool-age and school-age children were recruited for the study so as to assess for developmental differences in children's sharing

behaviour, as well as the degree to which relations between socio-cognitive skills and social behaviour may differ across development.

Influence of Contextual Factors on Sharing

With respect to the first goal, factors such as asking children to focus on their partner's goals, a competitive context, and a younger age resulted in less sharing of resources. These factors are discussed in turn below.

When asked to reflect on the goals of their partner, children shared fewer items than when they were asked to think about their own perspective. Thus, it appears that by reflecting on the interests of a social partner, children may be more aware of possible divergent interests and consequently engage in more self-serving behaviour. Such a pattern is somewhat consistent with the finding that adults engage in reactive egoism. When asked to think about the goals of a competitor, adults demonstrate more selfish behaviours in contrast to behaving more selflessly when they think about the goals of a collaborator (Epley et al., 2006). Contrary to predictions, in the current sample the impact of the perspective condition did not interact with the situational context. It may be that children, as compared to adults, hold a more biased view of social others such that divergent interests are perceived regardless of whether this is the case (i.e., competitive context) or not (i.e., cooperative context). Alternatively, it may be that the question, "What does X want to happen?" cues them to think about goals in a more dichotomous (i.e., me/them) fashion as opposed to recognizing that in the cooperative condition their partner's goals are likely similar to their own goals. Regardless, the findings are novel in that they suggest that the way in which a child is oriented to perspective prior to an interaction influences their social behaviour.

Children's sharing behaviour also differed across the two contexts, specifically, more items were shared in the cooperative context than the competitive context. Such a finding extends previous work, which has demonstrated that context impacts children's collaborative versus competitive behaviours with a peer during an interactive task (Huyder & Nilsen, 2012). What is important to consider is that in the present task children did not actually engage in games with their partner; their resource allocation was completed under the guise that the games would take place later. Thus, while past work has found that a social partner's behaviour impacts children's sharing (Hamann et al., 2011), the present work shows that the context influenced children's sharing behaviour in the absence of any input from their social partners.

Developmental differences were found in that younger children tended to share fewer items than the older children. These findings extend previous work, which has found that children show greater sharing with others as they get older (Benenson et al., 2007). Moreover, when children's sharing was compared to an equal distribution, it was found that younger children tended to share less than half of the items regardless of the context, whereas older children's sharing was not significantly different from equal within the cooperative context. Such a pattern suggests that the older children demonstrate greater adherence to principles of equality. Interestingly, within the competitive context, the older children, like the younger children, shared less than half of the items. This suggests that their adherence to fairness may be trumped by self-interest in winning. Though, it is important to note that there was not a significant interaction between age and context. In sum, while young children understand or expect fair division of resources between two parties, they have difficulty enacting these principles before the age of 7-8 years (Smith et al., 2013) and continue to distribute objects in a manner that benefits their self-interests (Damon, 1975; 1980). This departure from equality is particularly notable when sharing

is costly (Paulus, 2014), such as when objects are already in their possession (versus being communal; Ulber, Hamann, & Tomasello, 2015), or, as in the current study, when winning is at stake.

Ratings of Fairness and Partners' Behaviour

Similar to children's sharing behaviour, children's ratings of fairness differed across the two contexts. Although fairness is something that should be consistent across contexts, the situation did influence children's judgments. That is, they felt that it was fair for them to keep more items in a competitive context versus a cooperative context. In addition, younger children reported that it was fair for them to keep more items than did the older children. Notably, past work has found that children as young as 3 years old are aware of principles of fairness (e.g., as demonstrated through emotional reactions to inequality; DeJesus, Rhodes, & Kinzler, 2014). Therefore, it is interesting to note that in the present study, young children's acknowledgement of the principle that "equal = fair" was not always evidenced in their fairness ratings. This finding is in contrast to that of Wittig, Jensen and Tomasello (2013), where 5-year-olds demonstrated this awareness. It may have been the case that children's ratings of fairness were impacted by their goals for the tasks. Certainly, there was a positive relationship between what the children reported would be a fair distribution and what they actually shared. Moreover, for the younger children, there was a positive relationship between their actions and what they predicted their partner would do within a cooperative context. When younger children shared less, they predicted their partner would have given them more. It may be that they were trying to justify their own behaviour by indicating that it was what their partner would have also done. That is, this is what collaboration might have looked like to them, namely, another person giving them the items they wanted. In contrast, for the older group within the competitive context, there

was a pattern such that children who shared less predicted that their partner would have shared less. Thus, this older group demonstrated a pattern more similar to that of adults, wherein thoughts that a competitor would engage in less sharing related to more selfish behaviours (Epley et al., 2006).

Skills Associated with Sharing

The third aim of this research was to examine the degree to which children's mentalizing ability and EF related to their sharing behaviour. Different relations were found in the two age groups wherein for the younger age group ToM, working memory, and inhibitory control skills correlated with sharing behaviour; children with more proficient skills shared more items in both contexts. This was not the case for the older group where sharing behaviour did not significantly relate to individual differences in (socio)cognitive skills. When unique relations were examined in the context of regression analyses, it was found that age moderated the relationship between EF and sharing behaviour in both situational contexts. Whereas younger children's EF uniquely predicted their sharing behaviour, this was not the case for the older group.

The finding that EF was important for the young children's sharing in both contexts is novel given that past work has examined the role of EF within only one context. It may be the case that 4 to 6 year old children with better EF are generally better able to hold in mind the rules of equality and inhibit urges to hold on to resources for themselves, thereby showing greater social competence. Such an interpretation is consistent with past work which suggests that an important mechanism in the development of sharing behaviour is self-control, as per the finding that toddlers' inhibitory control predicts sharing behaviour approximately three years later (Paulus et al., 2015). However, it could also be the case that EF plays a different role within each context, albeit one that ends up with the same behaviour. For instance, it is plausible that better

EF within a cooperative context allows a child to align their behaviour with that of another in a more sophisticated way. That is, they are able to generate behaviours that maximize team success (i.e., a more equal distribution). Indeed, within other cooperative contexts children with better EF show more collaborative behaviours (Huyder & Nilsen, 2012; Huyder et al., 2017). In contrast, within a competitive context, children with better EF may be better able to play a competitive game in a way that is in keeping with rules of equality (i.e., understanding that to win fairly, games involve players starting at the same place).

Consistent with previous work, ToM correlated with young children's sharing behaviour (e.g., Takagishi et al., 2010; Wu & Su, 2014). This was the case even within the competitive context, which could have yielded less sharing behaviour because of a greater awareness of a social partners divergent interests leading to greater competitive gameplay (e.g., Priewassler et al., 2013). Certainly, past work has found that preschoolers who pass a false belief task tended to share less in a dictator game (Cowell et al., 2015). Instead, it seems that greater mentalizing ability for the younger group seemed to increase awareness about the importance of starting games with an equal playing field, potentially because they have appreciation of the mutually accepted rules of competition (Schmidt, Hardecker, & Tomasello, 2016). However, it should be noted that once the influence of other factors was controlled, ToM did not emerge as a unique predictor of children's sharing (similar to Paulus et al., 2015). Thus, while ToM allows children to appreciate fairness, it is the unique contribution of EF that relates to preschool-age children's production of behaviour that is consistent with such principles.

It is interesting to contemplate why the older children's mentalizing and EF did not relate to their sharing behaviour. It is possible that the older children's behaviour was more strictly guided by fairness rules, such that individual differences in cognitive skills had less of an

influence. That is, it may be that a certain level of EF allows for children to behave according to principles of fairness, but beyond that point, better EF does provide an added benefit. It could also be that children are utilizing different skills at different developmental periods (potentially due to the different rate by which cognitive skills develop; Best, Miller, & Jones, 2009). For instance, different relations have been found between children's planning skills and their behaviour during a collaborative task for 5- to 8-year-olds versus 9- to 12-year-olds (Huyder et al., 2017). Together with the current study, these findings suggest that when speaking to the importance of underlying skills for social behaviour, the developmental stage needs to be considered.

When attempting to put resources in place to improve social and academic outcomes for children, an understanding of the relevant risk and protective factors is imperative. There are robust relations between children's early prosocial behaviour (including sharing) and later academic skills and social status, even when controlling for early academic abilities (Caprara et al., 2000). The mechanism behind such relations is thought to be through the influence that prosocial behaviour has on reducing behavioural problems and vulnerability to depression (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Bandura, Pastorelli, Babaranelli, & Caprara, 1999). Such findings have led to a call for investing in resources to promote early prosocial behaviour. However, the development of an effective program rests on a clear understanding of the contextual and social factors that influence prosocial behaviours (i.e., what is appropriate in which given context), as well as the socio-cognitive skills that facilitate such behaviour, as presented here. For instance, current findings suggest that training in prosocial skills may also target the improvement of EF skills, but that this would be most pertinent for programs at the preschool level. Moreover, an understanding of the underlying skills allows educators to

appreciate who might be at risk for less developed social behaviour, for instance, those with weaker EF.

Limitations and Future Directions

While this work provides input into the various factors that influence children's sharing behaviour, it is not without its limitations. First, the context manipulation was within-subject, which may have had some carry-over effects. To attempt to minimize this, the procedure involved different social partners for each context (i.e., different children as identified by pictures and names). Moreover, data were examined to assess for order effects, with none detected. Related, children provided their fairness ratings prior to making their resource allocations. This sequence of activities may have influenced children's sharing behaviour, for instance, being reminded of fairness may have led to behaviour that was more consistent with equity principles. However, despite this order, findings revealed an impact of context and perspective. Thus, children indicating what was fair to do did not remove the influence of other contextual factors. Third, it may have been the case that children were aware that the procedures, including social partners, were a ruse, which could have influenced their behaviour. Nevertheless, the behaviour of the children suggested this was generally not the case. That is, they often showed disappointment in not being able to play the games with the other children. Fourth, due to attempts to keep the time frame manageable for younger children, the procedures involved only two aspects of EF. While the tasks used capture the main components of EF within a young population (e.g., Müller & Kerns, 2015), it would be beneficial for future work to include additional components of EF, such as planning or cognitive flexibility which have also been found to relate to children's social and communicative behaviour (e.g., Huyder et al., 2017; Bacso & Nilsen, 2017). Fifth, the majority of our sample was comprised of children whose

parents indicated they were Caucasian, White, or from a European background. Given this, the degree to which results generalize to other cultural/ethnic backgrounds is unknown. Certainly, culture plays a role in children's (socio)cognitive and sharing behaviour (e.g., Rao & Stewart, 1999; Sabbagh, Xu, Carlson, Moses, & Lee, 2006). Finally, as noted above, we were interested in children's behaviour in the absence of feedback from social partners. It would be of interest to continue this line of work by assessing whether the impact of context on children's sharing behaviour changes as a function of the type of interactions they witness from their social partner (as per Martin & Olson, 2015). For instance, it may be that children are more willing to share resources in a competitive context if they receive friendly overtures from their social partner.

Conclusion

Together, this work demonstrates that children's judgments of fairness and sharing behaviour are impacted by context as well as developmental stage. Results replicate past work showing that children become more equal in their distributions as they get older (Benenson et al., 2007). However, they also show that when in a competitive context, children's resource allocations become more selfish. Thus, motivation to win appears to trump adherence to principles of equality, at least within this age range. Past work has shown that the degree to which adults consider the goals of their social partner influences their behaviour (Epley et al., 2006). The present findings build on this by demonstrating that greater attention to the intentions of their partner led to less sharing with that person. Thus, the role of perspective-taking may be twofold. That is, while it may enable children to appreciate rules of fairness, as per studies examining individual differences in ToM (Takagishi et al., 2010), it may also serve to highlight potentially divergent interests of others, thereby leading to more selfish behaviours (Priewassler et al., 2013). Adding to previous work demonstrating the importance of EF for other social

behaviour, such as collaborating with peers (Ciairano et al., 2007; Huyder & Nilsen, 2012), this work highlights the importance that EF has for preschool-age children's sharing behaviour. That is, even when controlling for their mentalizing skills, preschool-age (but not school-age) children with more proficient EF allocated resources that created distributions closer to equal across both cooperative and competitive context. Together this work has implications for theories of the development of children's sharing as well as applied relevance understanding and promoting children's prosocial behaviour within various social contexts.

References

Ashiabi, G. S. (2007). Play in the preschool classroom: Its socioemotional significance and the teacher's role in play. *Early Childhood Education Journal, 35*, 199–207.

Bacso, S. A., & Nilsen, E. S. (2017). What's that you're saying? Children with better executive functioning produce and repair communication more effectively. *Journal of Cognition and Development, 18*, 441-464.

Bandura, A., Barbaranelli, C., Caprara, G. V., & Pastorelli, C. (1996). Multifaceted impact of self-efficacy beliefs on academic functioning. *Child Development, 67*, 1206-1222.

Bandura, A., Pastorelli, C., Barbaranelli, C., & Caprara, G. V. (1999). Self-efficacy pathways to childhood depression. *Journal of Personality and Social Psychology, 76*, 258-269.

Benenson, J. F., Pascoe, J., & Radmore, N. (2007). Children's altruistic behavior in the dictator game. *Evolution and Human Behavior, 28*, 168-175.

Best, J. R., Miller, P. H., & Jones, L. L. (2009). Executive functions after age 5: Changes and correlates. *Developmental Review, 29*, 180–200.

Beveridge, M., Jarrold, C., & Pettit, E. (2002). An experimental approach to executive fingerprinting in young children. *Infant and Child Development, 11*, 107-123.

Bosacki, S., & Astington, J.W. (1999). Theory of Mind in preadolescence: Relations between social understanding and social competence. *Social Development, 8*, 237-255.

Brownell, C. A., Iesue, S. S., Nichols, S. R., & Svetlova, M. (2013). Mine or yours? Development of sharing in toddlers in relation to ownership understanding. *Child Development, 84*, 906-920.

Brownell, C. A., Svetlova, M., & Nichols, S. (2009). To share or not to share: When do toddlers respond to another's needs? *Infancy, 14*, 117–130.

Caprara, G. V., Barbaranelli, C., Pastorelli, C., Bandura, A., & Zimbardo, P. G. (2000). Prosocial foundations of children's academic achievement. *Psychological Science, 11*, 302-306.

Carlson, S. M. (2005). Developmentally sensitive measures of executive function in preschool children. *Developmental Neuropsychology, 28*, 595-616.

Ciairano, S., Visu-Petra, L., & Settanni, M. (2007). Executive inhibitory control and cooperative behavior during early school years: A follow-up study. *Journal of Abnormal Child Psychology, 35*, 335-345.

Coull, G. J., Leekam, S. R., & Bennett, M. (2006). Simplifying second-order belief attribution: What facilitates children's performance on measures of conceptual understanding? *Social Development, 15*, 548-563.

Cowell, J., Samek, A., List, J., & Decety, J. (2015). The curious relation between theory of mind and sharing in preschool age children. *PLoS ONE, 10*.

Damon, W. (1975). Early conceptions of positive justice as related to the development of logical operations. *Child Development, 46*, 301-312.

Damon, W. (1980). Patterns of change in children's social reasoning: A two-year longitudinal study. *Child Development, 51*, 1010-1017.

Decety, J., Jackson, P. L., Sommerville, J. A., Chaminade, T., & Meltzoff, A. N. (2004). The neural bases of cooperation and competition: An fMRI investigation. *Neuroimage, 23*, 744-751.

Decety, J., & Svetlova, M. (2012). Putting together phylogenetic and ontogenetic perspectives on empathy. *Developmental Cognitive Neuroscience, 2*, 1-24.

DeJesus, J. M., Rhodes, M., & Kinzler, K. D. (2014). Evaluations versus expectations: Children's divergent beliefs about resource distribution. *Cognitive Science, 38*, 178-193.

Dunfield, K., Kuhlmeier, V. A., O'Connell, L., & Kelley, E. (2011). Examining the diversity of prosocial behavior: Helping, sharing and comforting in infancy. *Infancy, 16,* 227-247.

Eisenberg, N., Fabes, R. A., Karbon, M., Murphy, B., C., Wosinski, M., Polazzi, L., … Juhnke, C. (1996). The relations of children's dispositional prosocial behavior to emotionality, regulation, and social functioning. *Child Development, 67,* 974-992.

Epley, N., Caruso, E., & Bazerman, M. H. (2006). When perspective taking increases taking: Reactive egoism in social interaction. *Journal of Personality and Social Psychology, 91,* 872-889.

Fehr, E., Bernhard, H., & Rockenbach, B. (2008). Egalitarianism in young children. *Nature, 454,* 1079-1083.

Fehr, E., Glätzle-Rützler, D., & Sutter, M. (2013). The development of egalitarianism, altruism, spite and parochialism in childhood and adolescence. *European Economic Review, 64,* 369-383.

Fournier-Vicente, S., Larigauderie, P., & Gaonac'h, D. (2008). More dissociations and interactions within central executive functioning: A comprehensive latent-variable analysis. *Acta Psychologica, 129,* 32-48.

Giannotta, F., Burk, W. J., & Ciairano, S. (2011). The role of inhibitory control in children's cooperative behaviors during a structured puzzle task. *Journal of Experimental Child Psychology, 110,* 287-298.

Grueneisen, S., Wyman, E., & Tomasello, M. (2015). "I know you don't know I know…" Children use second-order false-belief reasoning for peer coordination. *Child Development, 86,* 287-293.

Hamann, K., Warneken, F., Greenberg, J. R., & Tomasello, M. (2011). Collaboration encourages equal sharing in children but not in chimpanzees. *Nature, 476*, 328-331.

Harbaugh, W. T., Krause, K., & Liday, S. J. (2003). *Bargaining by children.* University of Oregon Economics Working Paper (No. 2002-4). Available at SSRN: https://ssrn.com/abstract=436504.

House, B. R., Henrich, J., Brosnan, S. F., & Silk, J. B. (2012). The ontogeny of human prosociality: Behavioral experiments with children aged 3 to 8. *Evolution and Human Behavior*, *33*, 291-308.

Hughes, C. (1998). Finding your marbles: Does preschoolers' strategic behavior predict later understanding of mind? *Developmental Psychology, 34*, 1326-1339.

Hughes, C. (2011). *Social understanding and social lives: From toddlerhood through to the transition to school*. East Sussex, UK: Psychology Press.

Hughes, C., Fujisawa, K. K., Ensor, R., Lecce, S., & Marfleet, R. (2006). Cooperation and conversations about the mind: A study of individual differences in 2-year-olds and their siblings. *British Journal of Developmental Psychology, 24*, 53-72.

Hughes, C., & Leekam, S. (2004). What are the links between theory of mind and social relations? Review, reflections and new directions for studies of typical and atypical development. *Social Development, 13*, 590-619.

Huyder, V., & Nilsen, E. S. (2012). A dyadic data analysis of executive functioning and children's socially competent behaviours. *Journal of Applied Developmental Psychology, 33*, 197-208.

Huyder, V., Nilsen, E. S., & Bacso, S. A. (2017). The relationship between children's executive functioning, theory of mind, and verbal skills with their own and others' behaviour in a

cooperative context: Changes in relations from early to middle school-age. *Infant and Child Development*. Advance online publication. doi:10.1002/icd.2027.

Im-Bolter, N., Agostino, A., & Owens-Jaffray, K. (2016). Theory of mind in middle childhood and early adolescence: Different from before? *Journal of Experimental Child Psychology, 149*, 98–115.

Kline, R. B. (1998). *Principles and Practice of Structural Equation Modeling,* New York, NY: Guilford Press.

Li, L., Rizzo, M. T., Burkholder, A. R., & Killen, M. (2017). Theory of mind and resource allocation in the context of hidden inequality. *Cognitive Development, 43,* 25-36.

Liberman, Z., & Shaw, A. (2017). Children use partial resource sharing as a cue to friendship. *Journal of Experimental Child Psychology, 159,* 96-109.

Martin, A., & Olson, K. R. (2015). Beyond good and evil: What motivations underlie children's prosocial behavior? *Perspectives on Psychological Science, 10*, 159-175.

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology*, *41*, 49-100.

Müller, U., & Kerns, K. (2015). The development of executive function. In L. Liben & U. Müller (Eds.), *Handbook of child psychology and developmental science* (pp. 1-53). Hoboken, NJ: Wiley.

Nigg, J. T., Quamma, J. P., Greenberg, M. T., & Kusche, C. A. (1999). A two-year longitudinal study of neuropsychological and cognitive performance in relation to behavioral problems and competencies in elementary school children. *Journal of Abnormal Child Psychology*, *27*, 51-63.

Nilsen, E. S., & Fecica, A. M. (2011). A model of communicative perspective-taking for typical and atypical populations of children. *Developmental Review*, *31*, 55-78.

Nilsen, E. S., & Graham, S. A., (2009). The relations between children's communicative perspective-taking and executive functioning. *Cognitive Psychology*, *58*, 220-249.

Paulus, M. (2014). The emergence of prosocial behavior: Why do infants and toddlers help, comfort, and share? *Child Development Perspectives*, *8*, 77-81.

Paulus, M., Licata, M., Kristen, S., Thoermer, C., Woodward, A., & Sodian, B. (2015). Social understanding and self-regulation predict pre-schoolers' sharing with friends and disliked peers: A longitudinal study. *International Journal of Behavioral Development*, *39*, 53-64.

Paulus, M., & Moore, C. (2012). Producing and understanding prosocial actions in early childhood. *Advances in Child Development and Behavior*, *42*, 271–305.

Pennington, B. F. (1997). Dimensions of executive functions in normal and abnormal development. In N. A. Krasnegor, G. R. Lyon, & P. S. Goldman-Rakic (Eds.), *Development of the prefrontal cortex: Evolution, neurobiology, and behavior* (pp. 265-281). Baltimore, MD: Paul H Brookes Publishing.

Pennington, B. F., & Ozonoff, S. (1996). Executive functions and developmental psychopathology. *Journal of Child Psychology and Psychiatry*, *37*, 51-87.

Perner, J., & Wimmer, H. (1985). "John thinks that Mary thinks that…" attribution of second-order beliefs by 5-to 10-year-old children. *Journal of Experimental Child Psychology*, *39*, 437-471.

Priewassler, B., Roessler, J., & Perner, J. (2013). Competition as rational action: Why young children cannot appreciate competitive games. *Journal of Experimental Child Psychology*, *116*, 545-559.

Rao, N., & Stewart, S. M. (1999). Cultural influences on sharer and recipient behavior: Sharing in Chinese and Indian preschool children. *Journal of Cross-Cultural Psychology, 30*, 219-241.

Razza, R. A., & Blair, C. (2009). Associations among false-belief understanding, executive function, and social competence: A longitudinal analysis. *Journal of Applied Developmental Psychology, 30*, 332-343.

Rheingold, H. L. (1982). Little children's participation in the work of adults, a nascent prosocial behavior. *Child Development, 53*, 114-125.

Riggs, N. R., Jahromi, L. B., Razza, R. P., Dilworth-Bart, J. E., & Müller, U. (2006). Executive function and the promotion of social-emotional competence. *Journal of Applied Developmental Psychology, 27*, 300-309.

Rochat, P., Dias, M. D. G., Liping, G., Broesch, T., Passos-Ferreira, C., Winning, A., & Berg, B. (2009). Fairness in distributive justice by 3- and 5-year-olds across seven cultures. *Journal of Cross-Cultural Psychology, 40*, 416-442.

Sabbagh, M. A. (2004). Recognizing and reasoning about mental states: Understanding orbitofrontal contributions to theory of mind and autism. *Brain and Cognition, 55*, 209-219.

Sabbagh, M. A., Xu, F., & Carlson, M., Moses, L. J., & Lee, K. (2006). The development of executive functioning and theory of mind: A comparison of Chinese and U.S. preschoolers. *Psychological Science, 17*, 74-81.

Sally, D., & Hill, E. (2006). The development of interpersonal strategy: Autism, theory-of-mind, cooperation and fairness. *Journal of Economic Psychology, 27*, 73-97.

Schmidt, M. F. H., Hardecker, S., & Tomasello, M. (2016). Preschoolers understand the normativity of cooperatively structured competition. *Journal of Experimental Child Psychology, 143,* 34-47.

Smith, C. E., Blake, P. R., & Harris, P. L. (2013). I should but I won't: Why young children endorse norms of fair sharing but do not follow them. *PLoS ONE, 8,* e59510.

Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology, 18,* 643-662.

Sullivan, K., Zaitchik, D., & Tager-Flusberg, H. (1994). Preschoolers can attribute second-order beliefs. *Developmental Psychology, 30,* 395-402.

Takagishi, H., Kameshima, S., Schug, J., Koizumi, M., & Yamagishi, T. (2010). Theory of mind enhances preference for fairness. *Journal of Experimental Child Psychology, 105,* 130-137.

Ulber, J., Hamann, K., & Tomasello, M. (2015). How 18-and 24-month-old peers divide resources among themselves. *Journal of Experimental Child Psychology, 140,* 228-244.

Warneken, F., & Tomasello, M. (2006). Altruistic helping in human infants and young chimpanzees. *Science, 311,* 1301-1303.

Wechsler, D. (2003). *Wechsler intelligence scale for children* (4th ed.). San Antonio, TX: Psychological Corporation.

Wellman, H. M., Fang, F., & Peterson, C. C. (2011). Sequential progressions in a theory-of-mind scale: Longitudinal perspectives. *Child Development, 82,* 780-792.

Wellman, H. M., & Liu, D. (2004). Scaling of theory-of-mind tasks. *Child Development, 75,* 523-541.

Wittig, M., Jensen, K., & Tomasello, M. (2013). Five-year-olds understand fair as equal in a mini-ultimatum game. *Journal of Experimental Child Psychology, 116,* 324-337.

Wu, Z., & Su, Y. (2014). How do preschoolers' sharing behaviors relate to their theory of mind understanding? *Journal of Experimental Child Psychology, 120,* 73-86.

Yu, J., Zhu, L., & Leslie, A. M., (2016). Children's sharing behavior in mini-dictator games: The role of in-group favoritism and theory of mind. *Child Development, 87,* 1747-1757.

Table 1

Descriptive Statistics for EF and ToM Measures for Both Age Groups

	4- to 6-year-olds				7- to 9-year-olds			
Variable	*M*	*SD*	Minimum	Maximum	*M*	*SD*	Minimum	Maximum
Digit Span	7.85	3.38	2	14	15.03	2.76	10	22
Red Dog/Blue Dog	18.10	8.84	0	28	25.08	2.58	17	28
Theory of Mind (ToM)	5.14	1.79	1	7	-	-	-	-
Second Order False Belief (SOFB)	-	-	-	-	2.73	1.11	0	4

Table 2

Bivariate Correlations Between Age, EF, ToM for Both Age Groups

	4- to 6-year-olds			7- to 9-year-olds		
Variable	ToM	Digit Span	Red/Blue	SOFB	Digit Span	Red/Blue
Age	.24	.43*	.26	.08	.19	.41*
ToM / SOFB	-	.50**	.38*	-	.14	.01
Digit Span	-	-	.38*	-	-	.42**

Note. * $p < .05$. ** $p < .01$.

Table 3

Bivariate Correlations Between Children's Sharing Behaviour and Ratings of Fairness and Prediction of Partner's Behaviour

		4- to 6-year-olds				7- to 9-year-olds			
		Cooperative Context		Competitive Context		Cooperative Context		Competitive Context	
Perspective	Condition	Fairness	Prediction	Fairness	Prediction	Fairness	Prediction	Fairness	Prediction
Self	Sharing Cooperative	.66**	-.63**			.18	-.08		
	Sharing Competitive			.67**	-.15			.65**	.34
Other	Sharing Cooperative	.57*	-.34			.51*	-.01		
	Sharing Competitive			.65**	-.17			.80**	.44*

Note. * $p < .05$. ** $p < .01$.

Table 4

Bivariate Correlations Between EF, ToM, and Sharing Task Variables for Both Age Groups

		4- to 6-year-olds				7- to 9-year-olds			
Condition	Variable	ToM	Digit Span	Red/ Blue	Age	SOFB	Digit Span	Red/ Blue	Age
Cooperative	Sharing	.38*	.46**	.55**	.47**	-.07	.05	.16	.03
	Fairness	.23	.31	.40*	.47**	.00	.20	.00	-.08
	Predictions	-.51**	-.31	-.33	-.27	-.12	-.07	.10	.23
Competitive	Sharing	.42*	.55**	.48**	.42**	-.11	-.19	.21	.09
	Fairness	.43**	.36*	.55**	.41**	.12	-.20	-.02	.14
	Predictions	-.41*	-.41*	-.32	-.06	.04	-.29	.19	.19

Note. * $p < .05$. ** $p < .01$.

Table 5

Summary of Regression Analyses Exploring the Role of ToM and EF in Children's Sharing Behaviour Within Both Cooperative and Competitive Contexts

	Cooperative Context						Competitive Context					
	Step 1		Step 2		Step 3		Step 1		Step 2		Step 3	
Predictors	β	*SE*	β	*SE*	β	*SE*	β	*SE*	β	*SE*	β	*SE*
Age Group	.45***	1.68	.45***	1.56	.44***	1.40	.53***	1.76	.54***	1.66	.53***	1.48
Perspective	-.19	1.68	-.16	1.66	-.07	1.53	-.23*	1.76	-.23*	1.76	-.14	1.62
ToM			.17	.87	.11	1.24			.20	.92	.18	1.31
EF			.27*	.89	.78***	1.40			.18	.94	.66***	1.46
ToMxAge Group					-.07	1.60					-.12	1.68
EFxAge Group					-.60***	1.66					-.57***	1.75
Equation R^2	.21**		.34***		.48***		.30***		.40***		.54***	
ΔR^2			.13***		.15***				.10**		.14***	

Note. Beta values are standardized regression coefficients.

* $p < .05$. ** $p < .01$. *** $p < .001$.

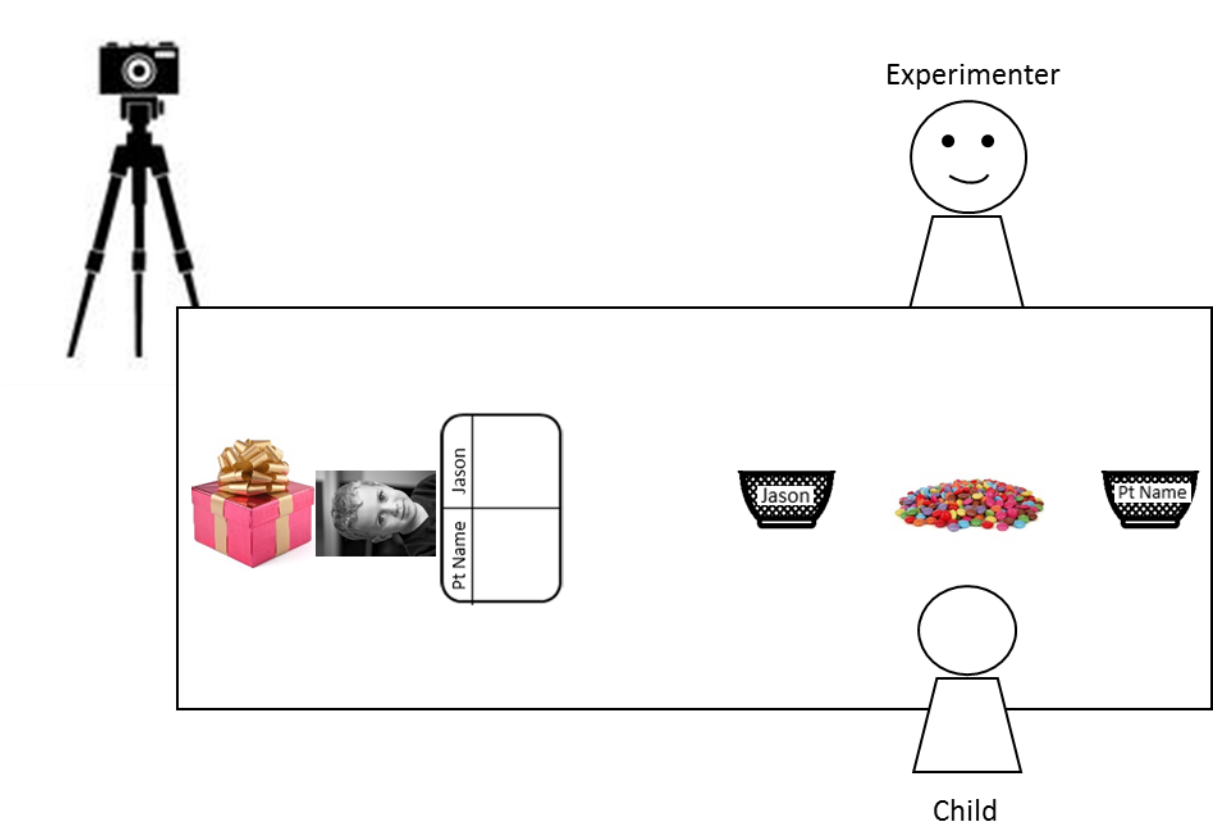

Figure 1. Example of sharing task set-up (competitive context).

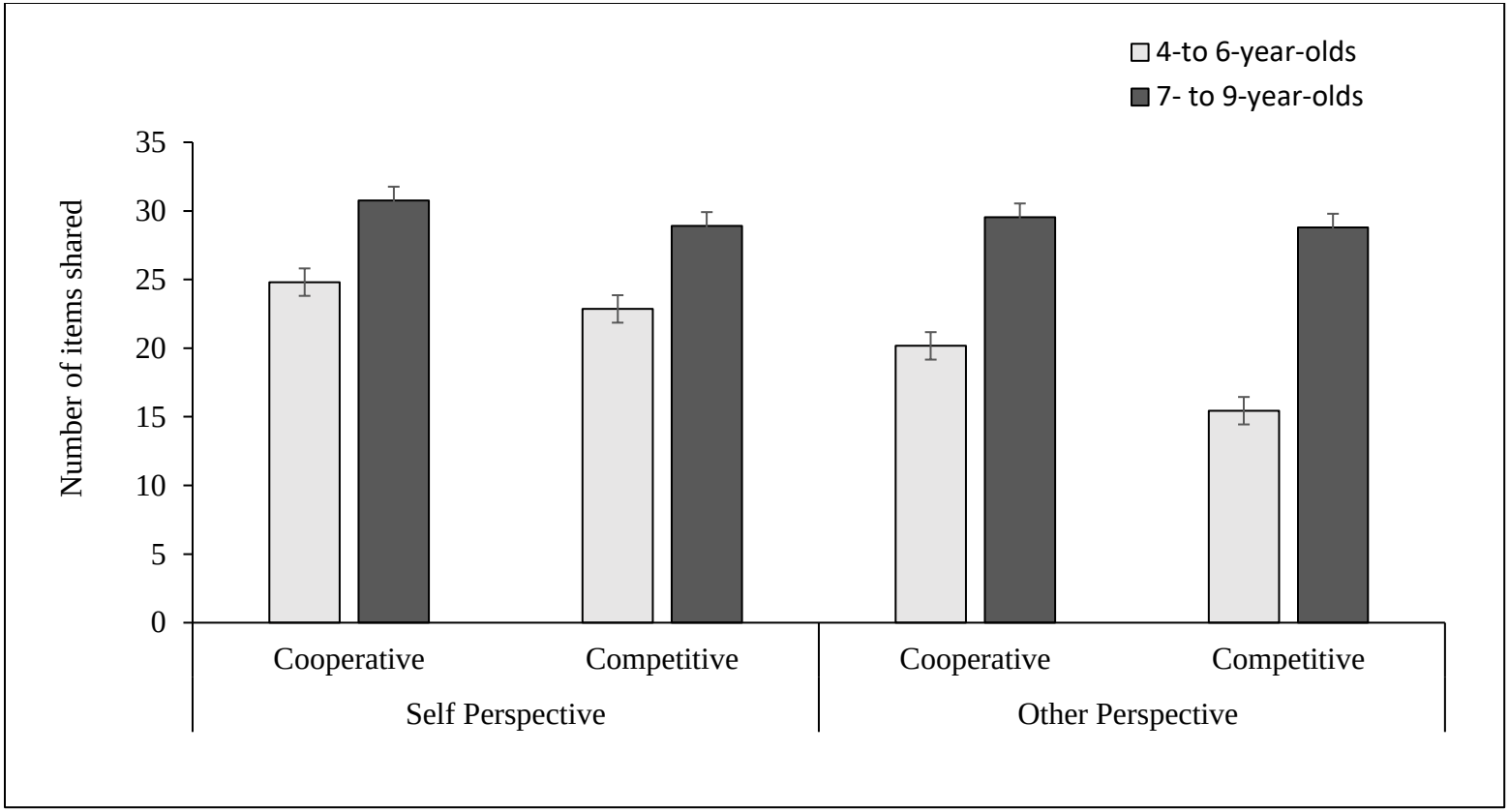

Figure 2. Children's sharing behaviour across context and perspective conditions.

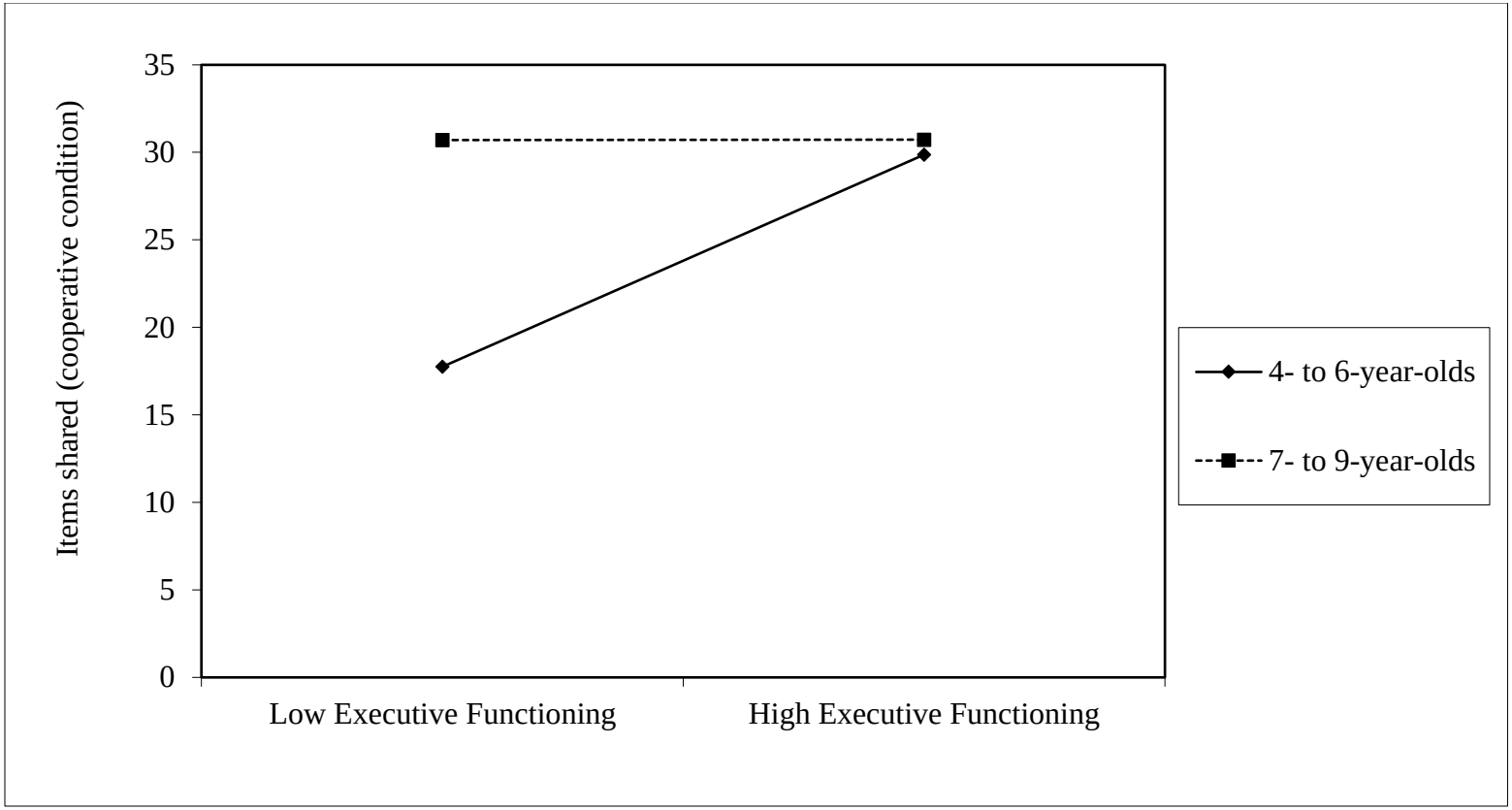

Figure 3. Sharing behaviour in the cooperative condition by EF and age group.

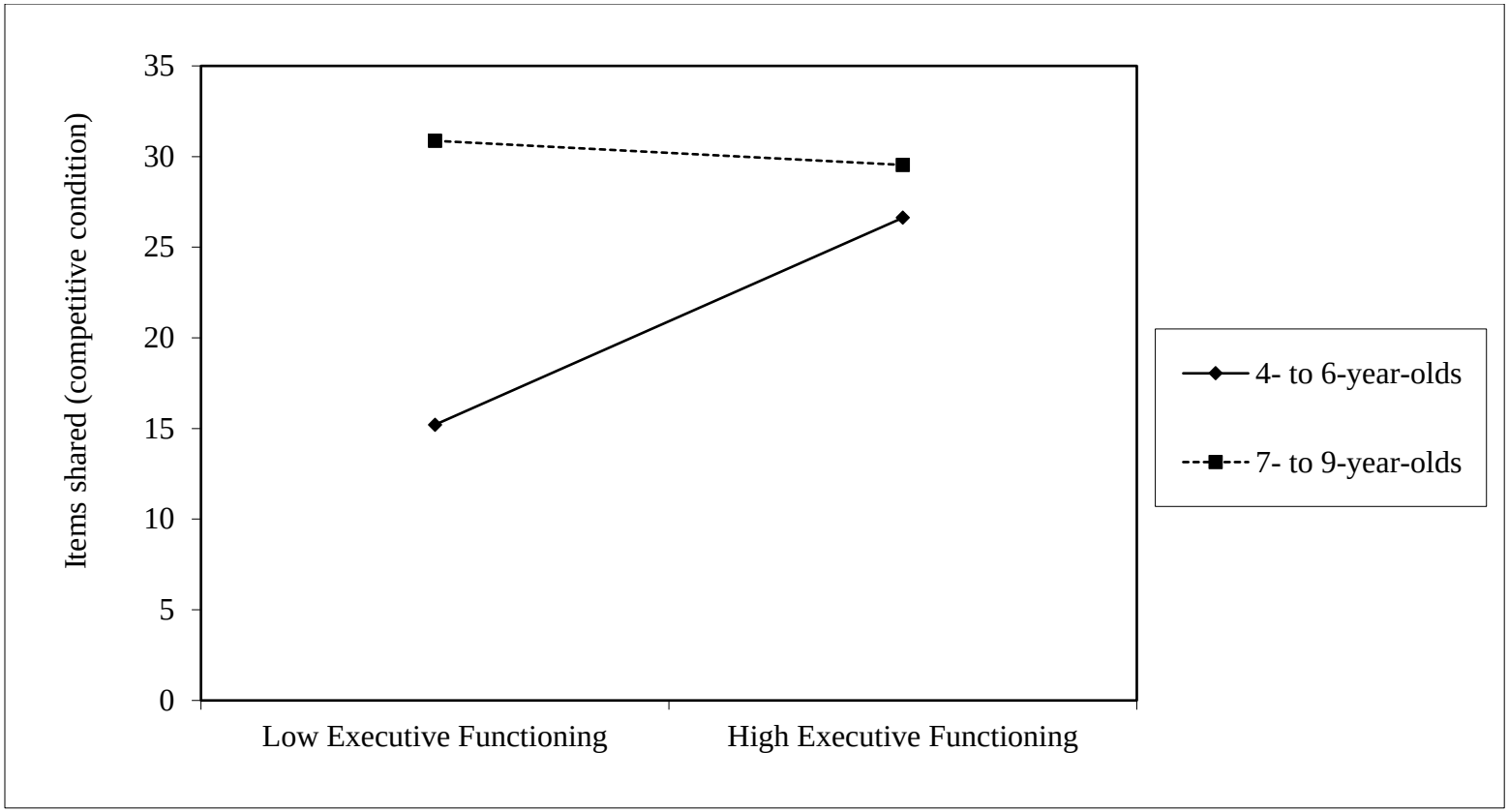

Figure 4. Sharing behaviour in the competitive condition by EF and age group.