Young children's prosocial responses towards peers and adults in two social contexts

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From very early in life, children show a variety of positive, other-oriented social behaviors: They pick up dropped objects for strangers, they comfort others in distress, they share toys and rewards with each other, and understand the commitment of a joint task and stick to it (e.g., Brownell, Svetlova, & Nichols, 2009; Gräfenhain, Behne, Carpenter, & Tomasello, 2009; Warneken & Tomasello, 2006; Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). Each of these behaviors describes so-called prosocial behavior (Grusec, 2002), a voluntary, intentional action to yield a beneficial outcome for the other. Based on both observational and experimental research over the past several decades, the clear findings are that prosocial behaviors emerge within the first two years of life and they can take a variety of forms (e.g. Paulus & Moore, 2012). The two most widely studied prosocial behaviors are helping, where the social response is based on action (benefiting others by providing a certain service), and sharing, where the social response is based on resource distribution (benefiting others by providing own goods).

Helping is one of the earliest and most common prosocial behaviors (Warneken & Tomasello, 2006), with research suggesting that children show helping behavior at home from around their first birthday (Dahl, 2015) and help a stranger in an experimental setting as young as 14 months of age (Warneken & Tomasello, 2007). Importantly, they do the latter in the absence of any rewards or parental encouragement and even if helping involves a cost (Warneken, Hare, Melis, Hanus, & Tomasello, 2007; Warneken & Tomasello, 2013). The developmental trajectory of children's helping behavior goes hand in hand with an increasing engagement in and understanding of cooperative activities. Although already preverbal infants engage in simple joint actions (e.g., Eckerman & Peterman, 2001; Ross, 1982), children become increasingly cooperative in the course of their second year and beyond. This includes successfully engaging in joint activities with complementary or parallel roles (Warneken, Chen, & Tomasello, 2006), coordinating their actions with social partners around a common goal (e.g., Ashley & Tomasello, 1998; Brownell, Ramani, & Zervas, 2006; Warneken & Tomasello, 2007), and acknowledging the joint intentions behind a social, cooperative activity (Warneken, Gräfenhain, & Tomasello, 2012). Finally, it is usually around three years of age that children recognize that collaborative activities come with certain obligations like preserving the joint commitment inherent in a mutual task, for instance by refusing to take leave from a joint task or collaborating until everyone has reached their final goal (Gräfenhain et al., 2009; Gräfenhain, Carpenter, & Tomasello, 2013; Hamann, Warneken, & Tomasello, 2012).

In contrast to their early and spontaneous helping behavior young children are more

reluctant to engage in sharing. Although infants sometimes spontaneously offer food and/or toys to parents and familiar others between 8 and 12 months of age (Hay, 1979; Hay & Murray, 1982; Rheingold, Hay, & West, 1976), in experimental settings, children do not share food with another person before the end of the second year of life (and only when the potential recipient vocalises a desire for it; Brownell et al., 2009). Sharing a windfall of resources in so-called dictator game scenarios is especially challenging for younger children and usually does not happen frequently before they reach school age (Kogut, 2012; Smith, Blake, & Harris, 2013), questioning the validity of these types of experimental tasks. To address this issue developmental scientists are calling for more naturalistic settings and experiments to capture and study children's ecological behavior (see Dahl, 2017). In line with this rationale, when sharing tasks are framed within in a collaborative and therefore more realistic setting (e.g. sharing the rewards with a partner after mutual efforts instead of handing over an unexpected windfall gain), however, children as young as two years of age often divide resources equally with others (Blake, McAuliffe & Warneken, 2014; Hamann, Warneken, Greenberg & Tomasello, 2011; Ulber, Hamann, & Tomasello, 2015; 2017). A plausible reason for this is thought to lie in the evolutionary roots of humans' collaborative foraging and subsequent mutual sharing of the spoils (as argued by e.g., Tomasello, 2009; Tomasello, Melis, Tennie, Wyman, & Hermann, 2012).

While most studies have looked at developmental timing, underlying motivation or contributing factors of these early social skills (e.g., Hepach, Vaish, & Tomasello, 2012; Hepach, Vaish, Grossmann & Tomsello, 2016; Warneken & Tomasello, 2008; Ulber, Hamann, & Tomasello, 2016; Kachel, Svetlova & Tomasello, 2017), there are a few studies that have examined more than one exemplary behavior within the same study (not including meta-analyses or systematical reviews relying on correlational analyses). The only studies methodically comparing two or more prosocial behaviors within an experimental set-up have done so with the goal of investigating the possibility of a general prosocial disposition (Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011) or of explaining individual variability (Newton, Thompson, & Goodman, 2016; Schachner, Newton, Thompson, & Goodman-Wilson, 2018). Nonetheless, so far no study has systematically investigated the two main types of positive, cooperative social behaviors, namely helping (action based) and sharing (resource based), and the different types of social interaction in which these behaviors can be based. For instance, a prosocial response can occur without any interaction between actor and recipient, and can therefore be defined as unilateral or autonomous prosocial behavior (e.g. opening a door for a stranger; giving money to a homeless person). On the other hand,

however, a prosocial response can occur when actor and recipient are already engaged in a joint action (e.g. helping a friend to carry a couch down the stairs; sharing the spoils after a mutual effort).

Just as the focus of previous research has been mostly on one specific behavior, it has also been on one type of social partner: adult experimenters. While the decision to pair young participants with adult experimenters is typically made for reasons of feasibility and practicality (e.g. scripted instructions, controlled behavioral reactions, limitations of drop-outs, etc.), it sacrifices external validity. Across the preschool years children spend an increasing amount of their time with similar-aged peers at nursery, playgroups, or at home and start to participate effectively in joint activities with peers from around 24 months of age (Brownell & Carriger, 1990; Brownell et al., 2006). The few studies that have looked at children's prosocial behavior towards peers have found that children are also very competent at helping, sharing, and cooperating with a peer (Hamann et al., 2012; Hepach, Kante, & Tomasello, 2017; Kachel et al., 2017; Ulber et al., 2015), although theses situations normally require greater scaffolding and clear, unambiguous tasks. And no study, to our knowledge, has compared young children's prosocial behavior towards adults versus peers. In light of the ongoing debate about the nature of human's exceptional prosociality (e.g. Paulus, 2014; Tomasello & Vaish, 2013; Warneken & Tomasello, 2009) an investigation into whether children actually differentiate between different social partners promises additional answers as to whether helping and sharing are actions formed and shaped merely by socialization practices or are indeed engrained in our human nature. The latter would suggest that children should not be ageist and offer support and assistance to anyone, despite their age. If socialization was the more prominent driving force behind the onset of prosocial behavior, then we would expect children (especially the younger they are) to show a greater amount of benefiting behavior towards the group of people who have taught, showed and instructed them to behave that way – and therefore exhibit more helping and sharing towards adults.

Based on the outlined limitations in previous studies, in the current study we compared the two basic prosocial behaviors of helping and sharing as a function of: (1) whether the partner was an adult or a peer, and (2) whether the child was actively interacting with the partner or not (bilateral vs. unilateral interaction). We designed our study to be suitable for children aged two and three, acknowledging this as the critical timeframe for the implementation of an advanced prosocial and cooperative mindset. Specifically, we paired 2- and 3-year-old children with either a same-aged child or an adult and administered two helping and two sharing tasks. These tasks were either set up as unilateral (e.g. sharing a

windfall of resources) or bilateral (e.g. helping a partner to tidy up). Most importantly, in order to be able to compare children's actions towards the social partners as a function of the partner's age and rank within the social hierarchy and not as a reaction to the partner's spontaneous behavior in these social situations (and since we could not control or standardize the children's behavior), adults' behavior in all interactions was carefully modelled on individual partner child's behavior.

Our expectations for this partner manipulation were clear: Although it was plausible that 2- and 3-year-olds would show greater prosocial behavior towards adults given that, up until this time point in their life, they most likely have had more experience in social encounters with adults we hypothesised that children would not be ageist and show the same degree of prosociality towards peers and adults, supporting a nativist view on the onset of prosocial behavior (e.g., Warneken & Tomasello, 2007; 2008). With regard to the nature of the task, our hypothesis was clearer. We expected that bilateral tasks would result in higher prosocial response rates in line with previous research on the facilitating impact of previous interactive activity (Barragan & Dweck, 2014) and collaboration (Hamann et al., 2011; Ulber et al., 2015) on prosocial behavior. In addition, we suspected this difference to be moderated by age: we assumed that older children would show more overall prosocial behavior than younger children (in line with meta-analyses of age differences in children's prosocial behavior, see Eisenberg & Fabes, 1998) who would find the bilateral tasks particularly challenging since they require a more complex interpretation of the situation and the partner's intentions (see Gräfenhain et al., 2009; Hamann et al., 2011; 2012; Smith et al., 2013).

Method

Participants

Participants were one hundred-two 3.5-year-old children (range 3;02 – 3;10; *M* = 3;09; 51 girls) and one hundred-one 2.5-year-old children (range 2;02 – 2;10; *M* = 2;08; 50 girls). Ten additional 3-year-olds and five additional 2-year-olds were tested but excluded from analysis due to fussiness or lack of motivation. All children were native [removed for blind review] speakers, came from mixed socio-economic backgrounds, and were recruited from a child database of medium-sized [removed for blind review] city. Written parental consent was given for all subjects prior to testing.

Design

The current study featured the two main prosocial behaviors (within subjects: helping & sharing) in two contexts (within subjects: unilateral task without active interaction, bilateral task with active interaction), resulting in four possible tasks: Instrumental helping, dictatorial sharing, collaborative helping, and collaborative sharing, see Figure 1 for overview. Children's performance in these tasks was compared between two age groups (between subjects, age 2 and 3) and two partners (within subjects, peer and adult partner).

Figure 1. All four experimental tasks. The cushions indicate where participants were placed with side fully counterbalanced across trials.

Thus, subjects of both age groups were were either paired with a same-aged, same-sex child (*peer partner*) or a same-sex adult counterpart (*adult partner*). No pair was tested repeatedly and subjects would only perform each of four possible interactive tasks once (irrespective of partner). To maximize partner and task combinations, one test session usually introduced three children and one adult at the same time, resulting in a total of three child/child and three child/adult pairings across six tasks. Therefore, per session, each subject

served twice as target-child (once with a peer partner and once with an adult partner) and one time as partner child for another subject. To allow for greater variation we also limited the number that the same adult could serve as the adult play partner to a maximum of three sessions. Task order and order of partner (i.e. whether subjects were paired with a child or an adult first) were randomized throughout sessions. Each task was counterbalanced for gender and partner, resulting in approximately the same number of boys and girls participating in each task, and an equal number of child-child and adult-child partner combinations per task (see Table 1 for sample breakdown). Towards the end of data collection, sessions often featured one or two subjects only, thus resulting in less possible test combination in order to fill in for dropouts or excluded trials (n=2 because of experimenter error and n=1 due to apparatus malfunction) during previous sessions.

Table 1

Final sample breakdown (N=203) by age, partner and task.

2 y/o	Instrumental Helping	Interdependent Helping	Dictatorial Sharing	Collaborative Sharing	Total
adult	12	12	12	12	48
child	12	12	14	15	53
Total	**24**	**24**	**26**	**27**	**101**
3 y/o					
adult	12	12	12	12	48
child	12	14	14	14	54
Total	**24**	**26**	**26**	**26**	**102**

Procedure

Children were tested in a quiet room in their day-care facilities (3-year-olds) or the laboratory (2-year-olds). Testing was done by one main experimenter (E1) who explained and structured the procedure, and one additional experimenter (E2) who assisted E1. An additional experimenter (E3) served as adult play partner.

At the beginning of each session, the children and E3 engaged in a short warm-up period in a play area to reduce initial inhibition. Warm-up was guided by E1 who introduced the children and E3 and encouraged them to participate in a short free play period outside the test room. Children were introduced by their first names, whereas E3 was referred to as “Mr./

Mrs. Schmidt" and employing the formal form of "you" [removed for blind review]. This was done to emphasize children's perception of the other children as equal-ranking peers and the adult as higher-ranking individual. However, when explaining the procedure and the individual tasks, E1 treated children and adult likewise, hence we will refer to "participants" (including both children and adult) for details of the procedure. After the initial warm-up period E1 led the children and E3 to the test room, where she introduced a specially designed marble box. This was a box with a xylophone inside and a tube attached to it (see Warneken et al., 2007) in the shape of a mouse or an elephant. Participants then received a little bowl containing three marbles each and were encouraged to "feed" the animals by throwing their marbles in the tube, which produced a fun jingle noise. After that, E1 announced that she had brought more marbles to feed the hungry marble animal, and that participants could gain more marbles if they participated in short games. Then the animal was covered by a blanket and E1 led participants back to the play area. Throughout the rest of the session, E3 stayed with the children in the play area, whereas E1 and E2 prepared the test room for each task. E1 would then call the respective pairs to the test room for each task. Tasks were videotaped and lasted between 2 and 10 minutes, with a complete session lasting up to 45 minutes in total. Materials used for each task are shown in Figure 1.

Unilateral helping (Instrumental helping). The target child entered the test room first to find a locked wooded box. E1 took the box to shake it, and revealed after listening to a clacking noise, that a new marble was locked inside that box. E1 then went on to get a large metal key situated on a white stool nearby. E1 used the key to unlock the box, explaining each step to the child. E1 encouraged the child to take the marble once the box is opened and to place it into her bowl. In the following, E1 locked a new marble inside the box. She handed the key to the child, asking the child to unlock and open the box. If the child has difficulties handling the lock, E1 provided assistance. After the box was successfully unlocked and the marble retrieved, E1 locked another marble inside the box, putting the key back on the stool. She again asked the child to open the box. If the child reluctant, E1 helps the children with prompting questions ("What do you need to open the box?"; "Where do you find the key?"). Children who failed to open the box on their own and needed assistance by the experimenter (other than the verbal prompts) got one more attempt to unlock the box. All 3-year-olds and 85 percent of 2-year-olds managed to unlock the box immediately. The remaining 2-year-olds passed after one additional attempt. After children had used their won marbles to feed the animals, they were placed approximately 2 meters opposite the stool. They were given an age-appropriate and well-know hammer game as distraction to play with.

They then witnessed how E1 locked another object in the box, and were told that this object was a dice and meant for the partner individual. E1 called the play partner in the room, placed her in between the stool and the target child and gave her the locked box. She also shook the box, stating that there was something hidden in the box. E1 then revealed she had to leave, but instructed the partner to go ahead opening the box. E repeated her instructions after approximately 30 seconds and the trial continued for another 10 seconds. When E1 returned to the room, she helped the partner opening the box (if necessary) and exchanged the dice with a new marble. Children's response in this scenario would be coded as prosocial if they assisted the partner in some form in order to open the box, e.g. by pointing out the location of the key or by fetching the key for them.

Bilateral helping (Interdependent helping). Pairs entered the test room facing a large bucket filled with yellow and blue plastic balls and two smaller empty buckets. E1 explained that in order to gain new marbles, participants first had to clean up together and sort the balls by color. Each participant was instructed to either put the yellow or the blue balls in one of the smaller buckets. In doing so, each child was responsible for the assigned color, hence their roles in the tidy up task were interdependent. In addition, E1 emphasized that both participants were mutually responsible to clean up successfully by encouraging them to engage in a "High Five" with both E1 and with each other to demonstrate their commitment and agreement. In contrast to the instrumental helping task, where the target child was set up unilaterally to help another child reaching their goal, this time the emphasis was on the mutual commitment to fulfil the task and reaching the mutual goal to gain more marbles.

E1 then left the room for approximately 30 seconds. During this period E2 called the target child outside (After 10 seconds: "[Name of child] would you come outside please?", after 20 seconds: "[Name of child] can you come outside?", after 30 seconds: "[Name of child] come outside!"). If the target child left the room, E1 gave her a marble, pretended she just found some and wanted to show them to the child. They then returned to the test room to also provide the partner with a marble. If the target child did not leave the room, E1 returned to the test room after E1's last call, praised the children for cleaning up and allocated one marble each. Participants were then allowed to wake up the marble animal and feed their marbles. Children's behavior in this scenario would be considered as prosocial if they resisted the experimenter's request and did not interrupt the game when being called outside for the first time.

Unilateral sharing (Dictatorial sharing). Pairs entered the test room and were given

a bowl each. E1 then explained that she would distribute new marbles directly into these bowl. She started by taking six marbles out of a small bag, counting them and placing them one by one into the target child's bowl. She then suddenly stopped and explained with a surprised and pitiful voice that she had no more marbles left. To emphasize this, she upended the empty bag and shook it. She then instructed the target child that she had leave now, and that the child could decide whether she wanted to share her marbles with the partner or whether she wanted to use all marbled to feed the animal. E1 then left the room for approximately 30 seconds before repeating the instructions and waiting for another 10 seconds. Participants who ended up with no or less marbles than their partner (i.e. in cases where the target child did not share) were compensated so that everyone had an equal amount of marbles at the very end to avoid frustration. Children's response in this scenario would be coded as prosocial if they shared a minimum of one marble out of their six marbles with the partner.

Bilateral sharing (Collaborative sharing). Pairs entered the test room facing a large transparent box (180 × 50 × 15 cm) with two opening holes on each side. The apparatus and its functioning was adapted from studies with chimpanzees (e.g. Hirata & Fuwa, 2006) and children (Warneken et al., 2011; Hamann et al., 2011; Ulber et al., 2016). Participants were seated left and right of the apparatus. In front of each opening hole they found a small bowl to collect new marbles. E1 made participants aware that there were three marbles on each side inside the box and encouraged participants to reach through the openings to collect their marbles. E1 then directed participants' attention to the center of the apparatus, were further six marbles had been placed, but were not accessible. E1 explained that in order to reach the marbles, participants had to pull the ends of a single long rope simultaneously, which was located next to them at the sides of the box. By pulling the rope, a block inside the apparatus moved forward and pushed the marbles, so that they would roll down towards the sides. E1 first encouraged both participants to pull individually, emphasizing that pulling alone would result in no movement. E1 then verbally coordinated participants' mutual pulling until they successfully moved the marbles. The six marbles split up, resulting in three marbles becoming accessible on each side. Participants were then instructed to wake up the marble animal and to feed their collected marbles while E1 re-baited the apparatus. When the participants returned to their seats, they found a further six marbles inside the transparent box. E1 reminded participants that they needed to pull the rope together in order to access the marbles and left the room haven given a start signal to pull. This time, if children operated the apparatus successfully, the marbles did not split up but all six marbles rolled down

towards the side of the target child. Instructions were repeated after approximately 30 seconds to remind children whose attention had drifted away from the task. E then waited for another 10 seconds before re-entering the room. At the end of the game participants who ended up with less marbles than the partner were compensated again. Children's behavior in this scenario would be considered as prosocial if they shared a minimum of one marble out of six with the partner.

Adult behavior. In order to make behaviors towards peer and adult partners comparable, the experimenter serving as adult play partner matched their behavior in the tasks closely with the behavior of a child partner of the previous session. In preparation, experimenters acting as adult partner watched the previous recordings prior to testing and observed, memorized and eventually re-enacted the following behavior: any verbalisations, gestures and emotions related to the task. Thereby, behavior was adapted to resemble authentic adult behavior if needed (e.g. grammatical errors were corrected, pointing with whole hand was replaced by index-finger pointing). Behavior that was not relevant for the task (e.g. scratching, asking for the toilet, bouncing, etc.) was not mimicked. Detailed instructions for E2 and examples are listed in Table 2.

Overall trials, speech was the behavior that had to be copied the most and occurred most prominently in the collaborative sharing task (n=18 trials), but less in the other three tasks (dictatorial sharing: n=7; collaborative helping: n=7; instrumental helping: n=6). Overall, 28% of trials involved task-relevant behavior of the partner child that was re-enacted by the adult partner. There were some trials where the target child responded too quickly for the adult partner to showcase any response, which brings the final percentage of trials that involved mimicked behavior down to 26 (52 out of 203 trials).

Table 2

Instructions for adult partner behavior (E2)

"Before you serve as adult partner in one of the four social tasks, you need to watch the respective previous video recording of a child performing the role as partner in the same task. E1 will give you the number of the correct video clip. You are asked to observe the behavior of the partner child in this video clip very carefully to eventually re-enact this performance when you are acting as play partner in the same game.
Only test-relevant behavior should be re-enacted and transformed into an appropriate adult-like action if needed (see list of examples below). Task-irrelevant behavior (e.g. utterances, coughing, blowing one's nose, bouncing up and down, asking for the toilet, actions before and after the task) should not be considered."

Child partner behavior	Adult partner behavior

Verbalisations	Words and sentences said (*Pull with me! That's unfair! No, like this!*)	*Copy as such*
	Incorrect sentences, wrong pronunciation (*Not nice! Inpfair! Give marble!*)	*Use correct version (That's not nice! Unfair! Give me a marble!))*
	Incomprehensible utterances	*Do not copy*
Movements/ gestures	Head movements towards E1/door/apparatus	*Mimic as such*
	Gaze (lowering gaze, looking up, looking towards E1/door/apparatus)	*Mimic as such*
	Playing with the apparatus	*Mimic as such*
	Stand up/ walk around/ turn around	*Mimic as such*
	Raising/dropping shoulders	*Mimic as such*
	Hand gestures (pointing, reaching, grabbing)	*Use correct gestures (index finger pointing, reaching with whole hand)*
Emotional expressions	Emotional/ facial expressions (smiling, laughing, looking sad, looking angry, looking disappointed, raising eyebrows, sighing)	*Mimic as such if within normal adult range of expressions (open mouth, but NOT sticking tongue out)*

Familiarity. We attempted to test unfamiliar pairs only. For reasons of practicality, logistics and accessibility we tested 2-year-olds in the lab and 3-year-olds in their daycare facilities. From experience we knew that testing 2-year-olds in their day care facilities would result in a higher number of drop-outs, especially when considering that we were testing dyads of children. Also, in Germany children under the age of 3 are normally looked after in relatively small and homogenous groups which would have made it nearly impossible to test unfamiliar pairs of children. Instead, we ensured when inviting 2-year-olds to the lab that children did not know each other relying on parents' report. To keep familiarity to a minimum level for 3-year-olds, we only paired children from different groups, testing in relatively large sites only (German children attend "kindergarten" from age 3 to 6 and are usually split into several mixed-aged small groups). Additionally, we asked their teacher to rate children's friendship on a 5 point Likert scale (with 1 being "Children hardly know each other" to 5 being "They are best friends and play together every day"). Only children with a Likert scale rating of 3 or below were paired together.

Coding and reliability

Coding was done from video by the main author of the study, with the exception of 3 trials which were life coded by the experimenter due to camera malfunction. Twenty percent of the sample were randomly selected and coded for reliability by a second observer who was unaware of the study hypotheses.

Primary coding focused on children's prosocial responses in each task resulting in a binary prosocial score, reflecting whether children showed the appropriate prosocial response in each task or not. Furthermore, we assessed supplementary parameters for each task describing the prosocial response in more detail, e.g. how many marbles were shared exactly, how help was provided, how quick children responded, etc. Details are shown in Table 3. The inter-rater agreement for the prosocial score was perfect (k = 1.0). Reliability for additional measures and the latency was also very high (k = .94, r = 0.93).

Table 3

Coding scheme for each task

Task	Prosocial score (0/1)	Supplementary measures
Helping	0 – no helping / leaving the room 1 – providing help / staying, refusing to leave	***Instrumental helping:*** *Helping initiative* Active/spontaneously: Target provides help immediately After request: Partner explicitly asks for support, "Can you help me?" *Helping behavior* Pointing: Pointing to the location of the key Giving: Getting key and handing it over to partner Demonstrating/opening: Getting key and demonstrating its use or opening the Box *Latency* Time between E's exit and start of helping response (standing up, raising arm,) ***Interdependent helping:*** *Number of cues provided until leaving the room* 1,2,3 *Means of commitment* Resistance: Child refuses to leave the room, "No!", shaking head, asking for reason Ignorance: Child does not respond to cue and continues with task Obligation: Child refers to mutual task and duty, "I can't come, I have to tidy up first."
Sharing	0 – no sharing 1 – sharing at least one marble	***Dictatorial and collaborative sharing*** *Numbers of marbles shared* 1,2,3,4,5,6 *Sharing behavior* Active/spontaneously: Target hands out marbles to partner Passive: Partner takes marbles and target tolerates it

	After request: Partner explicitly asks for a share, "Can I have some?" *Latency* Time between E's exit and sharing of first marble (handing over or placing in partner's bowl)

Results

As illustrated in Figure 2, the overall prosocial response rate was high, with children either helping or sharing with their partner in 0.67 of trials (standard error of the mean = 0.03). An overall generalized linear model (GLM) with prosocial behavior as the binary response revealed no overall interaction or main effect of gender or age, (*p*s > .24), but a significant main effect of task type (*Estimate* =-0.78, *se* = 0.31, *z* = -2.56, *p* = 0.01) with prosocial responses being generally lower in unilateral tasks (*m* = 0.57, *se* = 0.05) than bilateral tasks (*m* = 0.75, *se* = 0.04). The model also revealed a trend of an interaction between prosocial domain and partner (*Estimate* =-1.09, *se* = 0.62, *z* = -1.76, *p* = 0.08), driven by a trend of children helping peers more than adults (*Estimate* =0.84, *se* = 0.45, *z* = 1.87, *p* = 0.06) but not differentiating between their partners in a sharing task (*p* = 0.57). Although the interaction did not reach significance, we decided to follow up on the trend of an interaction detected acknowledging the different nature of the tasks and the added value of separate analyses on the task level. Therefore, subsequent analysis focused on each task independently via more traditional statistical analyses (Chi-square tests) and analyses of supplementary measures.

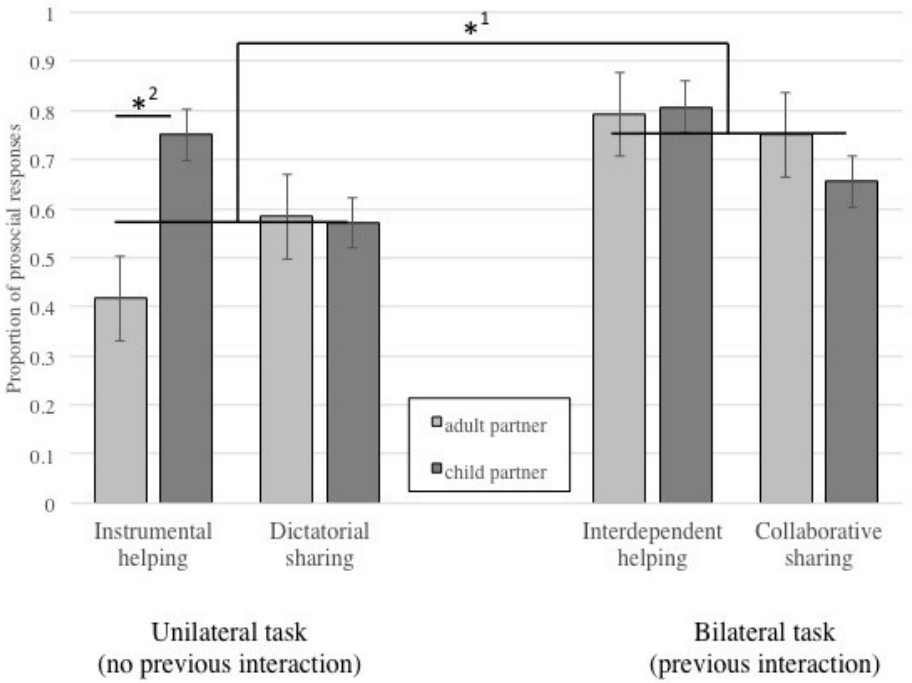

Figure 2. Proportion of prosocial responses of unilateral and bilateral tasks in both prosocial domains helping and sharing. [1]Overall main effect of task, $p = 0.01$; [2] Partner effect for instrumental helping task, $p = .04$.

Instrumental helping (unilateral). 58% of children helped their partner to open a locked box. Children were more likely to assist if the partner was a child (75%) than if the partner was an adult (42%; $\chi^2(1) = 4.2$, $p = .04$).

Children facing a child partner helped after an average of 12.8 seconds, whereas children took longer (on average 14.1 seconds) to provide help to an adult (see Figure 3). We ran a survival analysis in order to compare the probability ("risk") of helping between partners, considering both the binary helping response (helping, no helping) and the latency of helping simultaneously. The probability of children's helping when the partner was a child was 154.2 % higher at any given time point than the probability of helping an adult partner (Cox-proportional hazards model, $p = 0.02$, *Hazard Ratio* = 2.54, 95% *Confidence Interval* = 1.17-5.55). Facing an adult in need reduced helping by a factor of 0.39, or 60.7%.

Instances of partners asking for help and assistance directly were very rare: Only four 3-year-olds, but no 2-year-old asked the target child to help them opening the box. In all cases help was provided as a result. Helping was predominantly realized by handing the partner the key (54%) or demonstrating the use of the key (32%). 11% of children pointed to

the location where the key was hidden. There was no difference in their behavior between partners (p = .45).

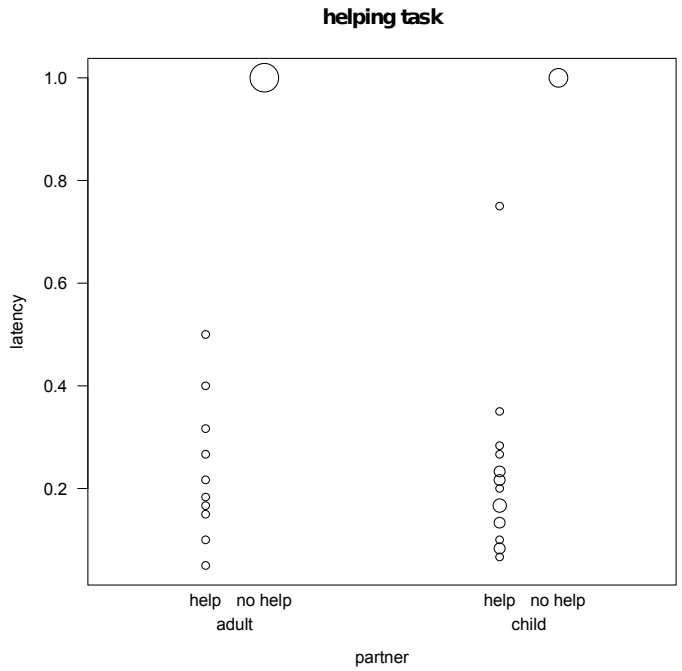

Figure 3. Helping response and latency in the instrumental helping task. The circle size is proportional to the number of children helping their partner within the duration of a trial (latency < 30 seconds) or not providing any help (set latency = 30 seconds).

Collaborative helping (bilateral). Children showed an overall high level of cooperation in the mutual tidying up task with 80% of children refusing to leave the room when being called outside. A chi-square test revealed no difference between adult and child partner (Chi-squared Test, p = 1.0).

Of all children who initially refused to stop helping the partner tidying up, 34% left after a second, more pressing call (second cue), and 10% after a final, very explicit order to step outside (third cue). 36% did not leave their partner until the end of the trial. There was no difference between adult and child partner with regard to the time point of leaving the room (p = .62).

The majority of children who continued to help their partner did so by simply ignoring the call to step outside (49%). 38% of children actively resisted to leave the room while a few children (13%) referred to their obligation to finish the mutual task. Behaviors differed between age-groups: While ignorance was the most common behavior in 2-year-olds, active resistance was more evident at age three; $\chi^2(2)=9.31$, p = .01.

Dictatorial sharing (unilateral). When given a windfall of six marbles, 58% of children shared at least one marble with their partner, irrespective of partner type (p = 1.0).

Of all children who shared, nearly one-third of participants (33%) reallocated the marbles in an equal manner. Most children (47%) shared only one or two out of six marbles, therefore keeping the majority for themselves. The remaining 20% shared four marbles or more. On average, children shared 1.5 marbles irrespective of partner type or gender (ANOVA, ps > .16). However, 2-year-olds tended to share less marbles (mean = 1.04 marbles) than 3-year-old children (1.88 marbles, F(1,45)=3.72, p=.06). It took children approximately 10.5 seconds to initiate a share. This latency was not influenced by partner, gender or age (all ps > .22).

Sharing behavior did not differ between partners (p = .27): Sharing was either initiated spontaneously (63%) or following a partner's request (33%), and there was only one instance of passive sharing (see Table 2 for definition).

Collaborative sharing (bilateral). Following a mutual task, 70% of children shared one or more marbles with their partner. There was no difference with regard to whether the collaborative partner was a peer or an adult (p = .65).

Of all children who shared, the majority (43%) reallocated the marbles equally, i.e. sharing three out of six marbles with their partner. Sharing just one (19%) or two marbles (16%) or giving up four or more items (21%) was less popular. On average, children shared 2.0 marbles irrespective of age or whether the partner was another child or an adult (ANOVA, ps > .30), but girls shared slightly more (1.8 marbles) than boys (1.2); F(1,45)=5.48, p=.02.

In terms of children's behavior, nearly half of the children (43%) gave up marbles in response to the partner asking or begging for a share. A remaining 22% shared spontaneously and actively while instances of passive sharing (e.g. the partner took marbles) happened in 35% of trials. This pattern did not differ between partners (Chi-squared Test, p = .23).

Discussion

The current study is the first study to systematically compare children's prosocial behavior in the two main domains sharing and helping as a function of two social variables: (1) whether the social partner was an adult or a peer, an (2) whether the child was actively interacting with the partner or not. Our results suggest that children as young as two years of age readily help others and share with others in age-appropriate tasks. The highest prosocial responses were found in bilateral, joint tasks like sharing the spoils after a collaborative effort

or helping a partner to complete a mutual activity. Prosocial responses were lower in unilateral, autonomous tasks like assisting another person to open a locked box or sharing a windfall of resources. Although this is consistent with previous research, especially with regard to sharing behavior (e.g. Hamann et al., 2011; Ulber et al., 2015), the current study extends this finding to helping behavior. Not only are children more likely to share with a partner if they are engaged in a mutual activity, they are also more likely to help a partner.

Most surprisingly, especially since previous research almost all concerned 3-year-olds only, we did not find a difference in children's prosocial behavior with regard to their age with 2-year-olds being as competent in helping and sharing as 3-year-olds. This speaks for an overall, all-encompassing prosocial inclination emerging at an early age, fostering the picture of the human species as an ultra social one (Tomasello, 2009; 2014).

Interestingly, our results do not provide evidence for a general systematic preference of adults over peers in children's prosocial behavior. One could argue that by having adults mimic the behavior of child partners, we may have eliminated potential differences in their natural behavior (e.g. presumably adults would beg less than peers) which would have resulted in potential differences in children's prosocial responses (e.g. less sharing with adults). However, if this were the case, it would also suggest that children do not hold initial assumptions about adults versus peers as recipients (at least in social scenarios), which feeds into our picture of a general, all-embracing prosocial motivation from early on. Nevertheless, without this "constraint" in our study, a clean comparison between adult and child partners would not have been possible. A closer look at the behavioral data also reveals that, for instance, most unilateral helping and sharing behavior occurred spontaneously and not in response to any reaction on the partner's side. Hence, the behavior of the adult and the child partner would have been very similar anyway, even without our yoked control manipulation. Despite the current finding that children are not selective in their prosocial behavior in terms of the recipient's age, other factors like familiarity, neediness or a recipient's previous demeanour have shown to have a great influence on children's social actions (e.g. Dahl, Schuck, & Campos, 2013; Moore, 2009; Schmidt, Svetlova, Johe, & Tomasello, 2016). It will be a task for future studies to look more closely into how other parameters on the partner's side are influencing prosocial reactions.

Although there was no general difference between social partners, there was one exception. In the current study, it was only the instrumental helping task that led to a greater prosocial response if the person in need of help was a same-aged child and resulted in less helping if the helpee was an adult. Therefore, a different treatment of social partners was not

linked to the child's age or the type of task but to a specific situation of their combination. This difference in children's motivation to help in an instrumental task is especially interesting since it concerns the earliest developing prosocial behaviors (Warneken & Tomasello, 2007). So far, previous studies on early helping behavior have shown that, in the lab, children as young as 14-months-old readily help a person completing an action by picking up and handing back out-of-reach objects (Warneken & Tomasello, 2007) and provide help in more complex situations by 18 months of age (Warneken & Tomasello, 2006). Importantly, these tasks involved unfamiliar adults as the social partner and person in need of help. In these studies the majority of children helped at least once and in up to 53% of trials. This is within the same range as the helping rate we report (58% overall; 41% towards an adult partner) and therefore shows that the helping task was age-appropriate and in line with the well-established and replicated standard helping situations from Warneken and colleagues (2006, 2007). Besides, also matching the seminal studies by Warneken and colleagues, in the great majority of cases helping was initiated spontaneously without any explicit prompts or requests from the helpee.

The one study to investigate whether toddlers would also help peers reports helping rates between 53% and 55% (Hepach et al., 2017). Strikingly, in the current study, children helped a peer in 75% of cases and hence significantly more often than adults, given that we were able to directly compare between partner conditions. Not only did they help more often, they were also quicker in helping a peer than an adult. This suggest that by directly comparing young children's helping behavior towards peers versus adults we were able to detect a phenomenon that has not been targeted so far, i.e. children's favoritism of peers over adults when it comes to instrumental helping. There are several reasons for this early bias: One explanation remains within the study's procedure and the fact that an adult experimenter explained the task and hid the key which, in turn, could have led the child to believe that the location of the key is common knowledge among adults. Although possible, we doubt that this was very likely since we tried hard to assure the child that the adult partner did not have prior knowledge to the peer partner and was introduced as naïve play partner without any relationship to the experimenter. A second, more plausible reason for children's bias towards peers might be the different assumed level of competence between adult and child partners. In case of adult partners, children might have assumed that since the partner was a grown up and therefore naturally more knowledgeable, an adult might be competent enough to help herself whereas same-aged children were automatically assumed to be less competent, requiring assistance in solving the situation. It might have been also the case that children

were simply more comfortable interacting with other children, however if this was indeed the case than we would have expected a general preference or bias towards peers across all four experimental tasks. Instead, it remains unclear why the instrumental helping task is an exception (for instance, one could potentially argue that adults are also more competent cleaners than children and should therefore be less supported in the collaborative helping task) and future research will look into this finding more closely.

Crucially, our findings can be interpreted as additional evidence for children's natural inclination to behave prosocially (as argued by Hoffman, 2007; Warneken & Tomasello, 2009; Wynn, 2008) rather than being shaped first and foremost by socialization processes (examples may include parental scaffolding, rewarding, encouragement, emotional or mental state talk; see Brownell, Svetlova, Anderson, Nichols, & Drummond, 2013; Bar-Tal., 1982; Dahl, 2015; Cialdini, Kenrick, & Baumann, 1982; Rheingold, 1982). If social experiences were the main driving force behind children's early positive social behavior, we would have seen more children behaving in a beneficial way towards adults than same-aged children. The fact that this was clearly not the case and that, at least for the instrumental helping task, the picture was actually completely the opposite tells us that there must be a motivation to prosocial behavior that goes beyond copying the environment and following instructions, and given the early onset we assume this to be a natural predisposition for prosocial behavior. This goes hand in hand with recent evidence that suggests that in fact some socialization practices, like rewarding, can even have a detrimental effect on sharing and helping behavior by undermining their intrinsic inclination (Ulber et al., 2016; Warneken & Tomasello, 2008). Our finding also contradicts the view that early prosocial behavior is highly shaped by an expectation of reciprocity (see Kuhlmeier, Dunfield, & O'Neill, 2014). If this was the case, we would have seen children being more inclined to offer help and resources to adults, as these were the more competent partners to be expected to either return the favor. The fact that we actually witnessed the opposite reaction (at least for instrumental helping) demonstrates that young children's prosocial actions are less selective, and therefore more universal, than previously thought. However, this emphasis on an early, arguably innate, prosocial propensity does and should not undermine the important contribution of socialization in shaping children's social behavior.

With regard to the sharing tasks, what stands out is the high rate of sharing in the dictator game scenario. Whereas it is commonly agreed that children tend to be selfish and do not share a windfall of resources before 5-8 years of age (e.g., Smith et al., 2013), our findings revealed 58% of children voluntarily allocated their own marbles to another person.

Although this number appears to be higher than previous research, it was still the case that children kept the majority of marbles for themselves and only shared one or two items. A reason why children were more prone to share their goods might be explained by the setting of the task: Whereas in the standard dictatorial sharing task the sharing partner is usually either anonymous or represented by photographs (e.g., Beneson, Pascoe, & Redmore, 2007; Fujii, Takagishi, Koizumi, & Okada, 2015; Gummerum, Hanoch, Keller, Parsons, & Hummel, 2010), in the current study participants were directly facing the unlucky partner. Under these circumstances it would have been harder for children to refuse to share their resources. Collaborative sharing rates slightly lower but within the range of rates reported in similar study designs (e.g., Hamann et al., 2011), presumably because these figures were based on repeated trials whereas the current study only featured one trial.

Nevertheless, children were still less likely to share in a dictatorial scenario, when they had received resources by a windfall than in the collaborative setting, when they had worked together with a partner in order to obtain the valuable items. In both cases, the numerical allocation was exactly the same: One person was lucky to receive all items, whereas an unlucky partner received nothing. The fact that children shared more in cases where the unfair allocation was a result of mutual work effort supports our hypothesis that, even within the same domain (here: distributive justice), there are different types of social tasks that lead to different social responses. When it comes to sharing as a means to restore fairness, children are sensitive to the exact context of the sharing situation and share more in a collaborative, joint situation than in an autonomous, individual task setting. The current study suggests that this phenomenon is not only true for sharing behavior, but also applies to other forms of positive social behavior like helping. The two tasks with the highest prosocial rates (interdependent helping, collaborative sharing) had one thing in common: the joint, bilateral context of the task. One can argue that it is exactly this jointness that encourages prosocial behavior as it creates a feeling of togetherness (or "We-mode", see Tuomela, 2006) which then translates into a greater sense of commitment and therefore positive social response towards the partner. This is supported by evidence from studies suggesting that early benevolence (as shown prosocial behavior) is indeed facilitated by prior interactive activities (Barragan & Dewck, 2014). The current research extends this finding in highlighting that the actual characteristics and nature of the exact (bilateral) circumstances of the helping or sharing situation have a similar effect as previous interaction experience. It is subject to future studies to investigate this difference in the nature of social situations further and find out whether the "advantage" of joint, bilateral social situations in comparison to

autonomous, unilateral social situations holds beyond 3 years of age and continues as children mature. Arguably later on in development, this sense of "us" will exceed bilateral situations and become more global, eventually being replaced with an understanding of being part of the same social group (Dunham, Baron, & Banaji, 2008; Tomasello & Vaish, 2013).

To conclude, the current study is the first to systematically compare children's behavior in different social situations with different social partners in an attempt to cluster these situations according to their level of interaction involved. Results suggest that children are better (i.e. more prosocial) in bilateral than unilateral social tasks for both helping and sharing behavior. Although this is consistent with previous research, it extends these findings by showing that there is no age difference between 2- and 3-year-old's prosocial behavior. This study is also the first to ever directly compare adult and peer partners in carefully designed tasks and yoked control conditions. Findings indicate that children do not generally differentiate between adult or same-aged recipients, with one major exception: Helping. Here children readily help if the person in need is a child as well, but are less likely to assist an adult. Taken together these findings indicate that toddlers' early prosocial skills and motivations are more complex and flexible than previous research suggests and that a general prosocial propensity and competence is present from very early on in life. Ultimately, our research suggests that toddlers' early prosocial skills and motivations are more sensitive to *how* they are engaged with a partner than with *who* that partner is. This supports the view that prosocial behavior is inherent in human nature, although it is also shaped and motivated by socialization in various ways.

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