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RESEARCH ARTICLE

Helping and sharing in preschool children with autism

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Abstract Autism is a neurodevelopmental disorder characterized by deficits in social-cognitive and social-communicative behaviors. Yet, little is known about the extent to which children with autism spectrum disorder (ASD) engage in prosocial action. We assessed helping and sharing behaviors in 3- to 6-year-old neurotypically (NT) developing children and children diagnosed with ASD. Children with ASD were more inclined to show spontaneous helping in the absence of the helpee than NT children. In the sharing task, NT children shared the resources equally between themselves and the recipients. In contrast, ASD children kept less for themselves and gave more resources away. In addition, the stronger the ASD symptoms were and the less cognitively weaker they were, the more children preferred to give resources to a rich than to a poor other.

Keywords Neurodevelopmental disorder · Autism · Preschoolers · Prosocial development

Introduction

The last years have experienced an increased interest in the ontogeny of prosocial behavior. This interest was sparked by a number of studies reporting that prosocial behavior plays an important role in human social interaction, and supports social as well as cognitive development (e.g., Caprara et al. 2000; Eisenberg and Fabes 1998). Developmental studies provided evidence that a variety of prosocial behaviors—most notably helping, sharing, and comforting—emerge in the course of the first years of life (for reviews, see Dunfield 2014; Paulus 2014a; Hay and Cook 2007).

While there exists a growing body of research on prosocial behavior in neurotypically (NT) developing children, there is much less known on prosocial behavior in children with autism spectrum disorder (ASD). This is surprising as ASD is characterized by deficits in social and communicative skills (American Psychiatric Association 2013). Given the role prosocial behavior plays in establishing and maintaining social relationships between NT individuals (Markiewicz et al. 2001), knowledge about ASD children's inclination to engage in prosocial behavior may help us better characterize the nature of the impairments in their interactions with others. This is all the more important as theoretical approaches suggested that ASD children favor instrumental goals over relationship goals (Dawson et al. 2004). Given that prosocial behavior is defined by a lack of immediate instrumental benefits, knowledge about ASD children's inclination to engage in prosocial behavior would be of interest for the field.

One aspect of prosocial behavior that has received attention in the literature on ASD concerns children's emotion processing and empathy (e.g., Baron-Cohen and Wheelwright 2004; Hobson et al. 2009; Yirmia et al. 1992). In an influential study, Charman et al. (1997) compared three groups of 20-month-old children at risk for autism, developmental delay, and typically developing in a number of tasks. One of the tasks assessed children's empathy for someone in pain. The authors reported that zero percent of the children at risk for autism showed facial concern, whereas almost two-thirds of the typically developing children and about half of the developmentally delayed children did so. Consequently, researchers have suggested

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that ASD is related to reduced empathic responding (e.g., Bacon et al. 1998; Bons et al. 2013), although it remains open whether the difficulties might stem from emotional processes (Nuske et al. 2014), or is driven by reduced cognitive empathy (Schwenck et al. 2012).

Yet, far less is known about their resource allocation behavior and their helping behavior. This is important given that recent research provided extensive evidence that prosocial behavior consists of different subtypes that have their unique characteristics and that do not relate well to each other (Dunfield and Kuhlmeier 2013; Paulus et al. 2013). Two studies focused on helping behavior in ASD children. Liebal and colleagues (2008) demonstrated that 2- to 5-year-old children with ASD and general developmental delay showed no difference in their rate of helping behavior, suggesting no specific deficit in helping for ASD children. In contrast, Sigman and Ruskin (1999) showed a reduced helping rate in 10- to 13-year-old ASD children compared to children with Down syndrome. However, both studies did not compare ASD children to a group of NT children. Thus, further research would be helpful to examine in greater detail whether or not ASD children show a reduced rate of helping behavior.

Surprisingly, even less is known about ASD children's behavior in classical resource allocation tasks even though they have been studied heavily in developmental psychology in the past years (e.g., Fehr et al. 2008; Moore 2009; Olson and Spelke 2008; Smith et al. 2013). Recently, Schmitz et al. (2015) presented 9- to 15-year-old ASD and NT children with a dictator game in which they could decide in different trial types how to distribute coins between themselves and an anonymized other. In all trial types, an equal distribution (i.e., one coin for everyone) was pit against another distribution (for example, two coins for the other recipient and one coin for self, or vice versa). Results showed that both groups had an inclination to opt for the equal option. Yet, ASD children were more likely to depart from the equal distribution (e.g., 1–1) when one of the recipients could benefit from that without harming the other (e.g., 2–1). This was the same irrespective of whether the benefitting party was self or other. This pattern is in strong contrast to other results from NT children demonstrating a strong reliance on equality (Shaw and Olson 2012). This might indicate that ASD children have a more instrumental view on resource allocation decisions and might focus less on equality.

The current study was designed to explore in greater detail the development of prosocial behavior in ASD children. Given the scarcity of research on helping and sharing in ASD children, we decided to focus on these behaviors. Given that recent research demonstrated the emergence of prosocial behaviors in the first years of life (Paulus 2014a) and given that resource allocation scenarios have successfully been employed with 3-year-old children, we decided to study a sample of preschool-aged children.

We included an instrumental helping task in which an experimenter pretended to accidentally drop an item on the floor while leaving the room (similar to previous work, e.g., Kenward et al. 2015). We decided to rely on this task as it assesses children's inclination to help without immediate social reward or creating an opportunity for engaging with the helpee (Carpendale et al. 2015; Hammond 2014). Moreover, it does not include direct requests for help or other social signals provided by the helpee (as implemented in other paradigms, e.g., Svetlova et al. 2010), as this might pose additional difficulties for persons with ASD (Aldaqre et al. 2016). We assumed that this task might be a clearer indicator for young children's motivation to help another person.

To examine children's sharing and resource allocation behavior, we used a modified version of a mini-dictator game in which children could decide how to distribute valuable resources between three parties, themselves and two others. One of the recipients was a poor child with limited resources, whereas the other recipient was a rich child with plenty of resources. We decided to rely on this task as it allowed us to assess a number of factors that have been suggested to play a role. That is, we could see whether children would prioritize their own self-interest by allocating themselves the majority of resources (Smith et al. 2013). In addition, we could see to which extent children adhere to a norm of equal sharing or would show a developing inclination to preferentially allocate resources to the needy other instead of to the rich other. If it is true that ASD children strongly favor instrumental goals over relationship requirements and social goals (Dawson et al. 2004), we would expect a greater promotion of their own self-interest.

Methods

Participants

The final sample included 23 children with ASD (age range 3–6 years; mean age 55.7 months, SD 12.36; 21 boys) and 37 typically developing (TD) children (age range 3–6 years; mean age 57.3 months, SD 12.11; 32 boys). Age was not different between groups, $t(58) = 0.49$, $p = .627$. Seven further ASD children were not included due to an inability to understand task instructions. Following DSM-5, 14 children were classified with severity level 1, seven children were classified with severity level 2, and two children were classified with severity level 3. Henceforth, this classification will be referred to as autism coefficient. Child gender in the TD group was matched to the rate in the ASD group. An assessment of children's cognitive abilities by means of

a classical Corsi block task (for details see below) revealed no difference between groups, $t(58) = 0.77$, $p = .446$. Children were Catalan speakers from heterogeneous socioeconomic backgrounds. The TD children were recruited from a Catholic charter day care center and school. The ASD children were recruited from early childhood care centers in the southern area of Catalonia (Spain). Inclusion criteria for this group were that children should be 3–6 years old, being diagnosed by a certified clinician, and categorized following DSM-5. The study followed the ethical principles outlined in the 1964 Declaration of Helsinki. The caregivers of children in both groups gave informed consent for participation.

Materials

The materials for the sharing task included different cardboard cut-outs. One set of cardboard cut-outs consisted of pictures of single preschool-aged boys and girls. Another set consisted of pictures demonstrating houses as well as children's rooms. Some pictures showed "high-wealthy" houses (e.g., big house, freshly painted, beautiful garden, trees and flowers) and related children's rooms (e.g., colorful, full of toys); the other pictures showed "low-wealthy" houses (e.g., small house, two little windows, dilapidated, no garden) and related children's rooms (e.g., dreary, no toys). Further materials for the sharing task were ten stickers.

For the helping task, a pencil pot and pens were used. For the memory task, a 4×5 grid with squares of the same color was employed.

To provide a continuous measure of the severity of autistic characteristics, a common Spanish translation of Autism Spectrum Quotient-Children's Version (AQ-Child; Martinez n.d.) was administered to the parents of the ASD children. The AQ-Child is a 50-item parent-report questionnaire developed to detect autistic traits in preschoolers and children until the age of 11 years. The psychometrical properties indicate high sensitivity and specificity, good test–retest reliability, and high internal consistency (Auyeung et al. 2008). Following parental evaluation, children had a mean score of 85 (SD 21.7).

Procedure

Children were tested individually in a quiet room of their day care center by a female experimenter. Experimental sessions were videotaped for later coding and analyses. Children were accompanied by a care person who backed out from the child's interaction with the experimenter and remained silently in the background (similar to other studies, e.g., Warneken and Tomasello 2006).

Cognitive performance

In order to have a language-free estimator of cognitive abilities, working memory was evaluated with a Corsi block-tapping test (Pagulayan et al. 2006). The task consists of reproducing the sequence that the researcher taps at a grid with identical, spatially separated blocks. Children received first two familiarization trials. In the critical test trials, participants were first confronted with two trials in which the experimenter tapped two blocks (i.e., children had to remember and reproduce the correct sequence of the two taps). Then, two trials with three blocks, two trials with four blocks, and so on followed. The task was stopped once children made two consecutive errors in the same level, and the previous level (at which children reproduced at least one sequence correctly) therefore constituted their performance score. Given the task's stopping rule, data were coded online by the experimenter. An offline recoding of 22 children by a second person blinded to the hypotheses of the study showed a perfect agreement.

Sharing behavior

The protocol was based on previous work exploring the impact of others' material need on children's resource allocations (e.g., Paulus 2014b; Zinser et al. 1975). Children were seated in front of a table. Two cardboard cut-outs with gender-matched children representing the two recipients were placed in front of the participant: one displayed a wealthy child and the other one a poor child. The participants were familiarized with the two recipients, describing their respective homes and children's rooms. Both recipients were introduced with the same intonation in order to avoid presenting one recipient cheerfully and the other one with pity. Also they were presented as liking stickers a lot. Subsequently, the participants received ten stickers and, adopting previous protocols (e.g., Benenson et al. 2007; Paulus 2016), they were invited to distribute the stickers between themselves, the wealthy recipient, and the poor recipient.

Helping behavior

The instrumental helping task followed previous work with same-aged children (e.g., Kenward et al. 2015). The experimenter pretended to need to leave the room and, when walking along the table, accidentally dropped a pencil pot on the floor, so that the pencils fall to the ground. The pot was fabricated from iron and made therefore noise when falling to the ground. The experimenter made no verbalizations and gave no social cues to indicate that the pencils should be picked up (cf. Kenward et al. 2015). This phase

lasted for 30 s, after which the experimenter returned to the room.

Analysis

Sharing task

We coded the number of items children allocated to the rich recipient, the poor recipient, and to themselves. Twenty-two children were coded by a second person blinded to the hypotheses of the study. Raters showed 100% agreement.

Data were analyzed by a 2×3 mixed-model analysis of variance (ANOVA) with the between-subject factor Group (ASD, NT) and the within-subject factor Recipient (Rich recipient, Poor recipient, Participant). That is, the latter factor represents dependent measures. In a second analysis, age (in months) and memory performance were entered as covariates.

Helping task

We coded whether or not children engaged in helping behavior. Helping behavior was coded when children picked up the pencils from the ground and put it back on the table before the experimenter entered the room (cf. Kenward et al. 2015). Other behaviors (e.g., taking the pencil and merely playing with the object themselves) were not coded as helping behavior. Twenty-two children were coded by the second person blinded to the hypotheses of the study. Raters agreed in all cases on the classification. Given the nominal nature of the variable, data were analyzed by a Chi-square test.

Results

Sharing task

The ANOVA revealed a significant main effect of recipient, $F(2, 116) = 11.20$, $p < .001$, $\eta_p^2 = 0.16$, which was further qualified by a significant interaction between recipient and group, $F(2, 116) = 5.66$, $p = .005$, $\eta_p^2 = 0.09$. Given that every participant in each group was supposed to distribute ten stickers (that is, in both groups the mean of distributed stickers was ten with zero variance), we did not analyze the main effect of group. Adding age (in month) and working memory as the covariates in the analysis revealed the same interaction effect between recipient and group, $F(2, 112) = 5.20$, $p = .007$, $\eta_p^2 = 0.09$.

To follow up on the interaction, we conducted separate analyses for the two groups. The ANOVA for the ASD group revealed a significant effect of recipient, $F(2, 44) = 11.87$, $p < .001$, $\eta_p^2 = 0.35$, whereas there was no effect for the NT group, $F(2, 72) < 1$. Paired samples t tests for the ASD group between the recipients revealed that the participants gave more items to the rich recipient than to themselves, $t(22) = 4.35$, $p < .001$, and to the poor recipient than to themselves, $t(22) = 3.96$, $p = .001$. There was no difference between the rich and poor recipients, $t(22) = 1.04$, $p = .31$. Overall, the results demonstrate that children in the NT group gave each participant the same number of items, whereas children in the ASD group gave more to other recipients than to themselves.

In addition, between-group comparisons demonstrated that the ASD group gave significant less items to themselves than the NT group, $t(58) = 2.87$, $p = .006$, while they gave more to the rich recipient than the NT group, $t(58) = 2.46$, $p = .017$. There was no significant effect for the poor recipient, $t(58) = 0.97$, $p = .334$ (Fig. 1).

Helping task

In the ASD group, 14 children (61%) engaged in helping behavior, whereas nine children (39%) did not show helping. In the NT group, this pattern was reversed with ten children (27%) engaging in helping and 27 children (73%) not engaging in helping. It should be mentioned that four NT children only verbally told the experimenter (after her return) that the object fell to the ground without engaging in instrumental helping. According to our a priori criterion, this behavior was not coded as help. The Chi-square test revealed that the two groups differed in their rate of helping behavior, $\chi^2(1, N = 60) = 6.77$, $p = .009$. This indicates that the ASD group showed a greater inclination to help the other person than the NT group.

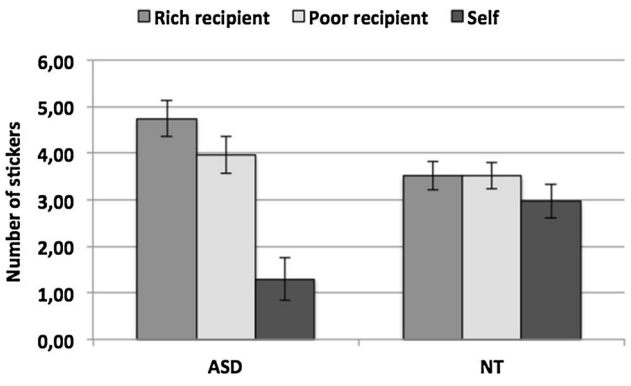

Fig. 1 Results of the sharing task. The *bars* show the number of items allocated to the respective recipient. *Error bars* indicate the standard errors of the means

Interrelations between the prosocial measures

To assess potential interrelations between the prosocial measures, we ran correlations between the helping score and children's sharing with each of the three different recipients. There was no correlation, either for the control group (all $ps > 0.16$) or for the ASD group (all $ps > 0.20$), indicating that helping and sharing behaviors were not related to each other.

Correlates of prosocial behavior in ASD children

To further examine ASD children's prosocial behavior in greater detail, we assessed the relations between children's prosocial responding and their cognitive abilities as well as autistic traits by means of correlational analyses (see Table 1). The analyses demonstrate that higher cognitive abilities were associated with a reduced generosity toward the rich recipient (and a tendency to give more to the poor). In addition, more severe autistic traits were related to an increased generosity toward the rich recipient (and a tendency to give less to the poor). Importantly, it should be noted that cognitive abilities and the autism coefficient were highly interrelated, $r = .744$, $p < .001$, indicating a common source of the correlations with ASD children's generosity toward the rich recipient. In NT children, memory did not correlate with any of the prosocial measures (all $ps > 0.30$).

Discussion

The current study investigated prosocial behavior in a sample of children with autism spectrum disorder (ASD). Compared to a neurotypically (NT) developing control group, ASD children displayed more spontaneous and unsolicited helping behavior. In a resource allocation task, ASD children kept only a minimal number of items for themselves while allocating the majority of items to the other recipients. The NT children, in contrast, realized an equal distribution amongst all potential recipients. Overall, the results indicate differences between the different forms of prosocial behavior in ASD and NT children. In the following, we will first discuss participants' performances in the single tasks, before considering the relations between the tasks and the additional measures.

Table 1 Intercorrelations between ASD participants' characteristics, and their behavior in the helping (first column) and sharing task (second to fourth column)

	Helping	Rich	Poor	Self
Memory	$r = .18$ $p = .405$	$r = -.42$ $p = .047^*$	$r = .38$ $p = .077^+$	$r = .11$ $p = .626$
Autism coefficient	$r = -.23$ $p = .286$	$r = .46$ $p = .028^*$	$r = -0.38$ $p = .074^+$	$r = -.15$ $p = .501$
AQ-R	$r = .11$ $p = .621$	$r = -.13$ $p = .546$	$r = .02$ $p = .924$	$r = .13$ $p = .564$

$^*p < .05$; $^+p < .10$

The resource allocation task required children to distribute resources between themselves, a poor recipient, and a rich recipient. The NT children followed a strict equal distribution and gave all three recipients approximately the same amount of resources. This finding relates well to the literature demonstrating a strong concern for equality in preschool children (e.g., Schmidt et al. 2016; Thompson et al. 1997; Wörle & Paulus, in press). Whereas some studies had reported a shift to a preference for a poor versus a rich other toward the end of the preschool years (e.g., Paulus 2014b), such a trend was not yet visible in our mixed-age sample.

Interestingly, the pattern of the ASD children differed considerably. ASD children gave the vast majority of resources to the other recipients, while keeping only a small amount for themselves. The results suggest that children with ASD took, contrary to our hypothesis, actually less advantage of the situation and care less about their own gains. How to interpret this finding? Here, we would like to point out two (not mutually exclusive) considerations. First, our results could indicate that ASD children might care less about themselves and might be happy with a minor number of resources as long as they receive something. In addition, ASD preschool children might not have a strong sense for fairness and inequity aversion, and might therefore be less inclined to ensure that everyone gets exactly the same. Interestingly, even 3-year-old NT children react strongly when not receiving the same as others (LoBue et al. 2011).

Notably, a recent study showed that older (mean age 12 years) children with ASD have a weaker inclination to rely on equal distribution than their NT peers: when there was a possibility to increase overall gain without hurting some, would they—in contrast to their NT peers—depart from the equal option (Schmitz et al. 2015). These results relate to the current finding in so far as in both studies the NT groups demonstrated a stricter reliance on equality than the ASD groups. Across both studies, the pattern of results suggests that a reliance on equality might be a later emerging outcome in ASD children and might not be as rigidly followed as in NT children. Notably, the two studies used different paradigms and different age groups. Further work is required to investigate in greater detail whether or not ASD and NT children show differences in self-interest and/or inequity aversion, and whether or not these phenomena show different developmental trajectories in both groups.

In addition, ASD children gave more resources to the rich recipient than NT children. This finding is interesting

as current research showed that in the course of the preschool years NT children start to give less resources to rich others and more resources to poor others (e.g., Paulus 2014b). In addition, further analyses showed that the more severe ASD children's problems were and the less cognitively able they were, the more they were inclined to give resources to the rich recipient (mostly on expense of the poor recipient). This might represent a tendency to give to the lucky, which has also been reported for younger NT preschool children (e.g., Olson et al. 2006). The fact that it was positively associated with degree of severity and negatively related to cognitive abilities could indicate that cognitive effort or cognitive sophistication is necessary to overcome such a bias at this age, which could explain the disappearance of this tendency in older preschool children (Paulus 2014b). This interpretation fits well to a recent work suggesting that in preschool children an implicit affective mechanism leads to preference for advantaged individuals, while it takes explicit reasoning to rectify inequalities, i.e., give more to the poor (Li et al. 2014). However, two caveats should be taken into account: first, although the between-group comparison revealed a greater tendency for ASD children to give to the rich than for NT children, the comparisons within the ASD group showed no preference to give more to the rich than to the poor. Second, it should be noted that cognitive abilities and degree of severity were strongly related. Thus, given the restricted variance, the interrelation between both correlates, and the small sample, these results should be interpreted with caution.

With respect to helping behavior, a different picture emerged. ASD children engaged in helping behavior to a high extent that was comparable to previous experiments (Liebal et al. 2008). In the current study, their rate of helping even exceeded that of the NT control group. The helping rate of the latter group was rather low. This finding relates to previous research demonstrating that reduced cues by the helpee (e.g., the helpee not noticing the event and the need for help) led to a reduced helping rate compared to other studies (Warneken 2013). The current results extend this work by showing that a complete absence of the helpee leads to a reduced propensity to engage in instrumental help by NT preschool children (i.e., putting the objects back on the table).

Interestingly, this was not the case for the ASD group who engaged in more helping behavior than NT children. This finding argues against a general deficit of engaging in prosociality in children with ASD. In contrast, it draws our attention to the specific conditions that support prosocial responding in both groups. One interpretation of our findings is that the social connection with the experimenter plays a central role in NT children's helping behavior (Carpendale et al. 2015) so that its lack reduces their propensity to engage in helping. ASD children, in contrast, are less affected by the potential interaction with the helpee and therefore their propensity for instrumental helping is high despite his absence. This interpretation is in line with the findings of a reduced social motivation in children with ASD (e.g., Dawson et al. 2004). One corollary of this interpretation is that helping behaviors in both groups might be differently affected by social contexts.

On a greater theoretical level, this finding speaks to the nature of young children's helping. The fact that NT children's help was quite low in our nonsocial context relates to claims that NT children's helping is, at least partly, motivated by experiencing pleasure through the social interaction with the other person (Carpendale et al. 2015; Hammond 2014). That is, NT children's instrumental helping might not be indicative for an altruistic motive, but rather for a social or affiliative motive (Paulus 2014a). Children with ASD have been suggested to show a higher interest in objects and the physical world, and less motivation to interact with the social world (Chevallier et al. 2012). One possibility is that their high propensity to engage in instrumental helping in the absence of the helpee could be motivated by their interest in restore the order of the objects (e.g., the pencils belong into the pot, which belongs on the table). This interpretation relates to the fact that stereotyped behavior (e.g., putting things in a fixed order) is a symptom for autism. Both interpretations point to the fact that instrumental helping behavior may be caused by a range of social and nonsocial mechanisms (Paulus 2014a). Note, however, that our considerations are based on the results of a between-group analysis. We did not systematically manipulate the presence of the helpee in the current study. Further research that systematically manipulates the social context to explore this hypothesis in greater detail is needed.

It should be noted that we did not find interrelations between children's performances in the different tasks. This was true for the NT as well as the ASD group. This finding is in line with a large body of evidence demonstrating that the different instances of early prosocial action do not relate to each other, constituting thus different and independent domains of early prosociality (for reviews, see Dunfield 2014; Paulus 2014a). The current study extends this line of research—despite differences between ASD and NT children within a particular domain—by demonstrating for the first time that also in children with ASD the domain specificity of the variety of prosocial behaviors remains preserved.

The current study has also some limitations and leaves us with open questions. First, although our results, in comparison with the pattern of behavior found in other studies (e.g., Warneken and Tomasello 2006), indicate that social contact might play a different role in NT and ASD children's instrumental helping, the current study did not systematically manipulate this factor. Second, we observed

that few NT children who did not engage in instrumental helping told the experimenter after her return about the pens. The function of this verbal statement remained unclear (e.g., directive, informative, or expressive), but it is interesting to note that these children choose a communication interaction with the experimenter instead of providing help. As we did not observe the same phenomena in ASD children, it would be interesting to investigate in greater detail how NT and ASD react to others' misfortunes. Third, although our working memory test did not reveal performance differences between groups, it would be desirable to include a more extensive assessment of children's cognitive functioning to be able to draw stronger conclusions. We have to leave it to future research to address these issues.

Taken together, the current study represents the first step in the examination of the early ontogeny of prosocial behavior in ASD children. It demonstrates the differences in ASD and NT children's prosocial behavior across two different tasks. ASD children showed less concern for strict equal resource distributions as they were more inclined to give resources to others than to keep for themselves. In addition, ASD children were more likely than NT children to instrumentally help another person in her absence. Similar to NT children, there was no correlation between both forms of prosocial behavior indicating that prosocial behavior is also in ASD children a multifaceted construct.

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