RESEARCH ARTICLE

Spontaneous Helping Behavior of Autistic and Non-autistic (Pre-)adolescents: A Matter of Motivation?

Rachel A. G. O'Connor ![ORCID], Lex Stockmann, and Carolien Rieffe ![ORCID]

Young autistic people have a range of social difficulties, but it is not yet clear how these difficulties can be explained. In addition, emerging research is suggesting that autistic girls may differ from boys in terms of their social behaviors, but yet unknown is if they differ in terms of their pro-social behavior, such as helping. The present study investigated spontaneous helping behavior using an in vivo paradigm and related this to participants' levels of social motivation (based on parent reports). Participants were 233 autistic and non-autistic (pre-)adolescents (*M* = 12.46 years, *SD* = 15.54 months). Our results demonstrated that autistic girls and boys have lower levels of social motivation compared to their non-autistic peers, but social motivation was unrelated to helping behavior in both groups. Furthermore, when the experimenter needed help, the autistic boys and girls looked and smiled to the same extent as their peers of the same gender, but they actually helped significantly less than their non-autistic peers. However, most autistic youngsters did help, highlighting the great individual differences in autistic individuals. We discuss the possibility that lower levels of helping behavior are due to difficulty initiating action in a social context, rather than lower social motivation. *Autism Res* 2019, 12: 1796–1804. © 2019 The Authors. *Autism Research published by International Society for Autism Research* published by Wiley Periodicals, Inc.

Lay Summary: This study examined the helping behavior of autistic boys and girls (aged 9–16). Many autistic young people did help, but compared to non-autistic individuals, autistic people did not help as much. This study also showed that when people did/did not help, it was not related to their interest in social relationships. It is important to teach young autistic people when and how to help others, to support them making friends.

Keywords: pro-social; helping; autism; gender; social motivation

Introduction

Pro-social behavior involves actions that support another person in some way, such as helping someone to pick up some fallen pencils, or giving a hand when someone is carrying some heavy books. It is believed that we are motivated to engage in such pro-social acts in order to build social bonds with others [Paulus, 2018]. However, young autistic people are often less motivated by social rewards [Chevallier, Kohls, Troiani, Brodkin, & Schultz, 2012]. Indeed, individuals with higher autistic traits generally report less pro-social behavior, even when they have knowledge of the social rules they are required to follow [Jameel, Vyas, Bellesi, Cassell, & Channon, 2015]. Worryingly, being less pro-social can have adverse consequences, especially when it comes to social relationships. It is associated with being a less desirable friend [Goossens, Bokhorst, Bruinsma, & Van Boxtel, 2002] and being less likely to have a best friend [McDonald, Wang, Menzer, Rubin, & Booth-LaForce, 2011]. Pro-social behavior is especially important for young people as they transition into adolescence, when peers become of greater importance [Nelson, Jarcho, & Guyer, 2016]. At this point, youngsters start spending more time with peers than with parents [Silbereisen, 2001], as well as turning to friends for advice and support [Berndt, 1992]. Hence, considering the peer difficulties that autistic adolescents already face [Rowley et al., 2012], the issue of their pro-sociality becomes a vital one. The present study aims to examine one type of pro-social behavior—helping—among autistic and non-autistic (pre-)adolescents and its relation to their social motivation.

Pro-social behavior implies a voluntary act intended to benefit someone else, generally with no direct benefit for oneself [Eisenberg-Berg, 1986]. It is considered to be a response to an inferred negative state of another person [Dunfield, 2014]. There are numerous types of negative experiences that one could observe, thus, categorizing pro-social behavior into three subtypes based on the stimulus helps us to better understand the occurrence of such behaviors [Dunfield, 2014]. These subtypes are

helping, comforting, and sharing, where *helping* is a response to an instrumental need (e.g., picking up someone's dropped pencil), *comforting* is a response to an emotional need (e.g., offering words of support when a friend is stressed about a test), and *sharing* is a response to a material need (e.g., offering a chocolate to someone when you have a full box but they have none; Dunfield, 2014).

Each subtype of pro-social behavior has unique characteristics and developmental trajectories, and thus it is important to consider each individually when it comes to the behavior of autistic children and adolescents [Dunfield & Kuhlmeier, 2013]. In terms of sharing behavior, despite an abundance of anecdotal data indicating a deficit and many interventions focused on increasing sharing in autistic children [Lane & Ledford, 2016], when presented with resource allocation tasks they show similar sharing tendencies to their non-autistic peers [Sally & Hill, 2006; Schmitz, Banerjee, Pouw, Stockmann, & Rieffe, 2015; Hartley & Fisher, 2018] and have even been shown to share more resources than their peers [Paulus & Rosal-Grifoll, 2017]. With regard to comforting, although autistic children express less facial concern [Butean, Costescu, & Dobrean, 2014], they engage in equal amounts of verbal and nonverbal comforting as their non-autistic peers when someone expresses physical pain [Butean et al., 2014; Travis, Sigman, & Ruskin, 2001; Bacon, Fein, Morris, Waterhouse, & Allen, 1998] or appears visibly upset when excluded from a ball-tossing game [Deschamps, Been, & Matthys, 2014]. While it may be helpful to understand more nuanced aspects of the sharing and comforting behavior of young autistic people, the current literature indicates that they are equally as pro-social as their peers in these areas. However, there is currently less clarity with regard to the helping behavior of autistic children and adolescents.

Helping behavior has been measured in structured laboratory settings, whereby opportunities for the participant to help the experimenter are presented in a candid way while other tasks are being completed. For example, the experimenter "accidentally" drops a pen on the floor so that it is out of reach to the experimenter, but close to the participant [Liebal, Columbi, Rogers, Warneken, & Tomasello, 2008] or the experimenter holds a full tray while standing near a table that is covered in objects [Travis et al., 2001]. While such studies have often shown that autistic preschool children help less frequently than their non-autistic peers [Liebal et al., 2008; Bacon et al., 1998], in one study, when the experimenter "accidentally" knocked over a pot of pencils while leaving the room, they were actually observed to help *more*, by picking up the fallen pencils and returning them to the desk [Paulus & Rosal-Grifoll, 2017]. When it comes to older autistic children and adolescents, the only study that exists so far has shown that they help significantly less than their non-autistic peers, although the actual difference in helping behavior between groups was marginal [Travis et al., 2001].

All pro-social behavior requires three key factors: the ability to recognize the negative experience of another person, the knowledge of an appropriate response and, importantly, a motivation to act [Dunfield, 2014]. In terms of helping behavior specifically, this motivation is thought to come from a desire to interact with and develop social bonds with others [Paulus, 2018]. However, young autistic people are believed to be less socially motivated than their non-autistic peers [Chevallier et al., 2012], which is a proposed explanation for decreased orientation to social stimuli [Chevallier et al., 2012; Dawson, Meltzoff, Osterling, Rinaldi, & Brown, 1998; Crawford et al., 2016] and inefficient social reward processing [Bottini, 2018; Clements et al., 2018]. Possibly, lower social motivation is therefore related to reduced helping behavior of young autistic people. It should be noted, however, that so far the majority of research on the social motivation of autistic people has been based on predominantly male samples, and therefore may not be applicable to autistic girls.

Autism in girls is less understood than it is in boys, likely because it is more difficult to detect, especially in those with an average or above average IQ [Gould, 2017]. In recent years, more attention has been paid to understanding potential gender differences in autism, which has revealed that autistic girls are superior to their male peers in masking or camouflaging their social difficulties [Hull et al., 2017; Dean, Harwood, & Kasari, 2017], which often results in missed or misdiagnoses [Gould & Ashton-Smith, 2011]. One proposed reason for this difference is that autistic adolescent girls are more socially motivated than boys, which has some support in the literature [Sedgewick, Hill, Yates, Pickering, & Pellicano, 2016] and although such quantitative findings are thus far inconsistent [Factor, Condy, Farley, & Scarpa, 2016; Frazier, Georgiades, Bishop, & Hardan, 2014], qualitative studies including autistic women and girls indicate a strong desire for social interactions and close friendships [Foggo & Webster, 2017; Sedgewick, Hill, & Pellicano, 2019]. Interestingly, this possible gender difference in social motivation is not observed in the community population [Sedgewick et al., 2016].

In terms of pro-social tendencies, non-autistic girls report more instances of helping, sharing, and comforting behavior than boys [Carlo, Padilla-Walker, & Nielson, 2015], but these outcomes are based on self-report, and to our knowledge no studies have examined this difference using an in vivo task. Thus, these previous results may not reflect actual pro-social behavior, but rather the socialized expectation for girls to be more nurturing and caring. Very young autistic girls have been shown to help more than their male counterparts [Bacon et al., 1998], but until now no studies have examined this gender difference in (pre-)adolescents. It is particularly crucial to understand any gender differences in the pro-social behavior of young autistic people who have cognitive abilities in the average or above

range, considering that it is these girls whose autism goes unnoticed in mainstream classrooms [Gould, 2017].

Not only is the pro-social action itself important, but how individuals communicate pro-social intents is also essential. As humans, we are continuously communicating our emotions, thoughts, and intentions via verbal and nonverbal cues [Darwin, 1872]. Indeed, this also applies to our pro-social intentions, whereby a smile can be perceived as an indicator of imminent pro-social action [Brown & Moore, 2002]. Meanwhile, it can simultaneously communicate a desire to initiate or maintain a social bond [Martin, Rychlowska, Wood, & Niedenthal, 2017] and thus is a key social communicative tool. However, autistic people are characterized as having deficits in nonverbal communication [American Psychiatric Association, 2013], which may limit their ability to communicate pro-social intent. This being said, to our knowledge no research currently exists comparing the smiling responses of young autistic and non-autistic people in response to an instrumental need.

In general, non-autistic female adolescents tend to smile more often than their male peers in a wide variety of situations, but in particular when involved in an interaction with an unfamiliar person [LaFrance, Hecht, Levy Paluck, & Cooper, 2003]. Socialization is thought to be the driving factor in gender differences in smiling behavior, due to the different gender roles of men and women, whereby women traditionally have less power than men [Henley, 1977] or due to their socialized need to please others [Chaplin, 2015]. While there is a small gender difference during childhood, the effect begins to peak during the adolescent years, likely due to the increased emphasis on gender roles at this stage of life [Chaplin, Aldao, & Hinshaw, 2013]. As young autistic people do not learn from their social environment as readily as their peers without, and they have known deficits in nonverbal communication, we may expect smiling responses different to those of their non-autistic peers. Thus, while a clear gender difference in smiling behavior exists among non-autistic (pre-)adolescents, we cannot assume that the development of smiling behavior in autistic youngsters will be the same.

The Present Study

This study intends to examine the differences in response to another's instrumental need between male and female, autistic, and non-autistic (pre-)adolescents, including their attention to the event (i.e., looking), their appropriate nonverbal communication (i.e., smiling), and their pro-social behavior (i.e., helping). Furthermore, we will compare the social motivation of autistic boys and girls, as well as investigate the relation between social motivation and pro-social responses to instrumental need.

To first determine if autistic and non-autistic individuals notice and attend to the individual in need to the same extent, their behavior of looking at the experimenter when their instrumental need emerges was measured. In line with the social motivation hypothesis [Chevallier et al., 2012] and previous studies demonstrating that autistic individuals orient less toward social stimuli, we hypothesized that autistic boys and girls would look less at the experimenter than non-autistic individuals.

In terms of smiling behavior, considering previous research, we expected that non-autistic females would smile more than non-autistic males [LaFrance et al., 2003]. In line with social learning theory, we predicted that autistic (pre-)adolescents would smile less than their non-autistic peers and that no gender difference would be observed in autistic (pre-)adolescents.

Based on the outcomes of previous research, we expected autistic (pre-)adolescents would help less than their non-autistic peers [Travis et al., 2001; Bacon et al., 1998; Liebal et al., 2008]. In line with previous research observing young autistic children [Bacon et al., 1998], we hypothesized that autistic girls would help more than their male peers.

In terms of social motivation, we predicted that autistic females would have higher social motivation than autistic boys [Sedgewick et al., 2016]. We also expected that social motivation would be positively related to helping behavior across both groups.

Method
Participants

The participants of this study were recruited as part of a larger on-going research project on social–emotional development in young people with autism, hearing loss, and language impairments, some results of which have been published elsewhere [e.g., Broekhof, Bos, Camodeca, & Rieffe, 2018; Kouwenberg, Rieffe, Theunissen, & Oosterveld, 2012; Rieffe, De Bruine, De Rooij, & Stockmann, 2014]. A total of 233 children and adolescents between the ages of 9 years, 11 months and 16 years, 3 months ($M = 12.47$ years, $SD = 15.54$ months) participated in the present study. Of this sample, 88 autistic young people (16 females/72 males) were recruited from the center of autism, special education schools, and other support organizations. All children in this group were diagnosed by trained psychologists independently of this study according to the DSM-IV-TR [American Psychiatric Association, 2000] and based on the Autism Diagnostic Interview-Revised [Lord, Rutter, & Le Couteur, 1994]. The comparison group consisted of 145 non-autistic children, of whom 85 were female and 60 were male. Participants in this group were recruited from regular primary and secondary schools.

Materials

IQ was measured using either the performance WISC, SON-r, Wechsler nonverbal score, Dutch intelligence for education symbolic scale, the Dutch differentiation test, or

using two subtests of the WISC [Kort et al., 2002; Wechsler, 1991]: block patterns and picture arrangement, in order to calculate mean IQ indication scores. Participants with an IQ below 70 were not included in this study.

The Social Responsiveness Scale (SRS; Constantino & Gruber, 2005) was completed by parents of the participants, to measure characteristics of autism. The scale consists of 65 items with responses on a 4-point scale, where higher scores indicate greater severity of autistic symptoms. The SRS subscale "social motivation" measures the extent to which an individual is generally motivated to engage in social and interpersonal behavior, and also contains elements of social anxiety, inhibition, and empathic orientation. The subscale consists of 11 items of the SRS, where higher scores indicate less social motivation; this was used to represent the social motivation of the participants. The social motivation subscale has excellent reliability, $\alpha = 0.86$. Scores on the SRS were converted to gender specific t-scores according to the Dutch SRS manual [Roeyers, Thys, Druart, De Schryver, & Schittekatte, 2011] and these t-scores were used in subsequent analysis and are referred throughout this article.

Procedure

Permission for this study was granted by the ethics committee of Leiden University, department of psychology and written informed parental consent was gained from all parents of the participants beforehand. Testing sessions were videotaped, lasted approximately 1 hr and took place in a quiet room at the children's school or home. The measures described in this article are part of a larger research project, which includes additional measures that are not reported here.

The "matches task," designed to elicit helping behavior, was administered amidst other tasks. For this task, the experimenter told the participant that they were about to work on a puzzle using matches. The experimenter then produced a matchbox. While doing so, he or she "accidentally" held it upside-down, dropping the matches on the floor in the process. He or she then said "Oh, well, how stupid." The experimenter then looked at the matches on the floor for 3 sec before picking them up him or herself, if the participant was not helping. Following this, a puzzle involving matches was done.

Scoring

Three items were scored; these were whether the subject (a) looked at the tester, (b) smiled, and (c) helped the tester to pick up the matches. The behavior of the participants was coded by the experimenter during the session. For all items, behavior was coded as *not* shown (i.e., did not look, smile or help the experimenter at all), shown *a little* (i.e., a brief 1–3 sec look/smile, picked up one to two

matches), or shown *much* (i.e., looked or smiled at the experimenter for longer than 3 sec or picked up three or more matches), by assigning a score of 1, 2 or 3 respectively. Finally, a description of the behavior was recorded with any noteworthy instances, for example, matches did not fall from the box as intended.

Statistical Analysis

Missing data. IQ scores were missing for five autistic participants and no non-autistic participants. Parents of 39 participants (15 from the autistic group, 24 from the non-autistic group) did not complete the SRS questionnaire. For three participants there were five or more items from the SRS that were not completed; SRS scores from these participants were omitted from analysis. For participants that had four or less items missing, the median value for that item was entered (as per the instructions of the Dutch SRS manual; Roeyers et al., 2011), such that raw SRS scores and subsequently t-scores could be computed. Cases where data were missing for the "matches task" were identified and the reason for this was identified. In all cases, the reason was either a failure of the matches to fall from the box, or the experimenter forgetting to administer the task. These cases were removed from the data set in advance. A Little's Missing Completely at Random (MCAR) test was conducted, which revealed that missing values were MCAR, $\chi^2 = 37.72$, $df = 29$, $P = 0.129$. Thus, pairwise deletion was deemed appropriate and employed during all analysis.

Assumptions. Assumptions of normality and homogeneity of variance were violated for looking, smiling, helping, and social motivation.

Analysis. First, descriptive data (mean and standard deviation) for each variable were gathered for autistic and non-autistic boys and girls separately. Second, a series of six 2-way between-groups analyses of variance (ANOVA) were conducted to examine the impact of group (autistic/non-autistic) and gender (male/female) on IQ, looking at the tester, smiling, helping, and social motivation. Due to the unbalanced design and violation of the assumption of homogeneity of variance caused by the small sample of autistic girls, Type 3 Sums of Squares were used to control for this. Furthermore, the significance level was set at <0.03 to reduce the chances of a Type 1 error resulting from the aforementioned violation of assumptions. Finally, Spearman correlations were conducted to examine the relation between social motivation and helping behavior for the entire sample and for both groups (autistic/non-autistic) separately. Difference in the strength of this relationship between the two groups (autistic/non-autistic) was calculated using Fisher's r to Z transformation.

Results

Participant Characteristics

See Table 1 for participant characteristics as a function of group and gender. A two-way ANOVA for IQ revealed no effect of group, gender, nor an interaction effect on IQ scores. A two-way ANOVA for total SRS scores showed no effect of gender and no interaction effect, but a significant group effect, $F(1, 189) = 273.20$, $P < 0.001$, indicating higher SRS scores in the autistic group than the non-autistic group (see Table 1).

Looking Behavior

Mean scores and SD of looking at the tester are shown in Table 2 for group and gender. A two-way between-groups ANOVA showed a main effect for group, $F(1, 229) = 5.92$, $P = 0.016$, $\eta^2_p = 0.025$ and gender, $F(1, 229) = 5.27$, $P = 0.023$, $\eta^2_p = 0.022$, but no interaction effect. This indicates that autistic participants looked at the experimenter more often than non-autistic participants and that girls looked at the experimenter more often than boys.

Smiling Behavior

Mean scores and SD of smiling behavior are shown in Table 2 for group and gender. A two-way between-groups ANOVA on smiling behavior showed a main effect for gender, $F(1, 228) = 6.61$, $P = 0.011$, $\eta^2_p = 0.028$, indicating that females smiled more often than males. There was no main effect for group, nor an interaction effect.

Helping Behavior

Mean scores and SD of helping behavior are shown in Table 2 for group and gender. A two-way ANOVA on helping behavior revealed a main effect of group, $F(1, 229) = 6.35$, $P = 0.012$, $\eta^2_p = 0.027$, signifying that autistic participants were significantly less likely to engage in spontaneous helping behavior than their non-autistic peers. There was no main effect for gender, nor an interaction effect.

Looking to the mean scores for each group, the observed difference in actual behavior between groups was small,

which is also reflected in the small effect size ($\eta^2_p = 0.027$). Specifically, the average autistic individual scored 2.44, compared to 2.73 for the non-autistic group, indicating that they were both approaching the maximum score (3). Furthermore, 27.3% of young autistic people did not help the experimenter, compared to 11.7% of non-autistic people. Meanwhile, 71.6% of autistic youngsters and 84.8% of non-autistic individuals helped the experimenter a lot, indicating that the vast majority of individuals in both groups behaved pro-socially.

Social Motivation

Mean scores and SD of social motivation are shown in Table 1 for group and gender. A two-way between-groups ANOVA showed a main effect for group, $F(1, 187) = 90.14$, $P < 0.001$, $\eta^2_p = 0.33$, indicating that autistic participants have significantly lower social motivation than non-autistic participants. There was no main effect for gender, nor an interaction effect.

Relation between Social Motivation and Helping Behavior

A Spearman's correlation indicated that there was no association between social motivation and helping behavior in either group. In addition, the Z-scores were tested and showed no difference in correlation between groups (autistic/non-autistic).

Discussion

The findings of the present study support those of previous research demonstrating the lower spontaneous helping among autistic children and adolescents in the context of an interaction with an unfamiliar adult [e.g., Travis et al., 2001]. Specifically, the autistic individuals seemed to acknowledge the incident by looking at the experimenter and even smiling, but more autistic children stopped short of helping to pick up the matches compared to their non-autistic peers. This being said, a very large proportion of autistic youngsters did help the experimenter, which was

Table 1. Participant Characteristics for Groups: Girls and Boys With or Without Autism: Mean (SD) and Range

	Girls		Boys	
	Autism	Control	Autism	Control
N	16	85	72	60
Age (SD)	12.28 (1.56)	12.26 (1.18)	12.59 (1.38)	12.65 (1.23)
Age range	9.92–16.25	10.17–14.25	10.33–15.50	10.67–15.42
IQ (SD)	101.60	105.48	109.75	105.95
IQ range	(19.10)	(17.09)	(19.11)	(19.04)
SRS (SD)	80.86 (9.94)	49.70 (7.40)	73.39 (11.04)	48.43 (9.15)
SRS range	70–100	39–74	41–93	36–82
SRS motivation (SD)	42.29 (2.09)	37.29 (1.63)	41.67 (2.32)	36.98 (4.46)
SRS motivation range	38–45	35–43	36–47	8–44

Table 2. Mean Scores (*SD*) for Looking, Smiling, and Helping as a Function of Diagnosis and Gender

| | Min–max | Girls | | | Boys | | | Total | | |
		Autism	Control	Total	Autism	Control	Total	Autism	Control	Total
Looking	1–3	2.87 (0.50)	2.47 (0.76)	2.53 (0.74)	2.50 (0.86)	2.27 (0.84)	2.39 (0.85)	2.57 (0.81)	2.38 (0.80)	2.45 (0.81)
Smiling	1–3	2.56 (0.81)	2.16 (0.87)	2.23 (0.87)	1.99 (0.97)	1.98 (0.86)	1.98 (0.92)	2.09 (0.97)	2.09 (0.87)	2.09 (0.90)
Helping	1–3	2.37 (0.96)	2.75 (0.62)	2.69 (0.69)	2.46 (0.89)	2.70 (0.72)	2.57 (0.82)	2.44 (0.90)	2.73 (0.66)	2.62 (0.77)

also observed by Travis et al. [2001], highlighting that many autistic young people are socially capable in this way. Indeed, it emphasizes the importance of considering the great individual differences within any group of autistic young people, as well as the range of social skills that many do possess. Somewhat unexpected was the finding that suggests autistic girls did not differ from the autistic boys when it came to social motivation or spontaneous helping. Also unexpected was that helping behavior was unrelated to social motivation, proposing that lower social motivation may not be able to explain any lower levels of helping.

With regard to smiling, as expected, females smiled more than their male counterparts and particularly noteworthy is that this effect was observed in both autistic and non-autistic (pre-)adolescents. In contrast to our outcomes in relation to helping behavior, this result indicated that autistic youngsters may act within social, and specifically gender, norms when it comes to smiling in this context. For girls and women, smiling is socially expected, in particular throughout (pre-)adolescence [Chaplin et al., 2013], so for the autistic girls, this social smile could be one of the ways they manage to successfully learn from their environment and compensate for their difficulties in front of others [Dean et al., 2017].

Most autistic and non-autistic youngsters did indeed help the experimenter, with a relative minority failing to do so. For those who did not offer help, it seems that this may not have been due to a lack of motivation to engage socially. So, then why did some individuals look and smile, but not take the next step to actually help the experimenter? According to Dunfield [2014], another factor necessary for pro-social action is recognition of the negative situation of the person. Considering the known theory of mind difficulties that many autistic people face [Tager-Flusberg, 2007], perhaps a difficulty recognizing that help is needed led to a lack of action for some individuals in the present study. Interestingly, one previous study has shown that when the experimenter left the room, autistic children actually engaged in *more* helping behavior [Paulus & Rosal-Grifoll, 2017]. This suggests that the presence of the experimenter might have posed a problem for some autistic youngsters. We propose that this might indicate a deficit in social initiative taking tendencies, whereby some young autistic boys and girls do not spontaneously apply (pro-)social knowledge during an interaction as much as their non-autistic peers, despite having knowledge of the appropriate response. This lack of social initiative is observed throughout development in autistic children, first in relation to their joint attention [Bruinsma, Koegel, & Koegel, 2004] and later in terms of their play and communication [Hauck, Fein, Waterhouse, & Feinstein, 1995; Lord & Hopkins, 1986]. Indeed, even in cases when they had the knowledge and a tangible reward was available, autistic pre-adolescents did not readily initiate action [Begeer, Rieffe, Terwogt, & Stockmann, 2003].

Alternatively, lower levels of helping while the experimenter is present may be explained by increased stress responses caused by the social interaction itself, or even the emergence of social expectation (the fallen matches). Young autistic people experience more physiological stress than those non-autistic people while engaged in social situations [Corbett et al., 2014; Corbett, Schupp, & Lanni, 2012] and higher levels of this stress is linked to less social engagement, such as verbal interaction or cooperative play, within that social situation [Corbett et al., 2014]. Therefore, it may have been an increased stress response that prohibited some young autistic people in the present study from helping the experimenter. These are, of course, only some of several possible explanations for lower levels of helping behavior in some young autistic people, which should be examined in future research. Another explanation to consider, for example, could be deficits in empathy (i.e., the empathy-altruism model; Batson, Duncan, Ackerman, Buckley, & Birch, 1981).

It should be noted that the autistic girls in the present study are somewhat of a specific subgroup; these girls have an IQ within the average range and have been diagnosed before entering adulthood. Often autistic girls and women go undiagnosed throughout their childhood and adolescence [Gould & Ashton-Smith, 2011], so it is possible that the results of this study could not be generalized to those females who are evidently particularly skilled at masking their social difficulties throughout their life. In addition, due to the gender imbalance of those diagnosed with autism, only a small sample of autistic girls could be recruited for the present study. Thus, when interpreting

the results of the present study, it must be noted that the generalizability of the findings related to autistic girls is limited. Nevertheless, considering the pressing need for research examining the female autism phenotype, we believe this study has a valuable part to play in the current literature.

The present study employed an in vivo paradigm, allowing for an objective measure of spontaneous helping behavior toward an unfamiliar adult. Furthermore, examining several behaviors (i.e., looking, smiling, and helping) within the overall response to instrumental need allowed us to get a fuller picture of typical responses made by autistic (pre-)adolescents in this context and how they differ from their non-autistic peers. However, it should be noted that a limitation of the present study is the lack of experimenter blinding with regard to diagnostic group, which was impossible due to the differing testing locations. This issue was countered by the provision of specific behavioral scoring instructions, but of course, it cannot be guaranteed that an element of bias was not present. Furthermore, the use of parent reports of social motivation may be problematic, as it indicates only the parents' perception of the young person's social motivation, rather than directly measuring the social motivation of the young person. Specifically, the SRS measures indicators of social motivation as may be observed by onlookers, thus including elements that may not exclusively measure social motivation, but rather may indicate other phenomena, such as social anxiety and inhibition (see Supporting Information for the SRS social motivation subscale), underlining the value of a self-report measure being employed in future research. It would also be helpful for future research to observe behavioral responses to a peer's or family member's instrumental need in order to understand if and how the individual in need affects the behavioral patterns.

This study aimed to make a contribution to our current understanding of gender differences in autistic (pre-)adolescents' pro-social behavior. The findings demonstrated that autistic girls and boys may learn the gender-specific social rules of smiling in this context. It seems only some autistic boys and girls lag behind their peers in their ability to act pro-socially when another's instrumental need is presented, importantly indicating that most autistic youth are equally as pro-social as their non-autistic peers. Nevertheless, considering the evident relation between pro-social behavior and success in friendships, it may be beneficial to incorporate instruction on appropriate helping behavior into social skill interventions for those young autistic people who do not seem to spontaneously do so. Given the great individual differences between autistic people, the present study highlights the importance of conducting a thorough assessment of pro-social tendencies as part of social skill assessments, and targeting these skills as needed. Furthermore, since helping behaviors were likely not related to social motivation, we might suppose that individuals who did not help do want to develop relationships with others, thus supporting them to develop pro-social skills is necessary.

Future research should aim to investigate alternative explanations for why some young autistic people help less than others, as this may have important implications for how interventions should be approached. For example, if heightened stress responses during social interactions do play a role, managing arousal levels would be an important first step in intervention.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

American Psychiatric Association. (2000). Diagnostic and Statistical Manual of Mental Disorders (DSM-4-TR) (4th ed.). Washington, DC: American Psychiatric Press.

American Psychiatric Association. (2013). Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (5th ed.). Washington, DC: American Psychiatric Press.

Bacon, A. L., Fein, D., Morris, R., Waterhouse, L., & Allen, D. (1998). The responses of autistic to the distress of others. Journal of Autism and Developmental Disorders, 28(2), 129–142.

Batson, C. D., Duncan, B. D., Ackerman, P., Buckley, T., & Birch, K. (1981). Is empathic emotion a source of altruistic motivation? Journal of Personality and Social Psychology, 40(2), 290–302.

Begeer, S., Rieffe, C., Terwogt, M. M., & Stockmann, L. (2003). Theory of mind-based action in children from the autism spectrum. Journal of Autism and Developmental Disorders, 33(5), 479–487.

Berndt, T. (1992). Friendship and friends' influence in adolescence. Current Directions in Psychological Science, 1(5), 156–159.

Bottini, S. (2018). Social reward processing in individuals with autism spectrum disorder: A systematic review of the social motivation hypothesis. Research in Autism Spectrum Disorders, 45, 9–26.

Broekhof, E., Bos, M., Camodeca, M., & Rieffe, C. (2018). Longitudinal associations between bullying and emotions in deaf and hard of hearing adolescents. The Journal of Deaf Studies and Deaf Education, 23(1), 17–27.

Brown, W. M., & Moore, C. (2002). Smile asymmetries and reputation as reliable indicators of likelihood to cooperate: An evolutionary analysis. Advances in Psychology Research, 11, 59–78.

Bruinsma, Y., Koegel, R. L., & Koegel, L. K. (2004). Joint attention and children with autism: A review of the literature. Mental Retardation and Developmental Disabilities Research Reviews, 10(3), 169–175.

Butean, I., Costescu, C., & Dobrean, A. (2014). Differences between empathic responses in children with autism spectrum disorder and typically developing children. Journal of Evidence-Based Psychotherapies, 14(2), 197–209.

Carlo, G., Padilla-Walker, L., & Nielson, M. (2015). Longitudinal bidirectional relations between adolescents' sympathy and prosocial behavior. Developmental Psychology, 51(12), 1771–1777.

Chaplin, T. (2015). Gender and emotion expression: A developmental contextual perspective. Emotion Review, 7(1), 14–21.

Chaplin, T., Aldao, A., & Hinshaw, S. P. (2013). Gender differences in emotion expression in children: A meta-analytic review. Psychological Bulletin, 139(4), 735–765.

Chevallier, C., Kohls, G., Troiani, V., Brodkin, E. S., & Schultz, R. T. (2012). The social motivation theory of autism. Trends in Cognitive Sciences, 16(4), 231–239.

Clements, C., Zoltowski, A., Yankowitz, L., Yerys, B., Schultz, R., & Herrington, J. (2018). Evaluation of the social motivation hypothesis of autism: A systematic review and meta-analysis. JAMA Psychiatry, 75(8), 797–808.

Constantino, J. N., & Gruber, C. P. (2005). Social responsiveness scale (SRS). Los Angeles: Western Psychological Services.

Corbett, B. A., Schupp, C. W., & Lanni, K. E. (2012). Comparing biobehavioral profiles across two social stress paradigms in children with and without autism spectrum disorders. Molecular Autism, 3(13), 1–10.

Corbett, B. A., Swain, D. M., Newsom, C., Wang, L., Song, Y., & Edgerton, D. (2014). Biobehavioral profiles of arousal and social motivation in autism spectrum disorders. Journal of Child Psychology and Psychiatry, 55(8), 924–934.

Crawford, H., Moss, J., Oliver, C., Elliott, N., Anderson, G. M., & McCleery, J. P. (2016). Visual preference for social stimuli in individuals with autism or neurodevelopmental disorders: An eye-tracking study. Molecular Autism, 7(24), 24.

Darwin, C. (1872). The expression of the emotions in man and animals. London: John Murray.

Dawson, G., Meltzoff, A. N., Osterling, J., Rinaldi, J., & Brown, E. (1998). Children with autism fail to orient to naturally occuring social stimuli. Journal of Autism and Developmental Disorders, 28(6), 479–485.

Dean, M., Harwood, R., & Kasari, C. (2017). The art of camouflage: Gender differences in the social behaviors of girls and boys with autism spectrum disorder. Autism, 21(6), 678–689.

Deschamps, P. K. H., Been, M., & Matthys, W. (2014). Empathy and empathy induced prosocial behavior in 6- and 7-year-olds with autism spectrum disorder. Journal of Autism and Developmental Disorders, 44(7), 1749–1758.

Dunfield, K. (2014). A construct divided: Prosocial behavior as helping, sharing, and comforting subtypes. Frontiers in Psychology, 5, 958.

Dunfield, K., & Kuhlmeier, V. (2013). Classifying prosocial behavior: Children's responses to instrumental need, emotional distress, and material desire. Child Development, 84 (5), 1766–1776.

Eisenberg-Berg, N. (1986). Altruistic emotion, cognition, and behavior. Hillsdale, NJ: Erlbaum.

Factor, R. S., Condy, E. E., Farley, J. P., & Scarpa, A. (2016). Brief Report: Insistence on sameness, anxiety, and social motivation in children with autism spectrum disorder. Journal of Autism and Developmental Disorders, 46(7), 2548–2554.

Foggo, R. S. V., & Webster, A. A. (2017). Understanding the social experiences of adolescent females on the autism spectrum. Research in Autism Spectrum Disorders, 35, 74–85.

Frazier, T. W., Georgiades, S., Bishop, S. L., & Hardan, A. Y. (2014). Behavioral and cognitive characteristics of females and males with autism in the Simons simplex collection. Journal of the American Academy of Child & Adolescent Psychiatry, 53(3), 329–340.e1-3.

Goossens, F. A., Bokhorst, K., Bruinsma, C., & Van Boxtel, H. W. (2002). Judgments of aggressive, withdrawn and prosocial behavior: Perceived control, anger, pity and sympathy in young Dutch children. Journal of School Psychology, 40(4), 309–327.

Gould, J. (2017). Towards understanding the under-recognition of girls and women on the autism spectrum. Autism, 21(6), 703–705.

Gould, J., & Ashton-Smith, J. (2011). Missed diagnosis or misdiagnosis? Girls and women on the autism spectrum. Good Autism Practice, 12(1), 34–41.

Hartley, C., & Fisher, S. (2018). Do children with autism spectrum disorder shair fairly and reciprocally? Journal of Autism and Developmental Disorders, 48(8), 2714–2726.

Hauck, M., Fein, D., Waterhouse, L., & Feinstein, C. (1995). Social initiations by autistic children to adults and other children. Journal of Autism and Developmental Disorders, 25(6), 579–595.

Henley, N. (1977). Body politics: Power, sex, and nonverbal communication (A Spectrum Book). Englewood Cliffs, NJ: Prentice-Hall.

Hull, L., Petrides, K. V., Carrie, A., Smith, P., Baron-Cohen, S., Lai, M., & Mandy, W. (2017). "Putting on my best normal": Social camouflaging in adults with autism spectrum conditions. Journal of Autism and Developmental Disorders, 47(8), 2519–2534.

Jameel, L., Vyas, K., Bellesi, G., Cassell, D., & Channon, S. (2015). Great expectations: The role of rules in guiding prosocial behaviour in groups with high versus low autistic traits. Journal of Autism and Developmental Disorders, 45(8), 2311–2322.

Kort, W., Schittekatte, M., Compaan, E. L., Bosmans, M., Bleichrodt, N., Vermeir, G., … Verhaeghe, P. (2002). WISC-3 NL. Instructions. London: The Psychological Corporation.

Kouwenberg, M., Rieffe, C., Theunissen, S. C. P. M., & Oosterveld, P. (2012). Pathways underlying somatic complaints in children and adolescents who are deaf or hard of hearing. Journal of Deaf Studies and Deaf Education, 17(3), 319–332.

LaFrance, M., Hecht, M., Levy Paluck, E., & Cooper, H. (2003). The contingent smile: A meta-analysis of sex differences in smiling. Psychological Bulletin, 129(2), 305–334.

Lane, J. D., & Ledford, J. R. (2016). A review of interventions designed to increase sharing behaviors in children with social delays or deficits. Journal of Behavioral Education, 25(1), 69–94.

Liebal, K., Columbi, C., Rogers, S. J., Warneken, F., & Tomasello, M. (2008). Helping and cooperation in children with autism. Journal of Autism and Developmental Disorders, 38, 224–238.

Lord, C., & Hopkins, J. M. (1986). The social behaviour of autistic – children with younger and same-age nonhandicapped peers. Journal of Autism and Developmental Disorders, 16(3), 249–262.

Lord, C., Rutter, M., & Le Couteur, A. (1994). Autism Diagnostic Interview-Revised: A revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. Journal of Autism and Developmental Disorder, 24(5), 659–685.

Martin, J., Rychlowska, M., Wood, A., & Niedenthal, P. (2017). Smiles as multipurpose social signals. Trends in Cognitive Sciences, 21(11), 864–877.

McDonald, K. L., Wang, J., Menzer, M. M., Rubin, K. H., & Booth-LaForce, C. (2011). Prosocial behavior moderates the effects of aggression on young adolescents' friendships. International Journal of Developmental Science, 5(127-2), 127–137.

Nelson, E. E., Jarcho, J. M., & Guyer, A. E. (2016). Social re-orientation and brain development: An expanded and updated view. Developmental Cognitive Neuroscience, 17, 118–127.

Paulus, M. (2018). The multidimensional nature of early prosocial behavior: A motivational perspective. Current Opinion in Psychology, 20, 111–116.

Paulus, M., & Rosal-Grifoll, B. (2017). Helping and sharing in preschool children with autism. Experimental Brain Research, 235(7), 2081–2088.

Rieffe, C., De Bruine, M., De Rooij, M., & Stockmann, L. (2014). Approach and avoidant emotion regulation prevent depressive symptoms in children with an Autism Spectrum Disorder. International Journal of Developmental Neuroscience, 39, 37–43.

Roeyers, H., Thys, M., Druart, C., De Schryver, M., & Schittekatte, M. (2011). SRS: Screeningslijst voor autismespectrumstoornissen. Amsterdam: Hogrefe.

Rowley, E., Chandler, S., Baird, G., Simonoff, E., Pickles, A., Loucas, T., & Charman, T. (2012). The experience of friendship, victimization and bullying in children with an autism spectrum disorder: Associations with child characteristics and school placement. Research in Autism Spectrum Disorders, 6 (3), 1126–1134.

Sally, D., & Hill, E. (2006). The development of interpersonal strategy: Autism, theory-of-mind, cooperation and fairness. Journal of Economic Psychology, 27(1), 73–97.

Schmitz, E. A., Banerjee, R., Pouw, L. B. C., Stockmann, L., & Rieffe, C. (2015). Better to be equal? Challenges to equality for cognitively able children with autism spectrum disorders in a social decision game. Autism, 19(2), 178–186.

Sedgewick, F., Hill, V., & Pellicano, E. (2019). 'It's different for girls': Gender differences in the friendships and conflict of autistic and neurotypical adolescents. Autism, 23(5), 1119–1132.

Sedgewick, F., Hill, V., Yates, R., Pickering, L., & Pellicano, E. (2016). Gender differences in the social motivation and friendship experiences of autistic and non-autistic adolescents. Journal of Autism and Developmental Disorders, 46(4), 1297–1306.

Silbereisen, R. K. (2001). Adolescents: Leisure-time activities. In N. J. Smelser & P. B. Baltes (Eds.) International Encyclopedia of the Social & Behavioural Sciences (pp. 122–125). New York: Elsevier Ltd.

Tager-Flusberg, H. (2007). Evaluating the theory-of-mind hypothesis of autism. Current Directions in Psychological Science, 16(6), 311–315.

Travis, L., Sigman, M., & Ruskin, E. (2001). Links between social understanding and social behavior in verbally able children with autism. Journal of Autism and Developmental Disorders, 31(2), 119–130.

Wechsler, D. (1991). Manual for the Wechsler intelligence scale for children (3rd ed.). San Antonio, Texas: The Psychological Corporation.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix S1: Supporting Information.