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Self-perceptions, parent-perceptions, and meta-perceptions of the interpersonal efficacy of adolescents with autism spectrum disorder

Kenneth D. Locke[a,*], Gwen E. Mitchell[b]

[a] Department of Psychology, University of Idaho, Moscow, ID, 83844-3043, USA
[b] Center on Disabilities and Human Development, University of Idaho, Moscow, ID, 83843-8331, USA

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ABSTRACT

Background: How do adolescents with autism spectrum disorder (ASD) perceive their interpersonal skills and are these "self-efficacy perceptions" accurate? And how do they perceive that their parents perceive their interpersonal skills and are these "meta-perceptions" accurate?
Method: We used the Circumplex Scales of Interpersonal Efficacy to assess self-perceptions and parent-perceptions of the efficacy of adolescents with ASD ($n = 22$) and without ASD ($n = 22$) for a broad set of social behaviors varying in agency (from assertive and controlling to timid and yielding) and varying in communion (from friendly and cooperative to wary and distancing). We also assessed adolescents' meta-perceptions of their parents' perceptions, and parents' meta-perceptions of the adolescents' perceptions.
Results: Parents of adolescents with ASD lacked confidence in their child's interpersonal skills (especially to connect with and lead others), but correctly predicted that their children would express more confidence than they did. Indeed, adolescents with ASD felt as efficacious as control adolescents and did not realize the degree to which their parents did not share their confidence. Nonetheless, adolescents with ASD and control adolescents did show similar levels of child-parent agreement and meta-perception accuracy regarding the adolescent's *relative* strengths/weaknesses.
Conclusions: Adolescents with ASD were overconfident, which may protect them from feeling discouraged, but ultimately only if they engage in activities and interventions that can improve their social skills. The observed agreement regarding an adolescent's relative strengths/weaknesses may enable parents and professionals to use relative strengths to bolster adolescents' confidence while simultaneously working with them on their relative weaknesses.

1. Introduction

Self-efficacy beliefs are self-perceptions that one can successfully perform a particular action or task (Bandura, 1997). Accordingly, interpersonal self-efficacy beliefs are self-perceptions that one can successfully perform particular interpersonal actions or tasks (e.g., "I can get them to listen to me" or "I can avoid getting into arguments"). Developing

* Corresponding author.
E-mail addresses: klocke@uidaho.edu (K.D. Locke), gmitchell@uidaho.edu (G.E. Mitchell).

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positive interpersonal self-efficacy is important because people tend to only attempt and persist at activities (e.g., playing with others) and actions (e.g., making suggestions) to the extent that they expect to be successful at those activities and actions (Bandura, 1997). At the same time, developing accurate interpersonal self-efficacy is important in order for people to appreciate which type of behaviors are strengths (that actually tend to yield positive outcomes) for them and which are weaknesses (that they may want to work on improving). Persistent deficits in social communication and social interaction are essential criteria for a diagnosis of autism spectrum disorder (ASD; American Psychiatric Association [DSM-5], 2013). Therefore, if adolescents' interpersonal self-efficacy beliefs accurately reflect their interpersonal competencies, then adolescents with ASD should report less interpersonal efficacy than their typically developing peers. But do adolescents with ASD have an accurate appreciation of their interpersonal strengths and weaknesses?

The answer from studies of the interpersonal self-efficacy of older children and adolescents with ASD is mixed. On the one hand, most studies have found that youth with ASD evaluate their social skills more negatively than do youth without ASD (Johnson, Filliter, & Murphy, 2009; Vickerstaff, Heriot, Wong, Lopes, & Dossetor, 2007). On the other hand, youth with ASD may only feel less confident in their ability to express certain specific social behaviors (e.g., assertion) and not others (e.g., cooperation) (Koning & Magill-Evans, 2001), and at least one study found that youth with ASD and youth without ASD reported similar levels of social competence (Lerner, Calhoun, Mikami, & De Los Reyes, 2012). Importantly, there is no evidence that adolescents in general overestimate their social competence; for example, adolescents without ASD do not rate their social skills or personality traits more positively than their parents or teachers (Johnson et al., 2009; Koning & Magill-Evans, 2001; Schriber, Robins, & Solomon, 2014). In contrast, in a number of studies youth with ASD made ratings of their social skills that were significantly higher than those made by their parents or teachers (Green, Gilchrist, Burton, & Cox, 2000; Knott, Dunlop, & Mackay, 2006; Koning & Magill-Evans, 2001; Lerner et al., 2012; McMahon & Solomon, 2015; Vickerstaff et al., 2007). In sum, previous research suggests that youth with ASD may recognize that they have social challenges, yet may also underestimate the breadth and severity of their challenges.

Schriber et al. (2014) found analogous results for the "Big 5" personality traits: Youth with ASD made self-ratings that were more positive than their parents' ratings of them but less positive than the self-ratings of typically developing (control) youth. Schriber et al. also examined child-parent agreement in two additional ways. First, for each trait, they computed the correlation between parent-ratings and child self-ratings; these trait-centered correlations indicate the degree of child-parent agreement regarding whether the child is relatively high or low on a particular trait. Second, for each child-parent dyad, they computed the correlation between the child's profile of self-ratings and the parent's profile of child-ratings across the various traits; these dyad-centered correlations indicate the degree of child-parent agreement regarding which traits are more or less descriptive of the child. In both the ASD and control groups, Schriber et al. found significant child-parent agreement on both indices. However, whereas the ASD and control groups showed similar levels of trait-centered child-parent agreement (regarding the child's ranking on each trait), the control group showed stronger dyad-centered child-parent agreement (regarding which traits better described the child).

The current study was designed to build on the preceding studies in two ways. First, the current study assessed not only self-perceptions (how adolescents perceive themselves) and parent-perceptions (how parents perceive their adolescent children), but also perceptions of others' perceptions or *meta-perceptions* (Kenny, 1994). In the context of the current study, meta-perceptions specifically refer to (a) adolescents' perceptions of their parents' perceptions of their child's interpersonal efficacy and (b) parents' perceptions of their child's self-perceptions of his or her interpersonal efficacy. Individuals with ASD typically have difficulties with tasks that involve meta-representations—that is, mental representations *of* mental representations such as perceptions, thoughts, emotions, and intentions (Grainger, Williams, & Lind, 2016). Specifically, individuals with ASD tend to perform more poorly than typically developing individuals on "metacognitive" tasks that involve representing one's own mental representations and also on "theory-of-mind" or "mindreading" tasks that involve representing others' mental states or perspectives (Happé & Frith, 2014; Lombardo & Cohen, 2011). Because meta-perceptions are meta-representations of others' perceptions, individuals with ASD may have difficulty forming accurate meta-perceptions and keeping those meta-perceptions distinct from their own perceptions.

Second, the current study assessed efficacy for behaviors from each region of the interpersonal circumplex, a well-validated model for conceptualizing and organizing interpersonal dispositions and actions (Gurtman, 2009; Wiggins, 2003), including those of children and adolescents (Trucco, Wright, & Colder, 2014). As shown in Fig. 1, the circumplex is defined graphically by two orthogonal axes. The vertical ("agentic") axis ranges from being interpersonally assertive, decisive, controlling, and self-assured to being interpersonally timid, yielding, and conflict-avoidant. The horizontal ("communal") axis ranges from being interpersonally cooperative, friendly, warm, and empathetic to being interpersonally wary, distancing, and disengaged. Diverse research paradigms (e.g., psychometric, cognitive, neuroendocrine) suggest that agency and communion are essential, fundamental dimensions of social cognition and behavior (Locke, 2015). By using a measure of interpersonal efficacy based on the interpersonal circumplex, the current study assessed efficacy for a set of behaviors that was simultaneously narrower and broader than those typically considered in studies of social competence. Specifically, whereas the social skills measures in previous studies included non-interpersonal behaviors (in particular, behaviors reflecting conscientiousness, self-regulation, and self-control), the current study focused more narrowly on peer interactions; and whereas previous studies typically focused on interpersonal behaviors from the communal side of the circumplex (e.g., being friendly, expressive, and agreeable), the current study assessed efficacy for a broader range of behaviors that included the uncommunal side of the circumplex (e.g., being competitive, setting boundaries, and hiding feelings).

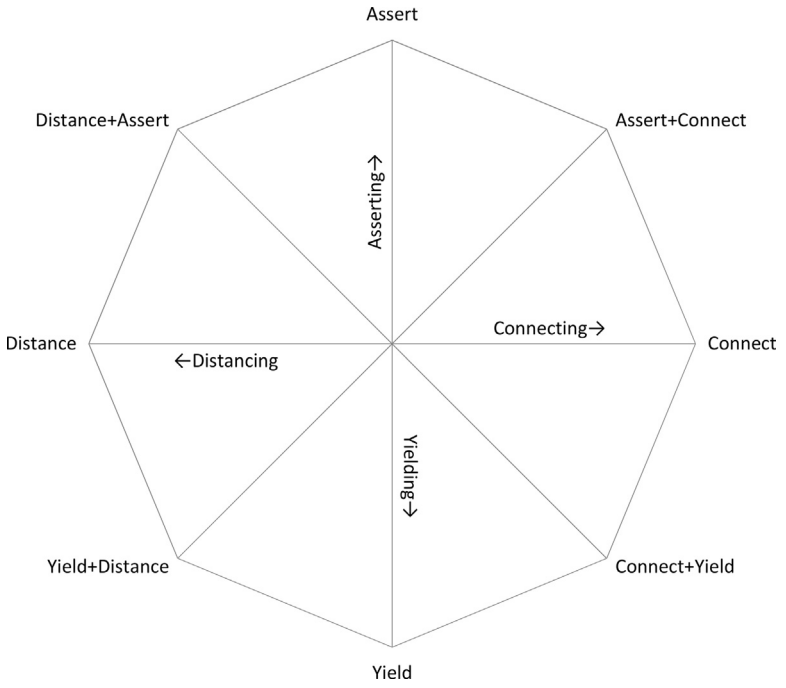

Fig. 1. The interpersonal circumplex.

To summarize, in the current study we used the interpersonal circumplex model to assess self-perceptions and parent-perceptions of the interpersonal efficacy of adolescents with and without ASD, and also adolescents' meta-perceptions of their parents' perceptions and parents' meta-perceptions of the adolescents' perceptions. We conducted two types of analyses. First, we analyzed *absolute* parent-child agreement and meta-accuracy. Meta-accuracy refers to the degree to which meta-perceptions are accurate (Vazire & Carlson, 2010)—that is, how well adolescents' and parents' beliefs about the ratings each other made match the ratings each other actually made. Second, following Schriber et al. (2014), we used dyad-centered and scale-centered correlations to assess (a) parent-child agreement regarding whether the adolescent is more or less efficacious in a particular circumplex region *relative to* either other adolescents or other circumplex regions and (b) parents' and adolescents' meta-accuracy in predicting whether each other's ratings on a particular scale were high or low *relative to* ratings by other raters or ratings on other scales. Based on past research we hypothesized that parents of adolescents with ASD would express less confidence in their child's social skills than would either their child or the parents of control adolescents; however, given the mix of findings from past research, we had no hypotheses concerning whether adolescents with ASD would express less confidence in their social skills than control adolescents. We also hypothesized that—because forming accurate meta-representations can be challenging for individuals with ASD (Lombardo & Baron-Cohen, 2011)—the meta-perceptions of adolescents with ASD would be less accurate (and perhaps more egocentrically aligned with their own self-perceptions) than those of their parents or control adolescents.

2. Method

2.1. Participants

The participants were 22 adolescents with a DSM-5 ASD diagnosis (17 males, 5 females; 17 Caucasian, 2 Hispanic/Latino, 2 Native American, 1 Other), 22 adolescents without an ASD diagnosis based on parent report (13 males, 7 females, 2 not specified; 16 Caucasian, 1 Hispanic/Latino, 1 Native American, 4 Other), and one parent of each adolescent (i.e., 44 parents). Although we attempted to recruit at least 25 adolescents per group, the obtained samples ($n = 22$/group) nonetheless provide 74% power to detect large ($d = 0.8$) differences between the adolescents with and without ASD, and 95% power to detect large differences between parents' ratings and adolescents' ratings within each group. The ASD group was slightly older (M age = 14.3 years, $SD = 1.6$, range = 12–18) than the control group (M age = 13.2 years, $SD = 1.8$, range = 12–17 [and one missing value]), $t(41) = 2.20$, $p = 0.033$, Cohen's $d = 0.65$.

The ASD group was recruited—and completed the study—at three clinics in the northwest United States with expertise in diagnosing neurodevelopmental disorders (University of Idaho Center on Disabilities and Human Development—Child and Youth Center; Educational and Psychological Services—Clarkston; Northwest Neurobehavioral Health). The clinics employed standard assessment protocols which included a developmental history, adaptive functioning measures, caregiver ratings of

behavior, and the Autism Diagnostic Observation Schedule and/or Autism Diagnostic Interview. Diagnoses were confirmed by doctoral-level licensed psychologists employed at the clinics at the time of the study. The control group was recruited—and completed the study—at two public schools near one of the clinics. Adolescents in both groups were required to be between 12 and 18 years old and to be able to independently complete a questionnaire requiring a 6th grade reading level (as judged by a parent and/or clinician familiar with that adolescent).

2.2. Circumplex scales of interpersonal efficacy

The Circumplex Scales of Interpersonal Efficacy (CSIE; Locke & Sadler, 2007; Locke, 2011) assesses a person's confidence that he or she can successfully perform behaviors associated with each facet or octant of the interpersonal circumplex depicted in Fig. 1. The complete CSIE is comprised of eight 4-item octant scales; however, because pilot testing indicated that some children found the task (especially meta-ratings) challenging, the current study only used the two items from each octant scale listed in Table 1. We specifically chose those items that had shown good psychometric properties in previous research and (because the CSIE was initially developed using college students and has not been used with younger individuals with ASD) were relatively concrete and easily understood. As you circumnavigate the circle, each octant scale reflects a progressive blend of the two axial dimensions; for example, "speak up" is an assertive action, "get them to leave me alone" is a distancing action, and "tell them when I am annoyed" is a blend of assertive and distancing. The CSIE can be easily understood by most adolescents (Flesch-Kincaid Reading Level = 6.5), and has demonstrated good psychometric properties (i.e., reliability, validity, and circumplex structure) in previous research in undergraduate and general population samples (e.g., Hopwood et al., 2011; Locke & Adamic, 2012). For example, Locke and Sadler (2007) found that students who reported more self-efficacy for assertive/agentic behaviors on the CSIE subsequently showed more assertive/agentic behaviors during interactions with other students they had not met before.

2.2.1. Child's ratings

The adolescents first rated themselves on the CSIE; specifically, they were asked: "For each of the following behaviors, rate how sure you are that you can act that way when with peers your age" on 11-point scales ranging from 0 (not at all confident) to 5 (moderately confident) to 10 (absolutely confident). After answering a few demographic questions, the adolescents completed the CSIE again, this time prefaced by the following instructions: "Your parent that is helping us with this study also rated you on these items. Below, please indicate how *you think your parent rated you*—that is, how confident is your mother or father that you can act that way with your peers". The response scale for these meta-perceptions was adjusted accordingly, ranging from "**my mother/father** is not at all confident that . . . " (0) to "**my mother/father** is absolutely confident that . . . " (10).

2.2.2. Parent's ratings

The parents first rated "For each of the following behaviors, rate how sure you are that your child can act that way when interacting with peers his or her age". After providing demographic and diagnostic information about their child, the parents completed the CSIE again, but this time were asked to "indicate how *you think your child rated himself or herself*—that is, how confident is your child that he or she can act that way with peers". The response scale for these meta-perceptions was adjusted accordingly, ranging from "**my child** is not at all confident that . . . " (0) to "**my child** is absolutely confident that . . . " (10).

Table 1
Items from Each Octant of the Circumplex Scales of Interpersonal Efficacy.

Octant Scale	Items
Assert	I can speak up when I have something to say; I can be assertive
Assert & Distance	I can win any arguments or competitions; I can tell them when I am annoyed
Distance	I can get them to leave me alone; I can be cold and unfriendly when I want to
Yield & Distance	I can hide my thoughts and feelings; I can be quiet
Yield	I can avoid getting into arguments; I can let others take charge
Yield & Connect	I can follow the rules; I can be nice
Connect	I can fit in; I can understand their feelings
Assert & Connect	I can be a leader; I can get them to listen to what I have to say

Note. When parents rated their child, in each item "I" was replaced with "my child" (which then required a few other minor adjustments to ensure subject-verb agreement).

2.3. Procedure

The experts completed an online questionnaire. Each adolescent and one parent of that adolescent completed a printed questionnaire; they completed their questionnaires simultaneously, but were seated separately and assured that their responses would not be shared with each other and could not be identified by the experimenters (because we used randomly assigned numbers to tag and match the parent and child questionnaires). The parents provided written informed consent and the adolescents provided written informed assent. The procedure was approved by the University of Idaho Institutional Review Board and meets Declaration of Helsinki ethical standards.

3. Results

Table 2 shows the mean perceptions and meta-perceptions of interpersonal efficacy reported by adolescents with and without ASD and their parents. Because the ASD group was slightly older than the control group, we checked if age was correlated with any of the outcome variables—namely, child perceptions, parent perceptions, child meta-perceptions, parent meta-perceptions, child meta-accuracy (child's meta-perception—parent's perception), and parent meta-accuracy (parent's perception—child's perception). Of the 48 correlations (6 variables × 8 scales) tested, only two were statistically significant. Age was negatively associated with child meta-perceptions of assertive, $r(41) = -0.37$, $p = 0.013$, and connecting behaviors, $r(41) = -0.40$, $p = 0.009$ (all remaining $rs \leq 0.29$, all remaining $ps \geq 0.06$). Moreover, including age as a covariate did not alter the statistical significance of the findings discussed below.

Table 2
Adolescents' and Parents' Perceptions and Meta-Perceptions of Interpersonal Efficacy of Adolescents with and without Autism Spectrum Disorder.

	ASD		Control				Cohen's
	M	*SD*	*M*	*SD*	*t*(42)	*p*	d_s
Adolescent's Self-Ratings							
Assert	6.36	*2.65*	7.41	*2.30*	−1.40	0.170	−0.42
Assert & Distance	6.05	*2.02*	6.25	*1.85*	−0.35	0.728	−0.11
Distance	5.89	*2.43*	6.82	*2.23*	−1.32	0.193	−0.40
Yield & Distance	7.59	*2.00*	7.32	*2.04*	0.45	0.657	0.13
Yield	6.09	*2.50*	7.07	*2.12*	−1.40	0.169	−0.42
Yield & Connect	7.86	*2.11*	8.07	*1.96*	−0.33	0.741	0.10
Connect	6.14	*2.42*	7.20	*2.19*	−1.54	0.132	−0.46
Assert & Connect	5.93	*2.74*	7.16	*2.43*	−1.57	0.123	−0.47
Parent's Rating of Child							
Assert	4.77	*2.53*	7.00	*1.94*	−4.31	<0.001	−1.30
Assert & Distance	4.68	*1.94*	6.59	*2.02*	−3.20	0.003	−0.97
Distance	5.86	*2.11*	5.57	*1.71*	0.51	0.612	0.15
Yield & Distance	5.23	*2.98*	6.43	*2.09*	−1.55	0.128	−0.47
Yield	5.14	*2.33*	6.73	*2.21*	−2.32	0.025	−0.70
Yield & Connect	6.07	*1.85*	8.23	*1.71*	−4.02	<0.001	−1.21
Connect	3.07	*1.54*	6.89	*2.08*	−6.93	<0.001	−2.09
Assert & Connect	3.70	*1.85*	6.82	*2.17*	−5.12	<0.001	−1.54
Adolescent's Meta-Perception of Parent							
Assert	6.39	*3.18*	7.70	*1.94*	−1.66	0.105	−0.50
Assert & Distance	5.59	*2.69*	7.30	*2.29*	−2.27	0.029	−0.68
Distance	5.50	*2.92*	6.93	*1.95*	−1.91	0.063	−0.58
Yield & Distance	7.02	*2.53*	7.14	*2.23*	−0.16	0.875	−0.05
Yield	6.27	*2.80*	6.70	*2.06*	−0.58	0.564	−0.18
Yield & Connect	7.84	*2.16*	8.00	*2.01*	−0.25	0.802	−0.08
Connect	5.95	*2.66*	8.02	*1.93*	−2.95	0.005	−0.89
Assert & Connect	5.80	*2.54*	7.25	*2.34*	−1.97	0.055	−0.59
Parent's Meta-Perception of Child							
Assert	6.32	*2.68*	7.75	*1.62*	−2.14	0.038	−0.65
Assert & Distance	6.93	*2.46*	6.84	*2.33*	0.13	0.900	0.04
Distance	6.75	*2.46*	6.09	*1.83*	1.01	0.319	0.30
Yield & Distance	7.32	*2.27*	7.25	*2.23*	0.10	0.920	0.03
Yield	6.11	*2.71*	7.16	*2.21*	−1.40	0.168	−0.42
Yield & Connect	7.70	*2.26*	8.68	*1.46*	−1.71	0.095	−0.51
Connect	4.82	*2.76*	7.43	*1.98*	−3.60	0.001	−1.09
Assert & Connect	5.95	*2.50*	7.00	*1.94*	−1.55	0.128	−0.47

Note. $n = 22$ per cell.

3.1. Efficacy perceptions

First, we conducted a mixed analysis of variance (ANOVA) on perceptions of the adolescents' interpersonal efficacy (see upper half of Table 2), with group (ASD vs control) as a between-subjects variable and octant and perceiver (parent vs child) as within-dyad variables. Table 3 (left side) shows the results. There were effects of group, octant, perceiver, and their interactions. (We will not discuss main effects of octant, which were significant in all analyses and simply indicate that people generally made higher ratings on some items than others).

We decomposed the 3-way interaction in two ways. First, we analyzed the ASD and control groups separately. In the control group, there was no effect of either perceiver ($F[1,21] = 0.70$, $p = 0.411$, $\eta^2_p = 0.03$) or the perceiver × octant interaction ($F[7,147] = 1.86$, $p = 0.079$, $\eta^2_p = 0.08$). Perceiver effects indicate discrepancies between how parents typically perceive adolescents and adolescents typically perceive themselves; thus, there was no evidence of parent-child disagreement in the control group. However, in the ASD group, there were effects of both perceiver ($F[1,21] = 21.73$, $p < 0.001$, $\eta^2_p = 0.51$) and the perceiver × octant interaction ($F[7,147] = 2.86$, $p = 0.008$, $\eta^2_p = 0.12$). Fig. 2 juxtaposes the mean efficacy ratings made by adolescents with ASD and their parents on the interpersonal circumplex, and Table 4 tests the parent-child discrepancy within each octant. The figure and table show that adolescents with ASD tended to be more confident in their interpersonal skills than their parents were, with the differences being greatest for connecting with others and non-existent for distancing from others.

We also decomposed the interaction by analyzing adolescents' and parents' perceptions separately. There was no effect of group ($F[1,42] = 2.37$, $p = 0.131$, $\eta^2_p = 0.05$) or the group × octant interaction ($F[7,294] = 0.95$, $p = 0.465$, $\eta^2_p = 0.02$) on adolescents' self-ratings, indicating that adolescents with and without ASD expressed similar interpersonal self-efficacy. In contrast, there were significant effects of group ($F[1,42] = 31.11$, $p < 0.001$, $\eta^2_p = 0.43$) and the group × octant interaction (F

Table 3
Results of 3-Way ANOVAs on Adolescents' and Parents' Perceptions and Meta-Perceptions of Interpersonal Efficacy.

Source		Perceptions			Meta-Perceptions		
	df	*F*	*p*	*η2p*	*F*	*p*	*η2p*
Group	1,42	19.27	0.000	0.31	7.02	0.011	0.14
Perceiver	1,42	14.73	0.000	0.26	0.02	0.891	0.00
Perceiver × Group	1,42	6.92	0.012	0.14	0.22	0.642	0.01
Octant	7,294	7.14	0.000	0.15	6.33	0.000	0.13
Octant × Group	7,294	3.13	0.003	0.07	2.57	0.014	0.06
Octant × Perceiver	7,294	1.92	0.066	0.04	1.42	0.198	0.03
Octant × Perceiver × Group	7,294	3.11	0.003	0.07	2.70	0.010	0.06

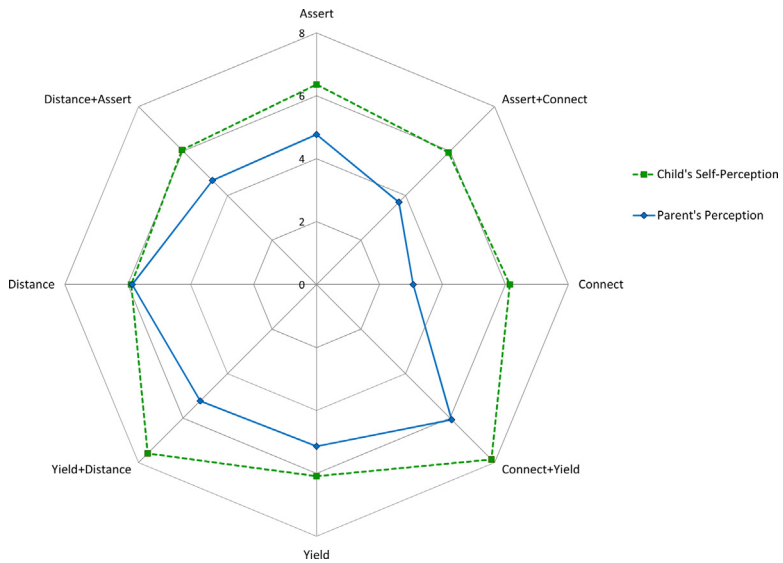

Fig. 2. Adolescents' and parents' perceptions of the efficacy of adolescents with ASD for behaviors associated with each interpersonal circumplex octant. Ratings were made on 0-to-10 scales; thus, along each octant scale, ratings further from the center and closer to the circumference of the circle indicate greater efficacy.

Table 4
Differences between Adolescents' and Parents' Perceptions of the Interpersonal Efficacy of Adolescents with ASD.

CSIE Octant	Adolescent − Parent Perceptions				
	$M_{difference}$	*SD*	*t*(21)	*p*	Cohen's d_z
Assert	1.59	*3.11*	2.40	0.026	0.51
Assert & Distance	1.36	*2.46*	2.59	0.017	0.55
Distance	0.02	*3.32*	0.03	0.975	0.01
Yield & Distance	2.36	*3.12*	3.55	0.002	0.76
Yield	0.95	*3.70*	1.21	0.240	0.26
Yield & Connect	1.80	*2.55*	3.31	0.003	0.70
Connect	3.07	*2.62*	5.48	<0.001	1.17
Assert & Connect	2.23	*2.44*	4.28	<0.001	0.91

[7,294] = 5.43, $p < 0.001$, $\eta^2_p = 0.11$) on parents' child-ratings. As shown in the second section of Table 2, the parents of adolescents with ASD were—compared to control parents—less confident that their child could express every type of social behavior except distancing behaviors, and especially lacked confidence that their child could assert themselves and/or connect with others.

3.2. Efficacy meta-perceptions

Next, we conducted a mixed ANOVA on meta-perceptions (see lower half of Table 2), with group (ASD vs control) as a between-subjects variable and octant and perceiver (parent vs child) as within-dyad variables. Table 3 (right side) shows the results. There were significant effects of group, octant, octant × group, and octant × perceiver × group. To tease apart the 3-way interaction, we conducted ANOVAs on adolescents and parents separately. For adolescents' meta-perceptions, there was an effect of group ($F[1,42] = 4.97$, $p = 0.031$, $\eta^2_p = 0.11$), but not the group × octant interaction ($F[7,294] = 1.65$, $p = 0.122$, $\eta^2_p = 0.04$): Compared to control adolescents, adolescents with ASD expected their parents to be less confident in their social skills. For parents' meta-perceptions, there was a marginal effect of group ($F[1,42] = 2.88$, $p = 0.097$, $\eta^2_p = 0.06$) and a significant group × octant interaction ($F[7,294] = 3.76$, $p = 0.001$, $\eta^2_p = 0.08$): As shown in the fourth section of Table 2, compared to control parents, parents of adolescents with ASD expected their children to feel less efficacious, especially with respect to connecting with others.

3.3. Comparing perceptions and meta-perceptions

To compare perceptions and meta-perceptions (i.e., the upper and lower halves of Table 2), we conducted a mixed ANOVA, with group (ASD vs control) as a between-subjects variable and octant, perceiver (parent vs child), and type of rating (perception vs meta-perception) as within-dyad variables. Table 5 shows the relevant results (i.e., involving type of rating): There were significant effects of rating, rating × perceiver, and rating × perceiver × group. We decomposed the interactions in two ways.

First, we considered absolute meta-accuracy. Comparing how adolescents think parents perceive them with how their parents actually perceive them is a measure of adolescent meta-accuracy. Table 6 (line 1) shows that whereas control adolescents were largely accurate (i.e., their meta-perceptions and parents' actual perceptions did not differ), adolescents with ASD generally overestimated their parents' confidence in them. Comparing how parents think adolescents perceive themselves with how adolescents actually perceive themselves is a measure of parent meta-accuracy. Table 6 (line 2) shows

Table 5
Results of 4-Way ANOVA Comparing Perceptions and Meta-Perceptions.

Source	*df*	*F*	*p*	*η2p*
Type of Rating	1,42	24.94	0.000	0.37
Rating × Group	1,42	3.85	0.056	0.08
Rating × Perceiver	1,42	14.00	0.001	0.25
Rating × Perceiver × Group	1,42	8.96	0.005	0.18
Octant × Rating	7,294	0.88	0.525	0.02
Octant × Rating × Group	7,294	0.70	0.676	0.02
Octant × Rating × Perceiver	7,294	0.89	0.515	0.02
Octant × Rating × Perceiver × Group	7,294	1.87	0.074	0.04

that—in both the ASD and control groups—parents' meta-perceptions were generally accurate (i.e., did not differ from adolescents' self-perceptions).

Table 6
Discrepancies between Meta-Perceptions and the Rater's or the Target's Perceptions.

	ASD Group					Control Group				
	M_{diff}	*SD*	*t*(21)	*p*	Cohen's d_z	M_{diff}	*SD*	*t*(21)	*p*	Cohen's d_z
Parent's Perception—Child's Meta-Perception	−1.48	*1.77*	−3.93	0.001	−0.84	−0.53	*1.88*	−1.33	0.199	−0.28
Child's Perception—Parent's Meta-Perception	0.00	*1.88*	0.00	0.999	0.00	−0.11	*1.80*	−0.30	0.770	−0.06
Child's Perception—Child's Meta-Perception	0.19	*1.31*	0.69	0.496	0.15	−0.22	*0.80*	−1.28	0.216	−0.27
Parent's Perception—Parent's Meta-Perception	−1.67	*1.55*	−5.08	0.000	−1.08	−0.43	*0.79*	−2.53	0.020	−0.54

Second, we compared a perceiver's meta-perceptions with their own perceptions. As Table 6 (line 3) shows, in both groups adolescents' meta-perceptions did not differ from their self-perceptions. In contrast, as Table 6 (line 4) shows, parents' perceptions and meta-perceptions differed; specifically, parents (especially parents of adolescents with ASD) assumed that they felt less confident in their children's social skills than their children did.

3.4. Octant-centered and dyad-centered parent-child agreement and meta-accuracy

Finally, we used two-way mixed model intraclass correlation coefficients ($ICC_{2,1}$) to quantify octant-centered and dyad-centered parent-child agreement and parent and adolescent meta-accuracy. We performed Fisher's *r*-to-*z* transformations on all ICCs before computing averages or inferential statistics; we then performed z-to-*r* transformations to place the averages back on a correlational metric before reporting them in the text below.

Separate octant-scale-centered ICCs were computed for each group (ASD and control) and octant scale. We computed three types of octant-centered ICCs: (1) ICCs between self-ratings and parent-ratings, which reflect *parent-child agreement* regarding whether the child's efficacy for behavior in that particular octant is high or low relative to other children; (2) ICCs between self-ratings and the parent's meta-perceptions, which reflect *parents*' *meta-accuracy* regarding whether their child's self-efficacy for behavior in that octant is high or low relative to other children; and (3) ICCs between parent-ratings and the child's meta-perceptions, which reflect *adolescents*' *meta-accuracy* regarding whether their parent's confidence in their ability to express that type of behavior is high or low relative to other parents. As Table 7 shows, all of the ICCs were, on average, positive, small-to-moderate in magnitude, and did not significantly differ from each other.

Dyad-centered ICCs were computed separately for each parent-child dyad across the eight CSIE octants. We computed three types of dyad-centered ICCs: (1) ICCs between the profile of self-ratings (across the eight octants) and the corresponding profile of parent-ratings, which reflect *parent-child agreement* regarding in which octants the child's efficacy is relatively high or low; (2) ICCs between profiles of self-ratings and parent meta-perceptions, which reflect *parents*' *meta-accuracy* regarding in which octants the child's self-efficacy is relatively high or low; and (3) ICCs between profiles of parent-ratings and adolescent meta-perceptions, which reflect *adolescents*' *meta-accuracy* regarding in which octants their parents believe their efficacy is relatively high or low. As Table 7 shows, all of the ICCs were again, on average, positive, small-to-moderate in magnitude, and did not significantly differ from each other.

4. Discussion

The results suggest that adolescents with ASD typically overestimate their interpersonal skills. The self-reported interpersonal efficacy of adolescents with ASD was no lower than the self-reported interpersonal efficacy of adolescents without ASD. In contrast—and consistent with past research (Johnson et al., 2009; Lerner et al., 2012)—the parents of children with ASD described their children as less socially skilled than did parents of children without ASD. Therefore, the parents of adolescents with ASD were significantly less confident in their children's interpersonal abilities than were their children themselves, whereas there was no such parent-child discrepancy in the control group. Other studies have also found that

Table 7
Octant-Centered and Dyad-Centered Agreement and Meta-Accuracy ICCs.

	Octant-Centered				Dyad-Centered			
	ICC	*SD*	*t*(7)	*p*	*ICC*	*SD*	*t*(21)	*p*
ASD Group								
parent-child agreement	0.17	*0.20*	2.30	0.055	0.23	*0.34*	3.09	0.006
parents' meta-accuracy	0.30	*0.21*	4.10	0.005	0.32	*0.41*	3.64	0.002
adolescents' meta-accuracy	0.20	*0.10*	6.06	0.001	0.27	*0.36*	3.37	0.003
Control Group								
parent-child agreement	0.29	*0.23*	3.59	0.009	0.36	*0.40*	4.20	0.000
parents' meta-accuracy	0.30	*0.20*	4.34	0.003	0.35	*0.34*	4.85	0.000
adolescents' meta-accuracy	0.22	*0.13*	4.74	0.002	0.34	*0.46*	3.38	0.003

youth with ASD rated their social skills more highly than did their parents or teachers (Green et al., 2000; Knott et al., 2006; Koning & Magill-Evans 2001; McMahon & Solomon, 2015; Vickerstaff et al., 2007), although only one previous study also found (like we did) that youth with ASD rated their social competence as highly as did youth without ASD (Lerner et al., 2012).

Parents and adolescents with ASD showed the most agreement when rating the adolescents' efficacy for distancing behaviors (e.g., *I can get them to leave me alone*) and the least agreement when rating the adolescents' efficacy connecting behaviors (e.g., *I can fit in*). In other words, to the degree that the parents' judgments were accurate, those judgments suggest that adolescents with ASD correctly estimate their ability to distance themselves from others, but overestimate their ability to connect with others. The other noteworthy discrepancies between parent and adolescent perceptions were in the yield-and-distance and assert-and-connect octants, suggesting that adolescents with ASD are also apt to overestimate how successful they are at influencing others and remaining quiet when it is appropriate to remain quiet.

Although the discrepancies between the self-ratings and parent-ratings of adolescents with ASD theoretically could reflect parents being too negative rather than adolescents being too positive, that seems unlikely for several reasons. First, on average, adolescents with ASD are indeed less socially adept than adolescents without ASD. Second, in previous studies of adolescents with ASD, teacher-ratings agreed more with parent-ratings than with adolescents' self-ratings. Consistent with those findings, while conducting the current study we also asked 10 experienced professionals (e.g., neuropsychologists) to rate their confidence that a typical adolescent with ASD could express behaviors associated with each interpersonal circumplex region, and we found these expert-ratings tended to be similar to parent-ratings and lower than adolescents' self-ratings (for details, see the online supplementary appendix). Third, the parents' meta-perceptions were more accurate than the adolescents' meta-perceptions. Specifically, the parents accurately predicted the interpersonal self-efficacy of their adolescents with ASD, whereas the adolescents tended to overestimate the confidence their parents had in their social skills.

One potential explanation for the adolescents' inaccurate meta-perceptions is that (perhaps due to general deficits in mind-reading or perspective-taking) they were being egocentric (Lombardo & Baron-Cohen, 2011): They simply assumed that their parents perceived them the way they perceived themselves (whereas in fact the adolescents were more confident than their parents were in their social skills). Their parents, in contrast, correctly anticipated that the adolescents' self-perceptions would be different—and more positive—than their own perceptions.

However, the current results do not necessarily imply that the meta-perceptions of adolescents with ASD were more egocentric than the meta-perceptions of adolescents without ASD. Overestimating the similarity between how others perceive us and we see ourselves is common, even among adults (Kenny, 1994). Moreover, the egocentric assumption that others perceive us how we perceive ourselves only undermines meta-accuracy to the extent that our self-perceptions diverge from others' perceptions of us. Therefore, in the control group—because there were no significant differences between how parents typically perceived their children, how their children typically perceived themselves, and how children typically believed their parents rated them—it is impossible to disentangle egocentricity from accuracy. In addition, comparing the meta-perceptions of adolescents with and without ASD suggests that although adolescents with ASD overestimated their parents' confidence in their social skills, they nonetheless realized that their parents had less confidence in their skills than other parents had in their children's skills.

Finally, the octant-centered and dyad-centered correlational measures of meta-accuracy (which control for the between-group differences in average efficacy ratings discussed above) showed that adolescents with ASD were at least somewhat accurate with respect to (a) which types of interpersonal behaviors their parents considered relative strengths and weaknesses for them and (b) within each facet of interpersonal efficacy, whether their parents rated them high or low relative to the ratings made by other parents of adolescents with ASD. Moreover, these correlations (between self-ratings, parent-ratings, and meta-perceptions across octants or across dyads) found no differences between the meta-accuracy of adolescents with ASD and the meta-accuracy of either their parents or the meta-accuracy of adolescents without ASD.

The current study has several limitations. Our small sample meant we lacked the power needed to test for moderately sized effects and to test potential moderators such as age, gender, and level of functioning. A related issue is that, as in other studies that employed self-report questionnaires, we only recruited participants who were able to complete such questionnaires independently, thereby excluding individuals with limited cognitive abilities. Although this range restriction reduces the likelihood of significant differences in intellectual functioning between the ASD and control groups, we did not assess intellectual functioning and therefore cannot rule out that possibility. Finally, our measure of interpersonal efficacy has not been validated among younger adolescents or individuals with ASD, and, lacking behavioral measures of social competence, we cannot definitively conclude—when discrepancies existed between adolescents' and parents' perceptions—whose perceptions were more accurate.

The current study raises two key questions to which we can only offer speculative answers. One question is: Why might adolescents with ASD be overly confident in their social skills? To address that question we should consider how people generally acquire accurate interpersonal self-efficacy beliefs. One source of information is direct feedback (from parents, teachers, or peers); however, such feedback is infrequent. Presumably the more common source of information involves individuals spontaneously noticing how successfully they are performing various interpersonal actions and updating their efficacy beliefs accordingly. Generalizing from research on other types of behavior (Bandura, 1997), evaluating the success of our interpersonal behaviors may typically require noticing how people respond to us, and perhaps comparing how people respond to us with how people respond to our peers. To use a couple of items from the CSIE as examples, to learn how confident to be in your abilities to "understand their feelings" or "be quiet", you need to appreciate when others' reactions

indicate that you did or did not understand their feelings or did or did not stay quiet when you should have. However, compared to other adolescents, adolescents with ASD may be less likely to initiate and more likely to avoid social interactions (especially with peers), less likely to notice others' reactions during interactions, and less likely to reflect on the social aspects of their experiences following interactions. Consequently, when asked to evaluate their social skills, adolescents with ASD may—lacking salient evidence to the contrary—simply assume that they are doing fine and further assume that others perceive them the way they perceive themselves.

A second key question is: Is it problematic if adolescents with ASD are unjustifiably confident in their social skills? There is limited research on the effects of parent-child discrepancies in perceptions of the skills and functioning of children with ASD, and the results paint a mixed picture regarding whether smaller discrepancies are associated with better outcomes (Lerner et al., 2012; Verhoeven et al., 2012). Moreover, because the discrepancies typically reflect children being more confident than their parents, smaller discrepancies are confounded with youth feeling less efficacious. Multiple studies in other populations have found that lower social self-efficacy predicts—both concurrently and prospectively—higher levels of depression (Bandura, 1997; Locke et al., in press; Smith & Betz, 2002; Wei, Russell, & Zakalik, 2005), and similar results have been found for youth with ASD (Vickerstaff et al., 2007). More generally, a substantial body of literature suggests that most people—and not just youth with ASD—are prone to overly optimistic self-perceptions, and that such beliefs are positively associated with psychological well-being and adjustment (Taylor & Brown, 1988).

4.1. Implications

Thus, the typically inflated interpersonal efficacy of adolescents with ASD may help protect them from feeling discouraged, pessimistic, and defeated. Yet, if adolescents with ASD do not actively engage with social activities and interventions that can help strengthen their social skills, then they may fail to develop the skills necessary to fulfill their personal and occupational potentials. Consequently, while allowing adolescents with ASD to ignore their interpersonal challenges may be convenient in the short term, it may leave them more vulnerable to feeling inadequate, isolated, and depressed as they transition into adulthood. Fortunately, the current study found—as did Schriber et al.'s (2014) study of personality traits—that the self-perceptions of adolescents with ASD were positively correlated with their parents' perceptions (both within and across octants), indicating that parents and their adolescent children broadly agree on which facets of interpersonal functioning are relative strengths or relative weaknesses for a particular adolescent. Furthermore, adolescents were at least somewhat attuned to which behaviors their parents considered relative strengths and weaknesses for them. Therefore, one way parents and professionals can support both the confidence and growth of an adolescent with ASD is by affirming—and giving that adolescent opportunities to express—what everyone agrees are his or her relative strengths (e.g., remembering and following the rules for particular situations), which is likely to help the adolescent then feel more open to actively working on other skills that everyone agrees are areas of relative weakness (e.g., understanding what others are feeling).

5. Conclusions

In summary, the current study assessed self-perceptions, parent-perceptions, and meta-perceptions of the efficacy of adolescents with and without ASD for behaviors exemplifying every facet of the interpersonal circumplex. On the one hand, adolescents with ASD and adolescents without ASD showed equivalent moderate levels of parent-child agreement and meta-accuracy with respect to which facets of interpersonal behavior were particular strengths and weaknesses for them. On the other hand, adolescents with ASD were generally overconfident, expressing as much confidence in their interpersonal skills as adolescents without ASD, and failing to recognize that their parents and other adults did not share their confidence, especially regarding abilities to connect with and lead others. Their overconfidence may be beneficial if it protects adolescents with ASD from becoming dejected and more socially withdrawn, but only if they stay committed to improving the skills that will help them be successful in diverse interpersonal and social situations—with fewer familial and institutional supports—in the years ahead.

Conflict of interest

The authors have no conflicts of interest to declare.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.rasd.2016.07.006.

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