

Emotion Dysregulation and Anxiety in Adults with ASD: Does Social Motivation Play a Role?

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Abstract Young adults with ASD and no intellectual impairment are more likely to exhibit clinical levels of anxiety than typically developing peers (DSM-5, American Psychiatric Association, 2013). This study tests a mechanistic model in which anxiety culminates via emotion dysregulation and social motivation. Adults with ASD (49 males, 20 females) completed self-report measures on emotion regulation, caregivers completed measures on ASD severity and both on social anxiety. Results indicated that emotion dysregulation ($p < .001$; $p < .05$) and social motivation ($p < .05$, $p < .001$) significantly predicted social anxiety as reported by caregivers and young adults respectively. However, social motivation did not appear to play a moderating role in the relationship between emotion regulation and anxiety, even when controlling for social awareness. Significant predictor variables of social anxiety varied based on reporter (i.e. caregiver versus young adult), with difficulty engaging in goal-directed behaviors during negative emotions serving as the only shared predictor.

Keywords Autism spectrum disorder · Emotion dysregulation · Social anxiety · Social motivation · Adults

Introduction

Although epidemiological prevalence estimates are not available, it has been reported that about 17 % of children and adolescents (van Steensel et al. 2011) and 22 % of adults (Lugnegard et al. 2011) with autism spectrum disorder (ASD) also meet diagnostic criteria for social anxiety disorder (SAD). These estimates are considerably higher than the 2.8 % prevalence of SAD estimated in adults without ASD (Grant et al. 2005). There are many plausible explanations for the high rate of ASD–SAD co-occurrence (cf. White et al. 2014b). One such process is impaired emotion regulation, or the ability to modify moment-to-moment affective experience and expression (White et al. 2014a).

Emotion dysregulation is often the primary concern prompting treatment referral for individuals with ASD and is a major contributor to caregiver stress (Mazefsky et al. 2012). Herein, we explore emotion dysregulation and social motivation in relation to self-reported problems with social anxiety experienced by adults with ASD. Emotion dysregulation, difficulty returning to baseline after emotional upset, and generally heightened emotional reactivity, has been empirically documented in people with ASD (Konstantareas and Stewart 2006). It has been suggested that emotion dysregulation in people with ASD arises from a host of factors such as cognitive rigidity and poor perspective taking, atypical connectivity, and altered physiological reactivity (Mazefsky et al. 2013). White et al. (2014a) expanded this framework with a developmental model in which emotion dysregulation may manifest in a person with ASD as anxiety when social motivation is high.

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Social Motivation and ASD

Social motivation refers to the extent to which a person is interested in engaging in social-interpersonal behavior (Constantino and Gruber 2012). As such, it can manifest via approach and avoidance behaviors. In very young children, social motivation is often assessed based upon their social attention or preferential orientation to socially relevant stimuli, such as abnormal eye gaze to faces or absence of response to name, which may form a foundation for later impairments in social reciprocity and social cognition (Dawson et al. 2005; Osterling et al. 2002; Tager-Flusberg 2007; von Hofsten et al. 2009). Social motivation may also extend beyond preferential social orienting or attention. Chevallier et al. (2012), for example, proposed that social motivation also encompasses social reward and social maintenance behaviors. Disruptions in neural circuitry related to reward may interfere with the satisfaction or reward value derived from social experiences in those with ASD (Dichter et al. 2012; Kohls et al. 2012), thus leading to low prioritization of social versus non-social (i.e., objects) stimuli. In other words, individuals with ASD may not seek out social interactions because they do not derive satisfaction from them. Another aspect of social motivation that may be compromised in ASD involves behaviors used to establish, maintain, or enhance relationships. For example, individuals with ASD may not reciprocate others' behaviors through mimicry or engage in social pleasantries (e.g., greetings, social laughter; Hobson and Lee 1998; Hudenko et al. 2009). Instead, individuals with ASD may actively avoid social interactions due to social aversion, misinterpretations of perceived threat in social situations, or poor regulation of autonomic arousal that normally support social engagement (Dalton et al. 2005; Eack et al. 2015; Patriquin et al. 2013).

Additional investigations into eye-gaze patterns in ASD, however, suggest heightened activation in the amygdala, a structure in the brain that plays an active role in emotional reactions and decision-making. As such, investigators argue that decreased eye contact may serve as a coping mechanism to attenuate over-arousal that results from the anxiety of social contact (i.e. face-to-face interaction; Dalton et al. 2005; Kliemann et al. 2012; Tottenham et al. 2013). For example, Tottenham et al. (2013) found reduced eye gaze in adolescents with ASD was associated with elevated amygdala signaling and higher threat ratings of neutral faces. Kliemann et al. (2012) also demonstrated greater amygdala activation during eye fixation for individuals with ASD, with increased likelihood of looking away from the eyes after initial fixation on the eyes. Similarly, White et al. (2014) demonstrated a relationship

between fear of negative evaluation and increased gaze toward social threat cues in adolescents with ASD. Collectively, this research suggests that individuals with ASD may not only have less preferential orientation toward social information (i.e. eyes), but that social fears and anxiety in the context of ASD may affect social orienting in terms of heightened orienting and subsequent active avoidance.

In sum, social motivation has been previously presented as an overarching construct to include social attention, social reward, and social behaviors. In this study, we conceptualize social motivation as the drive to engage or disengage in a socially interpersonal manner as evidenced by behaviors such as avoidance, inhibition and empathic orientation. Social motivation may influence emotion regulatory strategies for coping with intense emotional experiences in ASD. Specifically, we predict that higher social motivation will intensify the relationship between emotion dysregulation and anxiety. That is, the relationship between emotion dysregulation and social anxiety is expected to be enhanced in those who report greater desire for social interaction (i.e. high social motivation), while controlling for social awareness to account for variability in social insight.

Method

Participants

Participants were 69 young adults (17–27 years of age; $M = 20.5$; $SD = 2.0$ years) with ASD presenting for social skills treatment at the UCLA PEERS Clinic. Data were collected prior to treatment from young adults participating in either research or hospital-based clinical groups for the PEERS (Program for the Education and Enrichment of Relational Skills; Laugeson and Frankel 2010) intervention. Eligibility criteria included IQ >70, no major language delays, fluency in English, no major mental illness, and a caregiver willing to participate in treatment. Young adults completed self-report questionnaires on emotion regulation (DERS) and social anxiety (SAS) and caregivers reported on social responsiveness (SRS) and social anxiety (SAS). Complete baseline data for all measures were available for 33 participants in the clinical groups and 36 from the research groups. All had a previous diagnosis of ASD from a licensed mental health professional, and included 20 females (29 %) and 49 males (71 %) from diverse ethnic backgrounds: 41 Caucasian (59.42 %); 12 Asian (17.39 %); 8 Latino/Hispanic (11.59 %); 2 African American (2.90 %); 3 other (4.35 %); and 3 no report (4.35 %) (Table 1).

Table 1 Descriptive data (n = 69)

	Minimum	Maximum	Mean (SD)	Skewness	Kurtosis
Age (months)*	204	326	247.01 (24.60)	.947	−1.137
Total SAS (YA)	31	86	55.25 (14.83)	.263	−.971
Total SAS (CG)	19	88	58.86 (15.82)	−.009	−.635
SAS fear of negative evaluation (YA)	8	39	23.55 (8.30)	−.003	−.944
SAS fear of negative evaluation (CG)	8	40	24.26 (8.12)	.189	−.715
SRS social motivation	42	90	67.42 (11.58)	−.102	−.857
SRS total score	42	90	69.67 (10.13)	−.163	−.142
Non-acceptance DERS	6	30	14.71 (6.19)	.605	−.239
Goal DERS	5	25	16.64 (4.76)	−.076	−.678
Impulse DERS	6	28	14.35 (5.83)	.542	−.598
Strategies DERS	8	39	20.39 (7.51)	.446	−.606
Awareness DERS	10	24	17.43 (3.41)	−.103	−.607
Clarity DERS	10	21	15.72 (2.16)	.286	.865
Total DERS	66	152	99.25 (19.33)	.375	−.431

* n = 68; YA young adult; CG caregiver

Measures

Social Responsiveness Scale (SRS; Constantino and Gruber 2005)

The SRS is a 65-item rating scale of the severity of ASD symptoms as they occur in natural social settings. It provides a clinical representation of an individual's social impairments, assessing social awareness, social information processing, capacity for reciprocal social communication, social motivation, and autistic mannerisms using T-scores ($M = 50$; $SD = 10$). Higher scores represent more autism related traits. As such, higher scores on the Social Motivation subscale indicate more impairment (e.g. lower social motivation; more avoidance behaviors). SRS raw scores were converted to T-scores based on the SRS-2 (Constantino and Gruber 2012) norms for adults. The SRS was administered to caregivers of young adults at pre-intervention assessment.

Social Anxiety Scale (SAS; La Greca and Lopez 1998)

The SAS consists of 22 items and has also been used in multiple samples of young adults (Garcia-Lopez et al. 2006; Hanby et al. 2012). Completed by young adults and their caregivers, items include “I/My child gets nervous when talking to peers he/she doesn't know very well,” for example. Caregivers and young adults rate items on a 5-point Likert scale ranging from “Not at All” (1) to “All of the Time” (5). The SAS is comprised of three subscales (i.e. fear of negative evaluation, social avoidance and distress specific to new situations, and generalized social avoidance and distress) in addition to a total score. Internal

consistency (i.e. Cronbach's α) for a college age sample for the total score of the SAS-A was .93 (Bagner et al. 2007). In addition to the SAS total score, the fear of negative evaluation (SAS-FNE) subscale was used in hypothesis-testing, as it can be viewed as an index of the cognitive domain of social anxiety that exists as an orthogonal entity in comparison to social motivation. In this way, we can examine a social anxiety domain that is distinct from social motivation.

Difficulties in Emotion Regulation Scale (DERS; Gratz and Roemer 2004)

The DERS is a 36-item self-report measure that assesses individuals' typical levels of emotion dysregulation across six domains: non-acceptance of negative emotions (Non-acceptance), inability to engage in goal-directed behaviors when experiencing negative emotions (Goal), difficulties controlling impulsive behaviors when experiencing negative emotions (Impulsive), limited access to emotion regulation strategies perceived as effective (Strategies), lack of emotional awareness (Awareness), and lack of emotional clarity (Clarity). Scores are coded such that higher scores indicate greater emotion dysregulation. In a sample of undergraduate students, this scale demonstrated high internal consistency for the total score (Cronbach's $\alpha = .93$), adequate internal consistency for all of the subscales (Cronbach's $\alpha > .80$), and good test-retest [Cronbach's reliability over a period of 4–8 weeks ($\rho_1 = .88$, $p < .01$ total score, $\rho_1s > .57$, $ps < .01$ subscales; Gratz and Roemer 2004)]. The DERS was administered to young adults at pre-intervention assessment.

Data Analyses

To test the central hypothesis that social motivation would moderate the relationship between emotion regulation and social anxiety, linear multiple regressions were conducted with three predictor variables (i.e., emotion regulation, social motivation, and their interaction), based on the methods of Cohen et al. (2003). For each model tested, the independent variables were standardized. The presence of moderation was indicated by significant findings for the interaction term. Analyses were conducted separately for both caregiver and self-report of social anxiety (total score and fear of negative evaluation subscale). Based on the available sample size of 69 and $\alpha = .05$, we had sufficient (.81) power to detect a medium (Cohens $f^2 = .15$) effect. All analyses were then repeated to control for social awareness using hierarchical linear regression. For supplemental analyses, all DERS subscales and the Social Motivation subscale from SRS were entered simultaneously in one level of a linear regression model to compare the predictors for social anxiety, and repeated for each reporter.

Results

Primary Analyses of Main Effects and Interactions

For both caregiver and self-report total social anxiety, significant main effects emerged for both social motivation ($\beta = .565, p < .001$; $\beta = .242, p < .05$, respectively) and total emotion regulation ($\beta = .219, p < .05$; $\beta = .595, p < .001$, respectively) (see Table 2), such that impaired social motivation and emotion dysregulation were related

to increased social anxiety. However, the interaction of social motivation and total emotion regulation was not significant in either model ($\beta = .117; p > .05$ for caregiver report; $\beta = .022, p > .05$ for self-report), and remained non-significant even after controlling for SRS Social Awareness ($\beta = .075; p > .05$; $\beta = -.027, p > .05$, respectively). In the models predicting fear of negative evaluation, for caregiver report of SAS–FNE, similar results were yielded in comparison to caregiver report of total SAS. That is, both social motivation ($\beta = .285, p < .05$) and total emotion regulation ($\beta = .246, p < .05$) were significant predictors. However, for self-reported fear of negative evaluation (SAS–FNE), only total emotion regulation remained as a significant predictor ($\beta = .564, p < .001$) (Table 3).

Supplemental Analyses

When SRS social motivation and all DERS subscales were entered as predictor variables for caregiver-reported total social anxiety, only three variables were significant predictors. Specifically, difficulty with goal directed behavior for negative emotions ($\beta = .249, p < .05$), lack of awareness of emotions ($\beta = .240, p < .05$) and social motivation ($\beta = .533, p < .001$) significantly predicted caregiver-reported total social anxiety. Based on self-reported total social anxiety, a different set of predictors emerged. Non-acceptance of negative thoughts ($\beta = .289, p < .05$), difficulty with goal directed behavior for negative emotions ($\beta = .260, p < .05$), impulse control difficulties with negative emotions ($\beta = -.361, p < .01$), and limited access to strategies for regulation of emotions ($\beta = .513, p < .01$) each significantly predicted social anxiety. Taken together, difficulty with directing behavior towards goals

Table 2 Correlation matrix of variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. SRS soc mot	–											
2. Total SAS (CG)	.574**	–										
3. Total SAS (YA)	.281*	.567**	–									
4. FNE SAS (CG)	.300*	.849**	.527**	–								
5. FNE SAS (YA)	.176	.438**	.903**	.469**	–							
6. Non-Acc DERS	.202	–.285*	.610**	.258*	.543**	–						
7. Goal DERS	–.080	.163	.472**	.257*	.470**	.301*	–					
8. Impulse DERS	–.125	–.085	.175	–.057	.184	.415**	.368**	–				
9. Awareness DERS	.036	.201	.069	.156	.137	.071	–.123	.021	–			
10. Strategies DERS	.158	.254*	.642**	.229	.588**	.709**	.540**	.647**	–.014	–		
11. Clarity DERS	–.073	.052	–.156	.141	–.172	–.091	–.254*	–.212	–.137	–.222	–	
12. Total DERS	.067	.246*	.609**	.261*	.579*	.797**	.613**	.756**	.154	.916**	–.154	–

Table 3 Linear regression model (primary analyses): predictors of social anxiety

Predictors	Young adult report			Caregiver report		
	<i>b</i>	<i>F</i>	<i>R</i> ²	<i>b</i>	<i>F</i>	<i>R</i> ²
Social anxiety total (dependent variable)						
Social motivation	.242*	16.292***	.429	.565***	13.759***	.388
DERS total	.595***			.219*		
Social motivation × DERS total	.022			.117		
Social anxiety: fear of negative evaluation (dependent variable)						
Social motivation	.137	12.030***	.357	.285*	3.819*	.155
DERS total	.564***			.246*		
Social motivation × DERS total	-.057			.040		

* *p* < 0.05; ** *p* < 0.01; *** *p* < 0.001

during negative emotions was related to social anxiety for both caregiver and self-report (Table 4).

Discussion

Results from this study build on the current body of literature linking emotion regulation difficulties to heightened social anxiety. As predicted, increased emotion dysregulation was associated with higher levels of social anxiety. Although White et al. (2014a) proposed social motivation to act as a possible moderator, data from this sample of treatment-seeking adults with ASD do not lend support to the moderating effects of social motivation on the relationship between emotion dysregulation and social anxiety. These interaction effects remained non-significant across reporters on social anxiety (i.e., self-report and caregiver), and when controlling for level of social awareness.

The specific facets predictive of social anxiety differed based on whose report of social anxiety is relied upon. More specifically, caregiver and young adult report on total SAS and SAS–FNE were significantly correlated; only 56.7 % of the variance of caregiver report of total SAS was accounted for by young adult report of total SAS.

Furthermore, only 46.9 % of the variance of SAS–FNE reported by caregivers was accounted for by young adult report of the same construct. The only variable to remain a constant predictor across reporters was difficulty with goal-directed behavior for negative emotions. Examples of situations requiring goal-directed behavior includes difficulty maintaining concentration or getting work done when upset. In addition, lack of emotional awareness and overall social motivation significantly predicted levels of social anxiety based on caregiver report, but not based on self-report. It may be that the young adults were not cognizant of their lack of emotional awareness or level of social engagement. On the other hand, non-acceptance of negative thoughts (e.g. “I feel guilty, embarrassed or ashamed for feeling upset”), impulse control difficulties (e.g. “I become or feel out of control when I feel upset”), and limited access to emotion regulation strategies (e.g. “My emotions are overwhelming when I’m upset”) significantly predict self-reported levels of anxiety. It appears that predictors of social anxiety from a self-report perspective tend to associate with difficulties related to immediate control of emotions, whereas predictors of social anxiety from a caregiver perspective tend to be related to deficits in emotion awareness and social behavior. From this

Table 4 Linear regression model (supplemental analyses): predictors of social anxiety

Predictors	Young adult report			Caregiver report		
	<i>b</i>	<i>F</i>	<i>R</i> ²	<i>b</i>	<i>F</i>	<i>R</i> ²
Social anxiety total (dependent variable)						
DERS non-acceptance	.289*	13.291***	.604	.072	8.263***	.487
DERS goal	.260*			.249*		
DERS impulse	-.361**			-.215		
DERS awareness	.090			.240*		
DERS strategies	.513**			.169		
DERS clarity	-.006			.185		
Social motivation	.114			.533***		

* *p* < 0.05; ** *p* < 0.01; *** *p* < 0.001

perspective, it may also be that caregivers incorrectly infer the causes of anxiety of their child, as they often can only provide an account of overt behaviors and must infer the underlying cognitive and emotional influences.

Although we do not find support for a moderating effect of social motivation, we do see a direct effect of social motivation on social anxiety, such that impoverished social motivation was associated with higher social anxiety.¹ Similarly, Corbett et al. (2014) reported that during solicited play sequences, children with ASD who present with the highest level of cortisol reactivity, indicative of anxiety, also showed less social motivation. As a result, it may be that low social motivation perpetuates and negatively reinforces avoidance behaviors.

While this finding was opposite of our prediction, the results may capture a behavioral proxy of social motivation. For example, questions that fall under the social motivation sub-scale on the SRS tend to be about behaviors that are outwardly expressed, such that it is difficult to determine to what degree avoidance behaviors are indeed due to poor social motivation or to something else, such as anxiety. This is understandable given the scale's purpose as a parent-report measure for a population with highly variable verbal abilities. Arguably, the intrinsic desire for social interaction could result in a plethora of both observable behavioral manifestations as well as features that do not readily lend themselves to observation, such as social curiosity, interest in others, and desire for interaction. In other words, low social motivation is not synonymous with social avoidance because high social motivation could also result in avoidance behavior (e.g., due to fear of being judged or socially thwarted). As such, it is important to differentiate between social impairment (i.e., behavioral or skill deficit in all individuals with ASD) and social motivation (i.e., desire to engage socially that is variable within individuals with ASD).

While this study presents an analytical approach to test a proposed theoretical model, there are several limitations. The current analyses utilized solely self and caregiver report in a population of treatment seeking young adults who were motivated to participate in an intervention to improve their social skills; thus, the sample may be inherently biased toward more socially motivated individuals. In addition, inclusionary criteria required only a community diagnosis; therefore, full characterization of the sample was not attained via gold-standard measures such as the autism diagnostic observation schedule, 2nd edition (ADOS-2) or autism diagnostic interview—revised (ADI-R). Not all questionnaires in the study were completed by

both young adult and caregiver; as a result, all analyses compared a combination of young adult self-report and caregiver report. As indicated by the varying predictors of social anxiety based on reporter, the biases of both reporters must be considered. The efficacy of self-report measures by individuals with ASD provides mixed evidence. Some researchers have demonstrated high levels of consistent response to caregivers yet others do not (Berthoz and Hill 2005). In this sample, only young adults reported on emotion regulation abilities, which require an increased level of insight and awareness into one's ability to act on negative thoughts. Furthermore, young adult report on social anxiety also requires a level of self-awareness to reflect on one's negative feelings and caregiver reports may be equally biased. Within this sample, caregivers reported on young adult level of social responsiveness and social anxiety. Finally, while steps were taken to increase power (e.g., reliable continuous variables, grounding model in theory, strong established relationship between predictor and outcome variables), we were underpowered to detect the typically smaller effects often seen in moderation analyses (Cohen 1992; Frazier et al. 2004). Future studies may benefit from the utilization of a developmental approach to test the model with longitudinal analyses in order to truly target the early effects of social motivation on emotion regulation. That is, we can reach a better understanding of the interactions between variables over time. Overall, this study builds upon the literature linking emotion dysregulation and anxiety within individuals with ASD and provides a foundation for examining possible mechanisms that may moderate this relationship.

Author Contributions DS cleaned and analyzed the data, wrote the results and discussion sections and synthesized the individual parts. AS contributed primarily to writing. SWW contributed to theory development, data analysis guidance and wrote a portion of the introduction. EL collected the data and contributed to writing the methods section.

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Bagner, D. M., Storch, E. A., & Preston, A. S. (2007). Romantic relational aggression: What about gender? *Journal of Family Violence*, 22(1), 19–24.
- Berthoz, S., & Hill, E. L. (2005). The validity of using self-reports to assess emotion regulation abilities in adults with autism spectrum disorder. *European Psychiatry*, 20(3), 291–298.
- Chevallier, C., Kohls, G., Troiani, V., Brodtkin, E. S., & Schultz, R. T. (2012). The social motivation theory of autism. *Trends in Cognitive Sciences*, 16(4), 231–239.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155–159.

¹ Hierarchical linear regression analyses were run to test a possible curvilinear relationship between social motivation and social anxiety and yielded insignificant results.

- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.
- Constantino, J. N., & Gruber, C. P. (2005). *Social responsiveness scale (SRS)*. Los Angeles, CA: Western Psychological Services.
- Constantino, J. N., & Gruber, C. P. (2012). *Social responsiveness scale-second edition (SRS-2)*. Torrance, CA: Western Psychological Services.
- 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.
- Dalton, K. M., Nacewicz, B. M., Johnstone, T., Schaefer, H. S., Gernsbacher, M. A., Goldsmith, H. H., & Davidson, R. J. (2005). Gaze fixation and the neural circuitry of face processing in autism. *Nature Neuroscience, 8*(4), 519–526.
- Dawson, G., Webb, S. J., & McPartland, J. (2005). Understanding the nature of face processing impairment in autism: Insights from behavioral and electrophysiological studies. *Developmental Neuropsychology, 27*(3), 403–424.
- Dichter, G. S., Felder, J. N., Green, S. R., Rittenberg, A. M., Sasson, N. J., & Bodfish, J. W. (2012). Reward circuitry function in autism spectrum disorders. *Social Cognitive and Affective Neuroscience, 7*(2), 160–172.
- Eack, S. M., Mazefsky, C. A., & Minshew, N. J. (2015). Misinterpretation of facial expressions of emotion in verbal adults with autism spectrum disorder. *Autism, 19*(3), 308–315.
- Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology, 51*(1), 115–134.
- Garcia-Lopez, L. J., Olivares, J., Beidel, D., Albano, A. M., Turner, S., & Rosa, A. I. (2006). Efficacy of three treatment protocols for adolescents with social anxiety disorder: A 5-year follow-up assessment. *Journal of Anxiety Disorders, 20*(2), 175–191.
- Grant, B. F., Hasin, D. S., Blanco, C., Stinson, F. S., Chou, S. P., Goldstein, R. B., & Huang, B. (2005). The epidemiology of social anxiety disorder in the United States: Results from the National Epidemiologic Survey on alcohol and related conditions. *Journal of Clinical Psychiatry, 66*(11), 1351–1361.
- Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment, 26*(1), 41–54.
- Hanby, M. S., Fales, J., Nangle, D. W., Serwik, A. K., & Hedrich, U. J. (2012). Social anxiety as a predictor of dating aggression. *Journal of Interpersonal Violence, 27*(10), 1867–1888.
- Hobson, R. P., & Lee, A. (1998). Hello and goodbye: A study of social engagement in autism. *Journal of Autism and Developmental Disorders, 28*(2), 117–127.
- Hudenko, W. J., Stone, W., & Bachorowski, J. A. (2009). Laughter differs in children with autism: An acoustic analysis of laughs produced by children with and without the disorder. *Journal of Autism and Developmental Disorders, 39*(10), 1392–1400.
- Kliemann, D., Dziobek, I., Hatri, A., Baudewig, J., & Heekeren, H. R. (2012). The role of the amygdala in atypical gaze on emotional faces in autism spectrum disorders. *The Journal of Neuroscience, 32*(28), 9469–9476.
- Kohls, G., Schulte-Rüther, M., Nehr Korn, B., Müller, K., Fink, G. R., Kamp-Becker, I., ... Konrad, K. (2012). Reward system dysfunction in autism spectrum disorders. *Social Cognitive and Affective Neuroscience, 8*(5), 565–572.
- Konstantareas, M. M., & Stewart, K. (2006). Affect regulation and temperament in children with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 36*(2), 143–154.
- La Greca, A. M., & Lopez, N. (1998). Social anxiety among adolescents: Linkages with peer relations and friendships. *Journal of Abnormal Child Psychology, 26*(2), 83–94.
- Laugeson, E. A., & Frankel, F. (2010). Social skills for teenagers with developmental and autism spectrum disorders: The PEERS treatment manual. New York, NY: Taylor & Francis Group.
- Lugnegård, T., Hallerbäck, M. U., & Gillberg, C. (2011). Psychiatric comorbidity in young adults with a clinical diagnosis of Asperger syndrome. *Research in Developmental Disabilities, 32*(5), 1910–1917.
- Mazefsky, C. A., Herrington, J., Siegel, M., Scarpa, A., Maddox, B. B., Scahill, L., & White, S. W. (2013). The role of emotion regulation in autism spectrum disorder. *Journal of the American Academy of Child and Adolescent Psychiatry, 52*(7), 679–688.
- Mazefsky, C. A., Pelphrey, K. A., & Dahl, R. E. (2012). The need for a broader approach to emotion regulation research in autism. *Child Development Perspectives, 6*(1), 92–97.
- Osterling, J. A., Dawson, G., & Munson, J. A. (2002). Early recognition of 1-year-old infants with autism spectrum disorder versus mental retardation. *Development and Psychopathology, 14*(02), 239–251.
- Patriquin, M. A., Scarpa, A., Friedman, B. H., & Porges, S. W. (2013). Respiratory sinus arrhythmia: A marker for positive social functioning and receptive language skills in children with autism spectrum disorders. *Developmental Psychobiology, 55*(2), 101–112.
- Tager-Flusberg, H. (2007). Evaluating the theory-of-mind hypothesis of autism. *Current Directions in Psychological Science, 16*(6), 311–315.
- Tottenham, N., Hertzog, M. E., Gillespie-Lynch, K., Gilhooly, T., Millner, A. J., & Casey, B. J. (2013). Elevated amygdala response to faces and gaze aversion in autism spectrum disorder. *Social Cognitive and Affective Neuroscience, 9*(1), 106–117.
- van Steensel, F. J., Bögels, S. M., & Perrin, S. (2011). Anxiety disorders in children and adolescents with autistic spectrum disorders: A meta-analysis. *Clinical Child and Family Psychology Review, 14*(3), 302–317.
- von Hofsten, C., Uhlig, H., Adell, M., & Kochukhova, O. (2009). How children with autism look at events. *Research in Autism Spectrum Disorders, 3*(2), 556–569.
- White, S. W., Maddox, B. B., & Panneton, R. K. (2014). Fear of negative evaluation influences eye gaze in adolescents with autism spectrum disorder: A pilot study. *Journal of Autism and Developmental Disorders, 1–12*.
- White, S. W., Mazefsky, C. A., Dichter, G. S., Chiu, P. H., Richey, J. A., & Ollendick, T. H. (2014a). Social-cognitive, physiological, and neural mechanisms underlying emotion regulation impairments: Understanding anxiety in autism spectrum disorder. *International Journal of Developmental Neuroscience, 39*, 22–36.
- White, S. W., Schry, A. R., & Kreiser, N. L. (2014b). Social worries and difficulties: Autism and/or social anxiety disorder? In T. E. Davis III, S. W. White, & T. H. Ollendick (Eds.), *Handbook of autism and anxiety* (pp. 121–136). New York, NY: Springer International Publishing.