



Examining the Relations Between Social Competence, Autistic Traits, Anxiety and Depression in Autistic and Non-Autistic Children

Marisa L. Mylett¹ · Troy Q. Boucher¹ · Nichole E. Scheerer² · Grace Iarocci¹

Accepted: 7 May 2023 / Published online: 21 June 2023

© The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2023

Abstract

The current study examined whether social competence and autistic traits are related to anxiety and depression in autistic and non-autistic children. Parents of 340 children aged 6 to 12 years old, including 186 autistic and 154 non-autistic children completed the Autism Spectrum Quotient (AQ) to assess their child's autistic traits, the Multidimensional Social Competence Scale (MSCS) to assess their child's social competence, and the Behaviour Assessment Scale for Children 2 (BASC-2) to assess their child's internalizing symptoms of depression and anxiety, and children were administered the Wechsler Abbreviated Scale of Intelligence, Second Edition (WASI-II) to assess their intellectual abilities. Hierarchical multiple regression analyses were conducted to investigate the relations between social competence, autistic traits, anxiety, and depression. Social competence was related to anxiety and depression symptoms in autistic children, but only depression symptoms in non-autistic children, above and beyond the effects of autistic traits, IQ and age. Autistic children were also reported to experience more severe anxiety and depression symptoms, and more autistic traits were related to higher levels of anxiety and depression in both groups. These findings suggest that social competence and internalizing symptoms are intricately connected in autistic children and need to be jointly considered in both assessment and intervention. The social implications are discussed with an emphasis on acceptance of diverse social styles as a viable avenue to reduce children's internalizing symptoms.

Keywords Autism · Social competence · Autistic traits · Depression · Anxiety · Children

Introduction

Children diagnosed with Autism Spectrum Disorder (ASD) without an intellectual disability are at an increased risk for various externalizing and internalizing disorders that can negatively impact everyday functioning (Simonoff et al., 2008). Two of the most common co-occurring disorders in autistic children are anxiety and depression (Kim et al., 2000; Simonoff et al., 2008). Children who experience anxiety or depression face significant functional impairments in daily living, including social challenges (Pickles et al., 2001). The prevalence of anxiety in autistic children and youth without

intellectual disability has been reported to be 39.5% to 45%, while a prevalence of 10% to 15.7% has been reported for depression (Dellapiazza et al., 2022; Leyfer et al., 2006). The prevalence rates for autistic children are significantly higher than the anxiety and depression rates reported for children and youth in the general population, which ranges from 7.1% to 9.2% for anxiety (Ghandour et al., 2019; Lebrun-Harris et al., 2022), and 3.2% to 4.4% for depression (Bitsko et al., 2022; Ghandour et al., 2019). Considering the high rates of co-occurring internalizing disorders among autistic children, there is a growing need to understand the factors that may contribute to, and exacerbate, the development of internalizing problems in autistic children (Sam & White 2020).

✉ Marisa L. Mylett
addl@sfu.ca

¹ Department of Psychology, Simon Fraser University, RCB
5213, 8888 University Drive, Burnaby, BC V5A 1S6,
Canada

² Psychology Department, Wilfrid Laurier University, 75
University Avenue West, Waterloo, ON N2L3C5, Canada

Social Competence, Anxiety, and Depression

Social competence has been defined as the ability to make use of personal and environmental resources to achieve an adaptive social outcome (Waters & Sroufe, 1983), which

may involve the use of social, emotional, cognitive, and behavioural skills (Semrud-Clikeman, 2007; Yager & Iarocci, 2013). However, social competence is not an inherent trait, but rather emerges as a result of a dynamic interaction between the individual and their environment (Yager & Iarocci, 2013). Having poor social competence, including poor verbal and nonverbal conversation skills, poor social knowledge, and lower social motivation, may create a vulnerability to anxiety and depression during childhood (Kennedy et al., 1989; Segrin, 2000). Drawing on interpersonal models of internalizing disorders, a child's social competence influences their interactions with others in their social environment, such that their social challenges increase the likelihood of experiencing peer rejection and negative social interactions (Segrin, 2000). Failure models of childhood depression posit that anxiety and depressive symptoms can develop from negative self-evaluations as the child endures repeated social failures and rejection (Cartwright-Hatton et al., 2005; Cole et al., 1996; Kennedy et al., 1989; Patterson & Capaldi, 1990). Specifically, recurring negative social interactions can lead to the formation of a poor self-concept, social withdrawal, loneliness and consequently, symptoms of anxiety and depression (Kerns & Kennedy, 2013; Smith & White, 2020).

However, the relation between social competence and internalizing symptoms appears to be transactional and cyclical (Kerns & Kendall, 2013). Although poorer social competence may increase the risk of developing internalizing disorders, existing internalizing symptoms may also exacerbate difficulties in social competence, which in turn, may worsen internalizing symptoms (Smith & White, 2020). Generalized anxiety is characterized by excessive and uncontrollable worry and restlessness, whereas depression is characterized by persistent sadness, feelings of worthlessness and guilt, and lack of interest – and both disorders are accompanied by physiological symptoms, such as irritability, difficulty concentrating, fatigue, and disturbed sleep (American Psychiatric Association [APA], 2013). Falling within the overarching category of internalizing disorders, both anxiety and depression are characterized by transdiagnostic processes of repetitive negative thinking (Ehring & Watkins, 2008), fixation on negative self-thoughts (Wells & Carter, 2001), and emotion dysregulation (Cludius et al., 2020). In social situations, these cognitive symptoms may lead to interpersonal problems, such as peer conflict, and may interfere with the child's ability to form and maintain peer relationships (Motoca et al., 2012; Segrin, 2000). Moreover, as a result of distressing internalizing symptoms, the child may withdraw from social situations as a form of coping (Rubin et al., 2009), which may further impede or delay healthy social development, including social competence. Consequently, difficulties in social functioning may reinforce

existing internalizing symptoms of anxiety and/or depression (Katz et al., 2011; Rubin et al., 2009).

Indeed, anxiety and depression symptoms are found to be related to social competence in autistic and non-autistic children and adolescents. Mazurek and Kane (2010) found that autistic and non-autistic children with elevated anxiety and depression symptomatology had poorer quality friendships and relationships, social communication difficulties, were lonelier, and withdrew more from social situations compared to children without these symptoms. In a sample of autistic children, those who self-reported higher levels of anxiety were more likely to report greater loneliness and were rated by caregivers as being socially withdrawn (White & Roberson-Nay, 2009). Johnston and Iarocci (2017) identified that the severity of depressive symptoms was a significant predictor of parent-reported social competence in autistic children. Similarly, non-autistic children with generalized anxiety disorder (GAD) and social anxiety disorder (SAD) were reported by caregivers to be less socially competent than their peers without an anxiety disorder (Scharfstein & Beidel, 2015), and experienced more social problems than their peers (Motoca et al., 2012; Scharfstein & Beidel, 2015). In a longitudinal study, non-autistic children with lower social competence at age 4 exhibited more internalizing symptoms, including anxiety and depression, at age 10 and 14 years (Bornstein et al., 2010).

Social competence can serve as a protective factor against internalizing symptoms in childhood. In a study of non-autistic children and adolescents, positive peer relationships and high-quality friendships were identified as buffers against social anxiety (La Greca & Harrison, 2005) and depressive symptoms (Nilsen et al., 2013). Several interventions aimed at reducing anxiety and mood disorders target the development of social skills in autistic and non-autistic children (Beidel et al., 2014; Segrin, 2000; White et al., 2013). Thus, the importance of social competence in relation to internalizing symptoms must not be understated, considering that increasing social competence is likely to have positive effects on both anxiety and depression levels.

Autistic Traits and Internalizing Symptoms

Beyond social difficulties, there are additional factors associated with the development of internalizing symptoms, including the level of autistic traits (Lundström et al., 2011; Settapani et al., 2012). Although social difficulties are a core symptom of ASD and fall within the broader conceptualization of 'autistic traits', there are other autistic traits beyond social difficulties. For example, focused interests, repetitive behaviours, difficulties switching attention and adapting to change, and attention to details or sensations are autistic traits that are not solely based on social understanding and

behaviour (Baron-Cohen, 2001). However, autistic traits may influence how the child interacts with others in their social environment and may contribute to the development of internalizing symptoms through negative social interactions. Johnston and Iarocci (2017) identified that lower parent-reported social competence and higher autistic traits were related to higher depressive and GAD symptoms in autistic and non-autistic children ages 6 to 12 years old. Anxiety symptoms have also been found to be related to increased autistic traits, such as increased stereotypic and ritualistic behaviours (Mayes et al., 2011; Oswald et al., 2016; Sukhodolsky et al., 2008). However, a few studies report no association between autistic traits and internalizing symptoms in autistic and non-autistic children (Mazurek & Kanne, 2010; Simonoff et al., 2008). More research is needed to discern the association between autistic traits and anxiety and depression symptoms in children.

Other Factors Influencing Internalizing Symptoms

In addition to social competence and autistic traits, age and intellectual ability may be related to the prevalence and severity of anxiety and depression in autistic and non-autistic children. Through childhood and into adulthood, internalizing symptoms tend to steadily increase with age (Copeland et al., 2014; Pickles et al., 2001). Moreover, children with average or above-average intellectual ability may recognize and internalize their poorer social abilities relative to their peers, putting them at an even greater risk for internalizing symptoms (Bellini, 2004; Johnston & Iarocci, 2017; Smith & White, 2020). Mayes and colleagues (2011) report that age, verbal IQ, and autistic traits together are the strongest predictors of anxiety and depression symptoms in autistic children. What remains unclear is the role of social competence.

The objective of the current study was to examine whether social competence and/or autistic traits, would predict anxiety and depression symptoms in autistic and non-autistic children above and beyond the effects of age and IQ. We used a cross-sectional design at a single time point. It was hypothesized that autistic children would have higher symptom severity on measures of anxiety and depression compared to non-autistic children and that lower social competence would be related to higher levels of anxiety and depression symptoms in both autistic and non-autistic children. We reasoned that a greater number of autistic traits would be related to higher levels of anxiety and depression symptoms after controlling for IQ and age in both autistic and non-autistic children. We predicted that lower social

competence would be related to higher levels of anxiety and depression symptoms, above and beyond number of autistic traits, IQ and age for both autistic and non-autistic children.

Methods

Participants

Parents and their children ages 6 to 12 years old with and without a diagnosis of ASD participated in this study. Participants were recruited through a summer day camp for autistic and non-autistic children, which was advertised in the community and through local autism service providers. Inclusion criteria for the summer camp were an English-speaking caregiver and completion of all questionnaires. All caregivers provided written consent prior to participation. Sixteen participants (15 autistic and one non-autistic) were excluded from analyses because they held a diagnosis of intellectual disability and inclusion of these participants would introduce potential confounds into the sample that cannot be statistically controlled for. A total of 340 children met full inclusion criteria and were included in the study: 186 autistic children (147 boys, $M_{age}=9.76$, $SD=1.83$) and 154 non-autistic children (96 boys, $M_{age}=9.38$, $SD=1.75$). Forty-six of the non-autistic children had direct relatives diagnosed with ASD (i.e., biological parent or sibling). Analyses were conducted separately excluding these children, but no significant differences emerged, so they were retained. A table of participants' demographic information can be found in Table 1.

Parents provided confirmation of their child's autism diagnosis in the form of a clinical diagnostic report or government funding eligibility report. A diagnosis of ASD in British Columbia, Canada involves a standardized diagnostic procedure using the Autism Diagnostic Observation Schedule (ADOS) and the Autism Diagnostic Interview-Revised (ADI-R) conducted by a trained clinician. The Autism-Spectrum Quotient (AQ; Baron-Cohen et al., 2006) was administered to assess the presence of autistic traits in the sample and is used in the analyses. This study was approved by the Office of Research Ethics at Simon Fraser University.

Measures

Intelligence Quotient

The Wechsler Abbreviated Scale of Intelligence, Second Edition (WASI-II; Wechsler, 2011) was administered by trained graduate students in the Clinical Psychology program at Simon Fraser University to assess the children's

Table 1 Sample Characteristics

	Autistic (n = 186)	Non-Autistic (n = 154)
<i>Variable Mean (SD)</i>		
Age	9.76 (1.83)	9.39 (1.75)
WASI-II FSIQ-2	104.30 (14.84)	106.36 (12.24)
AQ Total Score*	31.88 (6.77)	15.05 (7.75)
MSCS Total Score*	207.29 (32.74)	285.18 (42.56)
BASC-2 Anxiety T-Score*	56.47 (13.35)	51.85 (11.88)
BASC-2 Depression T-Score*	61.54 (13.90)	52.45 (11.82)
<i>Race n (%)</i>		
Asian	49 (26)	50 (32)
Black	2 (1)	3 (2)
Indigenous	3 (2)	4 (3)
Mixed	21 (11)	13 (8)
White	110 (59)	84 (55)
<i>Child Education n (%)</i>		
Public School	160 (86%)	148 (96%)
Private School	14 (8%)	5 (3)
Home School	12 (6%)	1 (<1%)
<i>Family Income n (%)</i>		
Less than \$20,000	5 (3%)	6 (4%)
\$20,000 to \$49,999	27 (15%)	16 (10%)
\$50,000 to \$79,999	41 (22%)	42 (27%)
\$80,000 to \$109,999	34 (18%)	27 (17%)
\$110,000 to \$140,000	32 (17%)	23 (15%)
Greater than \$140,000	22 (12%)	26 (17%)
Undisclosed	25 (13%)	14 (9%)
<i>Participant with relative with ASD n (%)</i>		
Parent	3 (2%)	1 (<1%)
Sibling	32 (17%)	45 (29%)
Cousin	5 (3%)	2 (1%)

WASI-II FSIQ-2: Wechsler Abbreviated Scale of Intelligence, 2nd Edition—Full Scale Intelligence Quotient, 2 scale; *AQ Total Score*: Autism-Spectrum Quotient Total Score; *MSCS Total Score*: Multidimensional Social Competence Scale Total Score; *BASC-2*: Behaviour Assessment System for Children, 2nd Edition

* $p < .001$.

Group differences were not calculated for demographic variables

intellectual abilities. The Full-Scale IQ-2 (FSIQ-2), composed of scores from two subtests: Matrix Reasoning and Vocabulary, was used as an approximation of overall intellectual ability. The internal consistency for the FSIQ-2 composite scale is excellent ($\alpha = 0.93$) for children ages 6 to 16, and inter-rater reliability is high for both Matrix Reasoning ($r = 0.99$) and Vocabulary ($r = 0.95$; McCrimmon & Smith, 2012).

Autistic Traits

The AQ-Child (for ages 4 to 11 years old; Auyeung et al., 2008) or the AQ-Adolescent (for ages 12 to 15 years old; Baron-Cohen et al., 2006) were completed by all caregivers. The AQ is a parent-report questionnaire that assesses

the social and non-social characteristics of ASD across five domains: social skills, attention switching, attention to detail, communication skills, and imagination. The AQ contains 50 questions that are answered using a four-point scale (definitely agree, slightly agree, slightly disagree, and definitely disagree). A total score ranging between 0 and 50 is produced, where a higher AQ score reflects more autistic traits. The internal consistency is high for the AQ-Child ($\alpha = 0.97$) and the AQ-Adolescent ($\alpha = 0.79$), and all versions of the AQ are considered highly comparable (Auyeung et al., 2008).

Social Competence

The Multidimensional Social Competence Scale (MSCS; Yager & Iarocci, 2013) is a parent-report questionnaire assessing children's social competence in their everyday life. The MSCS is composed of 77 questions utilizing a five-point rating scale (not true or almost never true, rarely true, sometimes true, often true, very true or almost always true). The MSCS measures social competence across seven domains: social motivation, social inferencing, demonstrating empathic concern, social knowledge, emotion regulation, verbal conversation skills, and nonverbal sending skills. A higher MSCS total score, which is the sum of scores for all seven domains, reflects better social competence. The internal consistencies of the MSCS subscales are high (range $\alpha=0.84$ to $\alpha=0.90$), as is the MSCS total score ($\alpha=0.95$) (Yager & Iarocci, 2013).

Anxiety and Depression

The Behaviour Assessment System for Children, Second Edition (BASC-2; Reynolds & Kamphaus, 2004) measures adaptive and behavioural functioning for children at pre-school, child, and adolescent ages. The parent-report form for children (PRS-C; ages 6 to 11 years old) and adolescents (PRS-A; ages 12 to 21 years old) were completed by the caregivers. The BASC-2 PRS-C and PRS-A forms contain 160 and 150 questions, respectively, asking caregivers to indicate how their child has behaved in the last several months using a four-point scale (i.e., never, sometimes, often, or almost always). The BASC-2 yields a subscale score for anxiety (PRS-C = 14 items; PRS-A = 11 items), and a subscale score for depression (PRS-C = 14 items; PRS-A = 14 items), which were used in the current study. These subscale scores are represented as *t*-scores with scores greater than 60 *T* indicating clinically "at risk" levels of anxiety or depression symptoms and scores greater than 70 *T* indicating clinically significant levels. The anxiety subscale captures generalized anxiety in children and includes items about nervousness, fearfulness, and a range of worries. The depression subscale includes items about feelings of sadness and loneliness, quick shifts in mood, and expressions of suicidal thoughts. The internal consistency of both the anxiety subscale ($\alpha > 0.81$) and the depression subscale ($\alpha > 0.85$) are excellent (Reynolds & Kamphaus, 2004).

Although the BASC-2 was not specifically developed for autistic children and may introduce methodological issues such as symptom overlap between autistic traits and internalizing symptoms and atypical symptoms of depression and anxiety in autistic children, there is support for the utility and validity of the BASC-2 with autistic children. First, children and adolescents with ASD were included in

the general and clinical normative samples of the BASC-2 (Reynolds & Kamphaus, 2004). Second, Goldin et al. (2014) found no significant differences in the scores between an ASD group and another group with atypical development across all areas other than subscales considered to be core features of autism and distinctive to autism. These results indicate that subscales, like depression and anxiety, operate similarly between autistic and atypically developing children who are both more prone to experience mental health concerns. These results suggest that the BASC-2 may be an acceptable measure to use with autistic children.

Data Analysis

Descriptive and statistical analyses were conducted using SPSS version 25.0 (Armonk, NY: IBM Corp). Descriptive analyses were conducted to determine the means and standard deviations of the variables of interest. Pearson correlations were used to examine relationships among all variables. Independent sample *t*-tests and, in the case of assumption violations, Welch *t* tests were used to assess significant group differences in age, IQ, social competence, autistic traits, anxiety, and depression. Four hierarchical multiple linear regressions were conducted for each diagnostic group separately to examine the relations between age, IQ, autistic traits, and social competence with the outcome variables of anxiety and depression symptoms. To control for multiple comparisons, significance was adjusted and set at the $\alpha = 0.01$ level for all statistical analyses.

For all five between-group comparisons, the assumption of normality of the populations was met, but for three of the five comparisons, the assumption of homogeneity of variances was violated. For these cases, a robust Welch *t* test was used. Overall, there were no outliers in the data. For all linear regression analyses, relevant assumptions were met. All hierarchical regressions met the assumption of linearity, as assessed by a plot of studentized residuals against the predicted values, and data were normally distributed, as assessed visually by Q-Q plots. There was independence of the residuals, and there was homoscedasticity, visually assessed through inspection of a plot of studentized residuals versus unstandardized predicted values. There was no multicollinearity, as tolerance values were all below one.

Results

Descriptive Analysis

Table 1 presents the descriptive statistics for the variables in this study (age, IQ, social competence scores, anxiety scores, and depression scores). Sex was not evenly distributed across

autistic and non-autistic participants ($X^2(1, N = 340) = 11.5, p < 0.001$; with a total of 243 boys and 97 girls), as there were significantly fewer autistic girls than autistic boys (i.e., 39 autistic girls and 147 autistic boys); however, this distribution is representative of the autistic population, as autism is diagnosed four times more in boys than in girls (Maenner et al., 2020).

Between-Group Differences

Autistic and non-autistic children did not differ significantly in age ($t(338) = -1.936, p = 0.054, d = -0.21, 95\% \text{ CI} [-0.43, 0.03]$) or IQ ($t(338) = 1.383, p = 0.168, d = 0.15, 95\% \text{ CI} [-0.06, 0.36]$). For between-group differences in MSCS total scores and AQ total scores, homogeneity of variances was violated, as assessed by Levene's test for equality of variances ($p < 0.05$), thus a Welch t-test was used for these analyses. Autistic participants had significantly lower MSCS total scores than non-autistic participants ($t(283.439) = 18.604, p < 0.000, d = 2.08, 95\% \text{ CI} [1.81, 2.34]$). The autistic participants were also found to have significantly higher AQ total scores than the non-autistic participants ($t(306.272) = -21.099, p < 0.000, d = -2.33, 95\% \text{ CI} [-2.60, -2.05]$).

Autistic children had significantly higher BASC-2 anxiety scores ($t(338) = -3.339, p < 0.001, d = -0.36, 95\% \text{ CI} [-0.58, -0.15]$) with 19% in the clinically significant range and 18% in the at-risk range, compared to 10% and 13%, respectively, in the non-autistic sample. Similarly, autistic children had significantly higher BASC-2 depression scores ($t(338) = -6.413, p < 0.000, d = -0.70, 95\% \text{ CI} [-0.92, -0.48]$), with 24% in the clinically significant range and 26% in the at-risk range, compared to 9% and 17%, respectively, in the non-autistic sample. A total of 13% of autistic participants were within the clinically significant range of t-scores for both BASC-2 anxiety and depression, compared to 4% of non-autistic participants.

Correlation Analysis

Table 2 presents the Pearson correlations between all variables for autistic and non-autistic children. Results revealed that BASC-2 anxiety and depression scores were positively correlated for autistic ($r(184) = 0.596, p < 0.001$) and non-autistic children ($r(152) = 0.609, p < 0.001$). MSCS total scores were negatively correlated with BASC-2 anxiety scores for autistic children ($r(184) = -0.322, p < 0.001$), but were not significantly correlated for non-autistic children ($r(152) = -0.203, p = 0.013$). MSCS total scores were negatively correlated with BASC-2 depression scores for autistic ($r(184) = -0.488, p < 0.001$) and non-autistic children ($r(152) = -0.608, p < 0.001$). Autistic traits, as measured by AQ total scores, was positively correlated with BASC-2 anxiety scores for autistic children ($r(184) = 0.259, p < 0.001$), but they were not correlated for non-autistic children ($r(152) = 0.203, p = 0.012$). AQ total scores were positively correlated with BASC-2 depression scores for autistic ($r(184) = 0.256, p < 0.001$) and non-autistic children ($r(152) = 0.469, p < 0.001$). Finally, AQ scores were negatively correlated to MSCS scores for autistic ($r(184) = -0.506, p < 0.001$) and non-autistic children ($r(152) = -0.680, p < 0.001$). For children in both groups, neither age nor IQ was significantly correlated with BASC-2 anxiety or depression scores.

Hierarchical Regression Analysis

Anxiety

Two hierarchical regression analyses were conducted to test whether, after controlling for age and IQ, AQ total scores and MSCS total scores could predict BASC-2 anxiety scores for autistic and non-autistic children. For both regression

Table 2 Correlations among all variables

Variable	1	2	3	4	5	6
1. Age	–	.054	.018	–.109	.151	.162
2. IQ	.334**	–	–.027	.015	.103	.062
3. AQ	.288**	–.062	–	–.506**	.259**	.256**
4. MSCS	–.146	.157	–.680**	–	–.322**	–.488**
5. Anxiety	.195	–.063	.177	–.203	–	.596**
6. Depression	.200	–.078	.469**	–.608**	.609**	–

Correlations for the autistic group ($n = 186$) are above the diagonal. Correlations for the non-autistic group ($n = 154$) are shown below the diagonal

IQ: Wechsler Abbreviated Scale of Intelligence, 2nd Edition—Full Scale Intelligence Quotient, 2 scale; *AQ*: Autism-Spectrum Quotient Total Score; *MSCS*: Multidimensional Social Competence Scale Total Score; *Anxiety*: Behaviour Assessment System for Children, 2nd Edition, Anxiety T-Score; *Depression*: Behaviour Assessment System for Children, 2nd Edition, Depression T-Score

* $p < .01$; ** $p < .001$

Table 3 Hierarchical regression analysis predicting anxiety in autistic children

Variable	Anxiety					
	Model 1		Model 2		Model 3	
	B	β	B	β	B	β
Constant	37.179		20.563		50.262	
Age	1.062	.146	1.025	.141	.849	.116
IQ	.086	.095	.092	.102	.093	.104
AQ			.511	.259**	.270	.137
MSCS					-.099	-.242*
<i>Adj. R</i> ²	.021		.084		.123	
<i>F</i>	3.002		6.650**		7.474**	
ΔR^2	–		.067		.043	
ΔF	–		13.534		9.063	

n = 186

* $p < .01$; ** $p < .001$ **Table 4** Hierarchical Regression Analysis Predicting Anxiety in Non-Autistic Children

Variable	Anxiety					
	Model 1		Model 2		Model 3	
	B	β	B	β	B	β
Constant	51.305		49.161		61.488	
Age	1.694	.243*	1.387	.204	1.40	.206
IQ	-.140	-.145	-.121	-.125	-.105	-.108
AQ			.170	.111	.016	.010
MSCS					-.041	-.148
<i>Adj. R</i> ²	.044		.049		.054	
<i>F</i>	4.519		3.612		3.191	
ΔR^2	–		.011		.012	
ΔF	–		1.752		1.867	

n = 154

* $p < .01$; ** $p < .001$

analyses, a three-step procedure was used. Age and IQ were entered into Step 1, AQ total scores were entered into Step 2, and MSCS total scores were entered into Step 3.

For autistic children, Step 1 of the model indicated that age and IQ did not significantly predict BASC-2 anxiety scores (Adjusted $R^2 = 0.021$, $F(2, 183) = 3.002$, $p = 0.052$). The addition of AQ total scores in Step 2 was significant (Adjusted $R^2 = 0.084$, $\Delta F(1, 182) = 13.534$, $p < 0.001$), leading to a statistically significant change in R^2 of 0.067. Adding MSCS total scores in Step 3 was significant (Adjusted $R^2 = 0.123$, $\Delta F(1, 181) = 9.063$, $p = 0.003$), leading to a statistically significant change in R^2 of 0.043; see Table 3.

For non-autistic children, step 1 of the model indicated that age and IQ did not significantly predict anxiety scores (Adjusted $R^2 = 0.044$, $F(2, 151) = 4.519$, $p = 0.012$). The addition of AQ total scores in Step 2 was not significant

(Adjusted $R^2 = 0.049$, $\Delta F(1, 150) = 1.752$, $p = 0.188$). Adding MSCS total scores in Step 3 was not significant (Adjusted $R^2 = 0.054$, $\Delta F(1, 149) = 1.867$, $p = 0.174$). The entire model predicting BASC-2 anxiety scores in non-autistic children was not significant ($F(4, 153) = 3.191$, $p = 0.015$); see Table 4.

Depression

Two hierarchical regression analyses were conducted to see whether, after controlling for age and IQ, AQ total scores and MSCS total scores could predict BASC-2 depression scores for autistic and non-autistic children. For both regression analyses, a three-step procedure was used. Age and IQ were entered into Step 1, AQ total scores were entered into Step 2, and MSCS total scores were entered into Step 3.

Table 5 Hierarchical regression analysis predicting depression in autistic children

Variable	Depression					
	Model 1		Model 2		Model 3	
	B	β	B	β	B	β
Constant	44.571		27.542		87.372	
Age	1.206	.159	1.168	.154	.813	.107
IQ	.050	.053	.057	.060	.059	.063
AQ			.523	.255**	.039	.019
MSCS					-.199	-.468**
<i>Adj. R</i> ²	.018		.079		.238	
<i>F</i>	2.728		6.280**		15.451**	
ΔR^2			.065		.161	
ΔF			13.027**		39.026**	

n = 186

* $p < .01$; ** $p < .001$ **Table 6** Hierarchical regression analysis predicting depression in non-autistic children

Variable	Depression					
	Model 1		Model 2		Model 3	
	B	β	B	β	B	β
Constant	53.097		44.751		89.547	
Age	1.718	.255*	.700	.104	.744	.110
IQ	-.158	-.163	-.083	-.086	-.025	-.026
AQ			.661	.433**	.101	.066
MSCS					-.151	-.542**
<i>Adj. R</i> ²	.051		.215		.368	
<i>F</i>	5.135*		14.976**		23.275**	
ΔR^2	–		.167		.154	
ΔF	–		32.516**		37.298**	

n = 154

* $p < .01$; ** $p < .001$

For autistic children, Step 1 of the model was not significant (Adjusted $R^2 = 0.018$, $F(2, 183) = 2.728$, $p = 0.068$). Entering AQ total scores at Step 2 was significant (Adjusted $R^2 = 0.079$, $\Delta F(1, 182) = 13.027$, $p < 0.001$), leading to a significant change in R^2 of 0.065. Entering MSCS total scores to the model at Step 3 was significant (Adjusted $R^2 = 0.238$, $\Delta F(1, 181) = 39.026$, $p < 0.001$), leading to a significant change in R^2 of 0.161; see Table 5.

For non-autistic children, step 1 of the model was significant (Adjusted $R^2 = 0.051$, $F(2, 151) = 5.135$, $p = 0.007$). Adding AQ total scores at Step 2 accounted for a significant proportion of variance in BASC-2 Depression scores (Adjusted $R^2 = 0.215$, $\Delta F(1, 150) = 32.516$, $p < 0.001$), a significant R^2 change of 0.167. Adding MSCS total scores at Step 3 was also significant (Adjusted $R^2 = 0.368$, $\Delta F(1, 149) = 37.298$, $p < 0.001$), leading to a significant change in R^2 of 0.154; see Table 6.

Discussion

The current study investigated the relations between social competence, autistic traits, IQ, and age and anxiety and depression symptoms in autistic and non-autistic children. We found that autistic children had significantly higher anxiety and depressive symptoms than non-autistic children and were more frequently in the clinically significant range for both anxiety and depression. Among the autistic children, 37% and 50% had BASC-2 anxiety and depression t-scores greater than the “at risk” clinical cut-off of 60 T, respectively. These prevalence rates are similar to Johnston and Iarocci’s (2017) findings where 34% and 48% of autistic participants, aged 6 to 13 years old, scored above the clinical cut-off for anxiety and depression scores on the BASC-2, respectively. Overall, the findings that autistic children have higher anxiety and depressive symptom severity and

prevalence than non-autistic children are consistent with previous research (Johnston & Iarocci, 2017; Kerns et al., 2020a, 2020b; Kim et al., 2000; Oswald et al., 2016; White et al., 2009).

We also confirmed that poorer social competence was associated with higher anxiety and depression symptoms for autistic children. However, for non-autistic children, social competence was only significantly correlated with depression symptoms. These findings are similar to previous research, where impairments in social functioning were associated with greater anxiety (Chang et al., 2012; Dubin et al., 2015; Duvekot et al., 2018) and depression symptoms in autistic children (Johnston & Iarocci, 2017), as well as depressive symptoms in non-autistic children (e.g., Kennedy et al., 1989). Given the current pattern of results for non-autistic children, difficulties in social competence may be more likely to predict *social anxiety* rather than generalized anxiety. Previous reports of an association between social competence and anxiety in non-autistic children have typically used measures of social anxiety (Junttila et al., 2012; Liew et al., 2015; Miers et al., 2013), whereas the measure used in the current study, the BASC-2, measured generalized anxiety which may explain why we did not find an association. Indeed, Scharfstein and colleagues (2011) found that non-autistic youth with social anxiety were less socially competent, but youth with generalized anxiety did not differ from controls on social competence, friendships, or participation in groups/clubs.

Increased autistic traits was associated with increased anxiety *and* depression symptoms for autistic children but was only associated with increased depression symptoms for non-autistic children, after controlling for IQ and age. Above and beyond the effects of IQ and age, AQ total scores accounted for an additional 7% of variance in both anxiety scores and depression scores in autistic children and an additional 15% of variance in depression scores in non-autistic children. The finding that increased autistic traits positively predict internalizing symptoms in autistic children is similar to previous research (i.e., Mayes et al., 2011; Oswald et al., 2016). A child who has more autistic traits may experience more bullying, poorer peer relationships, and a greater risk of social withdrawal (Kennedy et al., 1989), which may lead to depression in both autistic and non-autistic children.

The relations between autistic traits and anxiety appear to be unique to autistic children and may have autism-specific pathways. For example, Liew and colleagues (2015) found that autistic traits predicted anxiety symptoms of worry through the prevention of repetitive behaviours and frequent aversive sensory experiences. These mediators are unique experiences of autistic individuals, unlikely to be shared by non-autistic individuals with increased autistic traits as

measured by the AQ. Liew and colleagues (2015) identified two distinct autism-specific pathways to anxiety which may explain why, in the current study, autistic traits were only related to anxiety among autistic children.

We found that increased autistic traits was related to higher levels of anxiety and depressive symptoms in autistic children and higher levels of depressive symptoms only in non-autistic children, however, other researchers have reported the opposite association (Mazurek & Kanne, 2010), whereby higher autistic trait is associated with *lower* rates of anxiety and depression. Mazurek and Kanne (2010) speculate that children with increased autistic traits may have more social deficits and perspective-taking difficulties and, thus, have less self-awareness which may act as a buffer against depression and anxiety. Although this theorizing may indeed hold true for certain autistic children, such as those with co-occurring intellectual disability, increased autistic traits can also lead to consequences that can reduce a child's well-being and increase the risk of internalizing symptoms regardless of their self-awareness, such as a lack of peer friendships, bullying, difficulties communicating one's needs, and other traumatic experiences (Rai et al., 2018). A child does not have to be aware of their social errors in the moment to be negatively affected by the consequences of such errors. Thus, for specific presentations of autism, increased autistic traits may function, to differing degrees and through different mechanisms, as both a protective and risk factor for internalizing disorders. More research is needed to identify how specific autistic characteristics may uniquely predict anxiety and depression in children.

Social competence significantly predicted both anxiety and depression scores for autistic children, but only depression scores for non-autistic children. For autistic participants, social competence scores accounted for additional variance in anxiety (4%) and depression scores (16%) beyond age, IQ, and autistic traits. For non-autistic participants, social competence scores accounted for additional variance in depression scores (15%) beyond age, IQ, and autistic traits. For both autistic and non-autistic children, poor social competence may be associated with withdrawal behaviours, possibly leading to, or stemming from, depressive symptoms through heightened loneliness, low self-esteem and limited social rewards (Rubin et al., 2009). To the extent that low self-esteem and social withdrawal are a primary response to, and/or predictor of, ongoing social difficulties and experiences, then it follows that poor social competence is more strongly related to depression, and possibly social anxiety, rather than generalized anxiety (Rubin et al., 2009). For non-autistic children, poor social competence has been found to lead to social anxiety and this social anxiety, in turn, may lead to increasingly worse social competence (Bellini, 2004),

but this form of anxiety is unlikely to generalize across other non-social contexts (e.g., health, safety, school etc.).

However, lower social competence in autistic children specifically, may involve some distinct pathways to generalized anxiety that do not occur as frequently in non-autistic children. When a child has lower social competence, they are less able to organize their personal and environmental resources to achieve and maintain social outcomes (Boyom & Parke, 1995; Ladd, 1999), and so they may experience unpredictable, and often negative, social outcomes, which can lead to an impaired sense of control and negative expectancies for the future. In general, autistic children tend to have higher levels of uncertainty intolerance and an increased desire for predictability and routine (Stark et al., 2021; Wigham et al., 2017), so the inability to control social outcomes may be particularly anxiety-inducing for autistic children. In contrast, non-autistic children may be negatively impacted by the aversive social outcomes leading to depressive symptoms, but they may not be as vulnerable to developing anxiety from the unpredictability and lack of control associated with lower social competence in the same way autistic children may be. More research is needed to examine whether the sense of control and/or uncertainty intolerance mediates the relationship between lower social competence and heightened anxiety symptoms in autistic children.

Limitations and Future Directions

The current study utilizes a cross-sectional approach, so directionality and causation cannot be inferred. Future longitudinal or experimental research should be conducted to discern the directionality of the relations between social competence and internalizing symptoms in children. Future research could also assess whether social competence has a differential effect on social anxiety as compared to generalized anxiety among autistic and non-autistic children.

There are some limitations based on the measures used in the current study. Given that the BASC-2 was not designed for use with autistic populations, caution should be taken when interpreting subscale score differences between autistic and non-autistic children. For example, the greater levels of anxiety and depression among autistic children in comparison to non-autistic children may, in part, be due to the construct overlap between autistic traits and internalizing problems. For instance, resistance to change is a common symptom of both autism and anxiety, and social withdrawal and lacking friendships is a common symptom of both autism and depression. Despite these similarities, there are many anxiety and depression symptoms within the BASC-2 subscales that are *not* characteristic of autistic traits as measured by the AQ (e.g., worries, fear, sadness, and suicidal thoughts), thus the score differences cannot be solely explained by autism.

Moreover, the BASC-2 may not fully capture depression and anxiety symptoms as expressed by autistic children who are more likely to have atypical symptom presentations, such as increased agitation and aggressiveness and increased repetitive behaviours (Magnuson & Constantino, 2011), and are less likely to verbally express their symptoms as required by some items on the BASC-2 (e.g., “says I’m afraid I will make a mistake”, “says I’m not very good at this”) due to autism-related communicative difficulties (Mahan & Matson, 2011). In light of the symptom overlap and complexity between internalizing symptoms and autistic traits, we controlled for autistic traits in all our main analyses to ensure that the relations between social competence and internalizing symptoms were not simply attributable to autistic traits. However, future research may want to use an autism-specific measure to assess anxiety and depression levels in autistic children with increased validity. Moreover, the current study utilized parent ratings, not child ratings. Future research could collect data from both parent and child to obtain a more comprehensive picture of the child’s social and emotional functioning. It is possible that parents may not be fully aware of their child’s internal workings, including their worries and beliefs about themselves, especially if the child is less verbally expressive.

Given the convenience sampling method employed in the current study, this sample may not be representative of the autistic and non-autistic child populations. Participants were recruited through a free summer camp run by a university psychology research lab and may have attracted parents who value scientific research and have an interest in autism. For example, many of the non-autistic children had direct relatives who were autistic ($n=46$) and although inclusion of these children did not lead to any significant differences in results, the use of a convenience sample in the current study may limit the extent to which the results are generalizable to the larger populations of autistic and non-autistic children.

Due to the small number of girls in the sample, we were unable to explore the effects of gender on social competence and internalizing symptoms.

Social Implications

The findings highlight the reciprocal relations between social competence and mental health in both autistic and non-autistic children. Improving children’s social competence *may* lower their vulnerability to internalizing mental health problems; however, efforts to camouflage social difficulties and autistic traits may in fact *worsen* mental health outcomes (Hull et al., 2021). Social competence is not an inherent or fixed psychological trait, but rather it emerges in the dynamic interaction between the child and other individuals and varies in its form and expression (Yager &

Iarocci, 2013). Thus, the effectiveness of a social interaction is dependent upon multiple factors, including the demands of the environment. The negative effects of social competence on internalizing symptoms are theorized to transpire through negative social consequences and experiences with others (e.g., bullying, rejection, or scolding), thus initiatives aimed to address how others respond to social diversity in children is an alternative and, more likely effective, avenue to improve children's mental health. Similarly, focusing solely on mental health targets such as anxiety and depression in autistic children may reduce symptoms temporarily but do not address the equally important social stressors that autistic children face in their everyday social encounters.

Conclusion

The current findings demonstrate that social competence is associated with anxiety and depression symptoms in autistic children, but only depression symptoms in non-autistic children, and these relationships are not explained by autistic traits, IQ or age. In particular, social competence seems to play a distinct role in the manifestation of generalized anxiety in autistic children. Consistent with past research, autistic children experienced more severe anxiety and depression symptoms compared to non-autistic children and increased autistic traits predicted anxiety and depression in both autistic and non-autistic children, beyond the effects of age and IQ. In sum, social competence and internalizing symptoms were intricately connected in autistic and non-autistic children and, thus, need to be considered jointly in both assessment and intervention.

Author Contributions TQB, NES, and GI contributed to the study conception, design, and data collection. Data analyses were performed by TQB and MLM. The manuscript was written by MLM. All authors reviewed and revised previous versions of the manuscript and approved the final manuscript.

Funding Social Sciences and Humanities Research Council of Canada, 435-2017-0202, Grace Iarocci.

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.
- Auyeung, B., Baron-Cohen, S., Wheelwright, S., & Allison, C. (2008). The autism spectrum quotient: Children's version (AQ-Child). *Journal of Autism and Developmental Disorders*, *38*(7), 1230–1240. <https://doi.org/10.1007/s10803-007-0504-z>
- Baron-Cohen, S., Hoekstra, R. A., Knickmeyer, R., & Wheelwright, S. (2006). The autism-spectrum quotient (AQ)—adolescent version. *Journal of Autism and Developmental Disorders*, *36*(3), 343–350. <https://doi.org/10.1007/s10803-006-0073-6>
- Beidel, D. C., Alfano, C. A., Kofler, M. J., Rao, P. A., Scharfstein, L., & Sarver, N. W. (2014). The impact of social skills training for social anxiety disorder: A randomized controlled trial. *Journal of Anxiety Disorders*, *28*(8), 908–918. <https://doi.org/10.1016/j.janxdis.2014.09.016>
- Bellini, S. (2004). Social skill deficits and anxiety in high-functioning adolescents with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, *19*(2), 78–86. <https://doi.org/10.1177/10883576040190020201>
- Bornstein, M. H., Hahn, C. S., & Haynes, O. M. (2010). Social competence, externalizing, and internalizing behavioral adjustment from early childhood through early adolescence: Developmental cascades. *Development and Psychopathology*, *22*(4), 717–735. <https://doi.org/10.1017/S0954579410000416>
- Boyom, L. A., & Parke, R. D. (1995). The role of family emotional expressiveness in the development of children's social competence. *Journal of Marriage and the Family*, *57*(3), 593–618. <https://doi.org/10.2307/353915>
- Cartwright-Hatton, S., Tschernitz, N., & Gomersall, H. (2005). Social anxiety in children: Social skills deficit, or cognitive distortion? *Behaviour Research and Therapy*, *43*(1), 131–141. <https://doi.org/10.1016/j.brat.2003.12.003>
- Chang, Y. C., Quan, J., & Wood, J. J. (2012). Effects of anxiety disorder severity on social functioning in children with autism spectrum disorders. *Journal of Developmental and Physical Disabilities*, *24*(3), 235–245. <https://doi.org/10.1007/s10882-012-9268-2>
- Cludius, B., Mennin, D., & Ehring, T. (2020). Emotion regulation as a transdiagnostic process. *Emotion*, *20*(1), 37–42. <https://doi.org/10.1037/emo0000646>
- Cole, D. A., Martin, J. M., Powers, B., & Truglio, R. (1996). Modeling causal relations between academic and social competence and depression: A multitrait-multimethod longitudinal study of children. *Journal of Abnormal Psychology*, *105*(2), 258–270. <https://doi.org/10.1037/0021-843X.105.2.258>
- Copeland, W. E., Angold, A., Shanahan, L., & Costello, E. J. (2014). Longitudinal patterns of anxiety from childhood to adulthood: The Great Smoky Mountains Study. *Journal of the American Academy of Child & Adolescent Psychiatry*, *53*(1), 21–33. <https://doi.org/10.1016/j.jaac.2013.09.017>
- Dellapiazza, F., Michelon, C., Picot, M. C., & Baghdadli, A. (2022). Early risk factors for anxiety disorders in children with autism spectrum disorders: Results from the ELENA Cohort. *Scientific Reports*, *12*(1), 10914. <https://doi.org/10.1038/s41598-022-15165-y>
- Dubin, A. H., Lieberman-Betz, R., & Lease, A. M. (2015). Investigation of individual factors associated with anxiety in youth with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *45*(9), 2947–2960. <https://doi.org/10.1007/s10803-015-2458-x>
- Duvekot, J., van der Ende, J., Verhulst, F. C., & Greaves-Lord, K. (2018). Examining bidirectional effects between the autism spectrum disorder (ASD) core symptom domains and anxiety in children with ASD. *Journal of Child Psychology and Psychiatry*, *59*(3), 277–284. <https://doi.org/10.1111/jcpp.12829>
- Ehring, T., & Watkins, E. R. (2008). Repetitive negative thinking as a transdiagnostic process. *International Journal of Cognitive Therapy*, *1*(3), 192–205. <https://doi.org/10.1521/ijct.2008.1.3.192>
- Ghandour, R. M., Sherman, L. J., Vladutiu, C. J., Ali, M. M., Lynch, S. E., Bitsko, R. H., & Blumberg, S. J. (2019). Prevalence and treatment of depression, anxiety, and conduct problems in US children. *The Journal of Pediatrics*, *206*, 256–267. <https://doi.org/10.1016/j.jpeds.2018.09.021>
- Goldin, R. L., Matson, J. L., Konst, M. J., & Adams, H. L. (2014). A comparison of children and adolescents with ASD, atypical

- development, and typical development on the Behavioral Assessment System for Children, (BASC-2). *Research in Autism Spectrum Disorders*, 8(8), 951–957. <https://doi.org/10.1016/j.rasd.2014.04.005>
- Hull, L., Levy, L., Lai, M. C., Petrides, K. V., Baron-Cohen, S., Allison, C., & Mandy, W. (2021). Is social camouflaging associated with anxiety and depression in autistic adults? *Molecular Autism*, 12(1), 1–13. <https://doi.org/10.1186/s13229-021-00421-1>
- Johnston, K. H. S., & Iarocci, G. (2017). Are generalized anxiety and depression symptoms associated with social competence in children with and without autism spectrum disorder? *Journal of Autism and Developmental Disorders*, 47(12), 3778–3788. <https://doi.org/10.1007/s10803-017-3056-x>
- Junttila, N., Vauras, M., Niemi, P. M., & Laakkonen, E. (2012). Multisource assessed social competence as a predictor for children's and adolescents' later loneliness, social anxiety, and social phobia. *Journal for Educational Research Online*, 4(1), 73–98. <https://doi.org/10.25656/01:7052>
- Katz, S. J., Conway, C. C., Hammen, C. L., Brennan, P. A., & Najman, J. M. (2011). Childhood social withdrawal, interpersonal impairment, and young adult depression: A mediational model. *Journal of Abnormal Child Psychology*, 39(8), 1227–1238. <https://doi.org/10.1007/s10802-011-9537-z>
- Kennedy, E., Spence, S. H., & Hensley, R. (1989). An examination of the relationship between childhood depression and social competence amongst primary school children. *Journal of Child Psychology and Psychiatry*, 30(4), 561–573. <https://doi.org/10.1111/j.1469-7610.1989.tb00268.x>
- Kerns, C. M., & Kendall, P. C. (2013). The presentation and classification of anxiety in autism spectrum disorder. *Clinical Psychology: Science and Practice*, 19(4), 323–347. <https://doi.org/10.1111/cpsp.12009>
- Kerns, C. M., Rast, J. E., & Shattuck, P. T. (2020). Prevalence and correlates of caregiver-reported mental health conditions in youth with autism spectrum disorder in the United States. *The Journal of Clinical Psychiatry*, 82(1), Article 20m13242. <https://doi.org/10.4088/JCP.20m13242>
- Kerns, C. M., Winder-Patel, B., Iosif, A. M., Nordahl, C. W., Heath, B., Solomon, M., & Amaral, D. G. (2020). Clinically significant anxiety in children with autism spectrum disorder and varied intellectual functioning. *Journal of Clinical Child & Adolescent Psychology*, 50(6), 780–795. <https://doi.org/10.1080/15374416.2019.1703712>
- Kim, J. A., Szatmari, P., Bryson, S. E., Streiner, D. L., & Wilson, F. J. (2000). The prevalence of anxiety and mood problems among children with autism and Asperger syndrome. *Autism*, 4(2), 117–132. <https://doi.org/10.1177/1362361300004002002>
- La Greca, A. M., & Harrison, H. M. (2005). Adolescent peer relationships, friendships, and romantic relationships: Do they predict social anxiety and depression? *Journal of Clinical Child and Adolescent Psychology*, 34(1), 49–61. https://doi.org/10.1207/s15374424jccp3401_5
- Ladd, G. W. (1999). Peer relationships and social competence during early and middle childhood. *Annual Review of Psychology*, 50, 333–359. <https://doi.org/10.1146/annurev.psych.50.1.333>
- Lebrun-Harris, L. A., Ghandour, R. M., Kogan, M. D., & Warren, M. D. (2022). Five-year trends in US children's health and well-being, 2016–2020. *JAMA Pediatrics*, 176(7), e220056. <https://doi.org/10.1001/jamapediatrics.2022.0056>
- Leyfer, O. T., Folstein, S. E., Bacalman, S., Davis, N. O., Dinh, E., Morgan, J., ... & Lainhart, J. E. (2006). Comorbid psychiatric disorders in children with autism: Interview development and rates of disorders. *Journal of Autism and Developmental Disorders*, 36, 849–861. <https://doi.org/10.1007/s10803-006-0123-0>
- Liew, S. M., Thevaraja, N., Hong, R. Y., & Magiati, I. (2015). The relationship between autistic traits and social anxiety, worry, obsessive–compulsive, and depressive symptoms: Specific and non-specific mediators in a student sample. *Journal of Autism and Developmental Disorders*, 45(3), 858–872. <https://doi.org/10.1007/s10803-014-2238-z>
- Lundström, S., Chang, Z., Kerekes, N., Gumpert, C. H., Råstam, M., Gillberg, C., & Anckarsäter, H. (2011). Autistic-like traits and their association with mental health problems in two nationwide twin cohorts of children and adults. *Psychological Medicine*, 41(11), 2423–2433. <https://doi.org/10.1017/S0033291711000377>
- Maenner, M. J., Shaw, K. A., & Baio, J. (2020). Prevalence of autism spectrum disorder among children aged 8 years—autism and developmental disabilities monitoring network, 11 sites, United States, 2016. *MMWR Surveillance Summaries*, 69(4), 1–12. <https://doi.org/10.15585/2Fmmwr.ss6904a1>
- Magnuson, K. M., & Constantino, J. N. (2011). Characterization of depression in children with autism spectrum disorders. *Journal of Developmental and Behavioral Pediatrics*, 32(4), 332–340. <https://doi.org/10.1097/DBP.0b013e318213f56c>
- Mahan, S., & Matson, J. L. (2011). Children and adolescents with autism spectrum disorders compared to typically developing controls on the behavioral assessment system for children, (BASC-2). *Research in Autism Spectrum Disorders*, 5(1), 119–125. <https://doi.org/10.1016/j.rasd.2010.02.007>
- Mayes, S. D., Calhoun, S. L., Murray, M. J., & Zahid, J. (2011). Variables associated with anxiety and depression in children with autism. *Journal of Developmental and Physical Disabilities*, 23(4), 325–337. <https://doi.org/10.1007/2Fs10882-011-9231-7>
- Mazurek, M. O., & Kanne, S. M. (2010). Friendship and internalizing symptoms among children and adolescents with ASD. *Journal of Autism and Developmental Disorders*, 40(12), 1512–1520. <https://doi.org/10.1007/s10803-010-1014-y>
- McCrimmon, A. W., & Smith, A. D. (2012). Test review: Weschler Abbreviated Scale of Intelligence Second Edition (WASI-II). *Journal of Psychoeducational Assessment*, 31(3), 337–341. <https://doi.org/10.1177/0734282912467756>
- Miers, A. C., Blöte, A. W., De Rooij, M., Bokhorst, C. L., & Westenberg, P. M. (2013). Trajectories of social anxiety during adolescence and relations with cognition, social competence, and temperament. *Journal of Abnormal Child Psychology*, 41(1), 97–110. <https://doi.org/10.1007/s10802-012-9651-6>
- Motoca, L. M., Williams, S., & Silverman, W. K. (2012). Social skills as a mediator between anxiety symptoms and peer interactions among children and adolescents. *Journal of Clinical Child & Adolescent Psychology*, 41(3), 329–336. <https://doi.org/10.1080/15374416.2012.668843>
- Nilsen, W., Karevold, E., Røysamb, E., Gustavson, K., & Mathiesen, K. S. (2013). Social skills and depressive symptoms across adolescence: Social support as a mediator in girls versus boys. *Journal of Adolescence*, 36(1), 11–20. <https://doi.org/10.1016/j.adolescence.2012.08.005>
- Oswald, T. M., Winter-Messiers, M. A., Gibson, B., Schmidt, A. M., Herr, C. M., & Solomon, M. (2016). Sex differences in internalizing problems during adolescence in autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 46(2), 624–636. <https://doi.org/10.1007/2Fs10803-015-2608-1>
- Patterson, G. R., & Capaldi, D. M. (1990). A mediational model for boys' depressed mood. In J. Rolf, A. S. Masten, D. Cicchetti, K. H. Nuechterlein, & S. Weintraub (Eds.), *Risk and protective factors in the development of psychopathology* (pp. 141–163). Cambridge University Press.
- Pickles, A., Rowe, R., Simonoff, E., Foley, D., Rutter, M., & Silberg, J. (2001). Child psychiatric symptoms and psychosocial impairment: Relationship and prognostic significance. *The British Journal of Psychiatry*, 179(3), 230–235. <https://doi.org/10.1192/bjp.179.3.230>

- Rai, D., Culpin, I., Heuvelman, H., Magnusson, C. M., Carpenter, P., & Jones, H. J. (2018). Association of autistic traits with depression from childhood to age 18 years. *JAMA Psychiatry*, *75*(8), 835–843. <https://doi.org/10.1001/jamapsychiatry.2018.1323>
- Reynolds, C. R., & Kamphaus, R. W. (2004). *Behavior Assessment System for Children* (2nd ed.). American Guidance Services.
- Rubin, K. H., Coplan, R. J., & Bowker, J. C. (2009). Social withdrawal in childhood. *Annual Review of Psychology*, *60*(1), 141–171. <https://doi.org/10.1146/annurev.psych.60.110707.163642>
- Scharfstein, L., Alfano, C., Beidel, D., & Wong, N. (2011). Children with generalized anxiety disorder do not have peer problems, just fewer friends. *Child Psychiatry & Human Development*, *42*(6), 712–723. <https://doi.org/10.1007/s10578-011-0245-2>
- Scharfstein, L. A., & Beidel, D. C. (2015). Social skills and social acceptance in children with anxiety disorders. *Journal of Clinical Child & Adolescent Psychology*, *44*(5), 826–838. <https://doi.org/10.1080/15374416.2014.895938>
- Segrin, C. (2000). Social skills deficits associated with depression. *Clinical Psychology Review*, *20*(3), 379–403. [https://doi.org/10.1016/S0272-7358\(98\)00104-4](https://doi.org/10.1016/S0272-7358(98)00104-4)
- Semrud-Clikeman, M. (2007). *Social competence in children*. Springer.
- Settipani, C. A., Puleo, C. M., Conner, B. T., & Kendall, P. C. (2012). Characteristics and anxiety symptom presentation associated with autism spectrum traits in youth with anxiety disorders. *Journal of Anxiety Disorders*, *26*(3), 459–467. <https://doi.org/10.1016/j.janxdis.2012.01.010>
- Simonoff, E., Pickles, A., Charman, T., Chandler, S., Loucas, T., & Baird, G. (2008). Psychiatric disorders in children with autism spectrum disorders: Prevalence, comorbidity, and associated factors in a population-derived sample. *Journal of the American Academy of Child & Adolescent Psychiatry*, *47*(8), 921–929. <https://doi.org/10.1097/CHI.0b013e318179964f>
- Smith, I. C., & White, S. W. (2020). Socio-emotional determinants of depressive symptoms in adolescents and adults with autism spectrum disorder: A systematic review. *Autism*, *24*(4), 995–1010. <https://doi.org/10.1177/2F1362361320908101>
- Stark, E., Stacey, J., Mandy, W., Kringelbach, M. L., & Happé, F. (2021). Autistic cognition: Charting routes to anxiety. *Trends in Cognitive Sciences*, *25*(7), 571–581. <https://doi.org/10.1016/j.tics.2021.03.014>
- Sukhodolsky, D. G., Scahill, L., Gadow, K. D., Arnold, L. E., Aman, M. G., McDougle, C. J., ... & Vitiello, B. (2008). Parent-rated anxiety symptoms in children with pervasive developmental disorders: Frequency and association with core autism symptoms and cognitive functioning. *Journal of abnormal child psychology*, *36*(1), 117–128. <https://doi.org/10.1007/s10802-007-9165-9>
- Waters, E., & Sroufe, L. A. (1983). Social competence as a developmental construct. *Developmental Review*, *3*(1), 79–97. [https://doi.org/10.1016/0273-2297\(83\)90010-2](https://doi.org/10.1016/0273-2297(83)90010-2)
- Wechsler, D. (2011). *WASI-II: Wechsler abbreviated scale of intelligence* (2nd ed.). Psychological Corporation.
- Wells, A., & Carter, K. (2001). Further tests of a cognitive model of generalized anxiety disorder: Metacognitions and worry in GAD, panic disorder, social phobia, depression, and nonpatients. *Behavior Therapy*, *32*(1), 85–102. [https://doi.org/10.1016/S0005-7894\(01\)80045-9](https://doi.org/10.1016/S0005-7894(01)80045-9)
- White, S. W., Ollendick, T., Albano, A. M., Oswald, D., Johnson, C., Southam-Gerow, M. A., ... & Scahill, L. (2013). Randomized controlled trial: Multimodal anxiety and social skill intervention for adolescents with autism spectrum disorder. *Journal of Autism and Developmental Disorders* *43*(2), 382–394. <https://doi.org/10.1007/s10803-012-1577-x>
- White, S. W., Oswald, D., Ollendick, T., & Scahill, L. (2009). Anxiety in children and adolescents with autism spectrum disorders. *Clinical Psychology Review*, *29*(3), 216–229. <https://doi.org/10.1016/j.cpr.2009.01.003>
- White, S. W., & Roberson-Nay, R. (2009). Anxiety, social deficits, and loneliness in youth with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *39*(7), 1006–1013. <https://doi.org/10.1007/s10803-009-0713-8>
- Wigham, S., Barton, S., Parr, J. R., & Rodgers, J. (2017). A systematic review of the rates of depression in children and adults with high-functioning autism spectrum disorder. *Journal of Mental Health Research in Intellectual Disabilities*, *10*(4), 267–287. <https://doi.org/10.1080/19315864.2017.1299267>
- Yager, J., & Iarocci, G. (2013). The development of the multidimensional social competence scale: A standardized measure of social competence in autism spectrum disorders. *Autism Research*, *6*(6), 631–641. <https://doi.org/10.1002/aur>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.