Does General Anxiety Predict Peer-Related Social Outcomes in Youth with High Functioning Autism Spectrum Disorder?

by

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Abstract

There is a paucity of research examining the impact of generalized anxiety symptoms on social outcomes in high functioning (HF) youth with ASD. The primary goal of this study was to examine the relation between parent ratings of generalized anxiety symptoms and peer relations in HF youth with ASD between the ages of 7 and 18 years. Results indicated that although generalized anxiety was related to poorer peer relations, it was not predictive of peer relations over and above age, gender, IQ, autistic social impairment, or depression symptoms. However, IQ and depressive symptoms were strong predictors of peer relations in these youth. This finding underscores the importance of screening for depression and other mental health issues in HF youth with ASD.

Keywords: Autism Spectrum Disorder; Generalized Anxiety; Depression; Social Outcomes; Peer Relations

I would like to dedicate this work to my mother,
who is a strong and amazing woman,
my grandparents, who have always provided
me loving encouragement,
and Quinn, who has inspired me.
~ Thank you

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List of Acronyms

ADDL	Autism and Developmental Disorders Lab
ADI-R	Autism Diagnostic Interview - Revised
APA	American Psychiatric Association
ASD	Autism Spectrum Disorder
BASC-2	Behaviour Assessment Scale for Children, Second Edition
CDC	Centers for Disease Control and Prevention
GAD	Generalized Anxiety Disorder
IQ	Intelligence Quotient
M	Mean
PPMC	Pearson Product Moment Correlation
SD	Standard Deviation
SFU	Simon Fraser University
SP	Social Phobia
SRS	Social Responsiveness Scale
SSRS	Social Skills Rating System
TD	Typically Developing

1. Introduction

Autism Spectrum Disorder (ASD) is a lifelong neurodevelopmental disorder characterized by impairments in social interaction and communication skills, as well as restricted, repetitive and stereotyped patterns of behaviours and interests (American Psychiatric Association, 2000). Most often, children are diagnosed between the ages of 2 and 5 when symptoms become more apparent with development. Statistics released in 2012 by the Centers for Disease Control and Prevention (CDC) state that approximately 1 in 88 children will be diagnosed with an ASD. Boys are also far more likely than girls to have ASD; prevalence rates for boys are as high as 1 in 54 whereas it is 1 in 252 for girls (CDC, 2012). To put these statistics in perspective, this makes ASD more prevalent than pediatric cancer, AIDS, diabetes, cerebral palsy, cystic fibrosis, muscular dystrophy, and Down syndrome, combined (Autism Speaks Canada, 2012). There are millions of people worldwide with ASDs and the cost of providing treatment and caring for these individuals is high.

Autism is a 'spectrum' condition, meaning that there is a broad range in the presentation of symptoms, number and severity of symptoms, as well as the degree of impairment each individual experiences by these symptoms. To complicate matters further, ASD also commonly co-occurs with other medical and psychiatric disorders such as (but not limited to) mental retardation, attention deficit hyperactivity disorder, anxiety, depression, Tourette's syndrome, and seizure disorder. Overall, anxiety is one of the most common comorbid conditions associated with ASD and occurs across the spectrum. A recent systematic literature review on anxiety in autism revealed that prevalence rates for anxiety range between 11% and 84%, with overall rates of anxiety disorder diagnosis at approximately 42% (White, Oswald, Ollendick, & Scahill, 2009). Types of anxiety disorders most often observed in youth with ASD include general anxiety, phobias, separation anxiety, obsessive-compulsive disorder, and social phobia (White et al., 2009). In a study examining the prevalence of psychiatric disorders in ASD, Simonoff et al. (2008) found social anxiety to be one of the most commonly

diagnosed comorbid disorders (29.2%) in youth with ASD followed by generalized anxiety disorder (13.4%) and panic disorder (10.1%).

Prior studies suggest that social anxiety symptoms are associated with poor social outcomes for both typically developing (TD) children and children on the autism spectrum. In typically developing children, Ginsburg, Greca, & Silverman (1998) found higher levels of social anxiety (as measured by the *Social Anxiety Scale for Children-Revised*, La Greca & Stone, 1993) to be related to impairments in social and emotional functioning such as lower levels of social acceptance (r=-.46;) and self-worth (r=-.33; as measured by the *Self Perception Profile for Children,* Harter, 1985), lower responsible (r=-.19) and assertive (r=-.24) social skills (as measured by the *Social Skills Rating System (SSRS)*, Gresham & Eliott,1990), and higher numbers of negative social interactions (r=*.45*; as measured by the *Friendship Questionnaire*, Bierman & McCauley, 1987). Social anxiety symptoms (as measured by the *Multidimensional Anxiety Scale for Children*, March, 1998) have also been found to be negatively associated with assertive social skills (r=-.31; as measured by the SSRS) in high functioning children with ASD (Bellini, 2004). Similarly, in a sample of youth with ASD and a comorbid social phobia (SP), researchers using the same outcome measure (SSRS) found higher levels of social anxiety to predict lower assertive (R^2=.12) and responsible (R^2=.12) social skills (Chang, Quan, & Wood, 2012).

Research on generalized anxiety and social outcomes in children and adolescents show mixed results. Although TD children with generalized anxiety disorder have comparatively fewer friends, they were rated the same as controls with regards to likelihood of having a best friend, rates of participation in club or group activities, and parent ratings of social competence (as measured by the *Child Behaviour Checklist,* Achenbach & Rescorla, 2001; Scharfstein, Alfano, Beidel, & Wong, 2011). These findings suggest that social outcomes for individuals with generalized anxiety symptoms may be different (and less negative) than those associated with social anxiety, at least for TD youth. Similarly, children with ASD and a comorbid generalized anxiety disorder (GAD) did not show lower parent reported social skills on the SSRS (Chang, 2012). However, a sub-group of youth with ASD with higher (more) anxiety symptoms may show better social outcomes (Mazurek & Kanne, 2010). Mazurek and Kanne (2010) sampled over 1,200 youth with ASD and found higher anxiety and depression symptoms

to be associated with more dyadic friendships (*r*=-.15) even when controlling for IQ and level of autism severity. One hypothesis to explain this could be that the presence of anxiety is actually signalling higher levels of other, more positive variables, such as social awareness, which may mediate the relationship between anxiety and friendship.

To date, the research findings have not clarified the link between generalized anxiety symptoms and social outcomes in children with ASD. However, high rates of anxiety are likely to complicate the social picture for youth with ASD. For these youth, adding worries and tension to the social difficulties of children with ASD may make it even more difficult for them to take advantage of social opportunities and be fully engaged in social interactions. Moreover, anxiety in youth with ASD has been found to be associated with oppositional behaviour and aggression (Kim, Szatmari, Bryson, Streiner, & Wilson, 2000) as well as irritability (Sukhodolsky et al. 2008; Mayes, Calhoun, Murray, Ahuja, & Smith, 2011) which may further increase the likelihood of experiencing negative peer interactions as well as contribute to poor social outcomes in these individuals.

Depression may also be an important factor to consider when examining the relationship between anxiety and social outcomes, since it often co-occurs with anxiety in TD youth (Lewinsohn, Zinbarg, Seeley, Lewinsohn & Sack, 1997) and youth with ASD (Mayes et al., 2011). In particular, youth with high functioning ASD tend to have high rates of anxiety and depression in comparison to lower functioning ASD and typical samples (Mayes et al., 2011). Depressive symptomatology includes depressed mood, anhedonia and withdrawal from social activities, fatigue, irritability, feelings of worthlessness and guilt, lack of concentration, and suicidal ideation (APA, 2000), all of which may negatively impact social outcomes. Depression is also associated with negatively-biased social information processing and cognitive distortions (Beck, 1967). Furthermore, higher self-reported depressive symptoms in TD adolescents have also been found to be associated with lower levels of self- and teacher- rated social competence (Dalley, Bolocofsky, & Karlin, 1994; Shah & Morgan, 1996). Taken together, depression may be an important factor to consider when examining the relationship between anxiety and social outcomes in youth with ASD since high rates of depression and anxiety are observed in this population, and because depressive symptoms may also have an impact on social outcomes.

The goal of the current research was to examine the relation between generalized anxiety symptoms and peer relations in youth with ASD. Specifically, this research aimed to address whether anxiety is predictive of peer relations over and above the level of autistic social impairment and depression demonstrated in the sample.

1.1. Statement of Research Questions

The current research will answer the following research questions:

1a. Does age, gender, IQ, autistic social impairment, depression symptoms, and generalized anxiety symptoms (predictor variables) correlate with peer relations?

1b. Is the relationship between generalized anxiety symptoms and peer relations equal to the relationship between depression symptoms and peer relations?

2a. Does level of autistic social impairment predict peer relations after controlling for age, IQ, and gender?

2b. Do generalized anxiety symptoms predict peer relations after controlling for age, IQ, gender, and level of autistic social impairment?

3a. Do depressive symptoms predict peer relations after controlling for age, IQ, gender, and level of autistic social impairment?

3b. Do generalized anxiety symptoms predict peer relations after controlling for age, IQ, gender, level of autistic social impairment, and depression symptoms?

1.1.1. Supplemental Research Questions

4. Do internalizing symptoms predict peer-related outcomes after controlling for age, IQ, gender, and level of autistic social impairment?

5. Does the interaction between generalized anxiety symptoms and depression symptoms predict peer-related outcomes after controlling for age, IQ, gender, and level of autistic social impairment?

2. Method

2.1. Participants

Participants included 55 high functioning (IQ>85) participants with ASD between the ages of 7 and 18 and their parents who had participated in research in the Autism and Developmental Disorders Lab (ADDL) between 2007 and 2012. The sample of youth participants included 49 males (89%) and 6 females (11%); thus, this sample had a slightly higher male to female ratio than what is typical for this disorder. However, males and females did not score significantly different on any of the variables of interest in the current study. Parent participants consisted of mostly mothers (75%).

All participants lived in the Lower Mainland of Vancouver, British Columbia, Canada. Participants were of mixed ethnic heritage, but were predominantly of western European heritage (60%). Other ethnic backgrounds represented in the sample include eastern European (10%), Asian (25%), and South American (3%) heritage. All participants spoke fluent English and most of the sample (92%) spoke English as their primary language. For 4 participants (7%), English was their second language; other primary languages reported were Russian, Slovak, and Mandarin.

Most of the sample (78%) consisted of two parent households (either married or common-law), 12% were from separated or divorced families, and a further 9% identified as ‘other’. A majority of mothers (67%) and fathers (75%) worked full-time or part-time. The remainder of parents were homemakers (mothers, 24%; fathers, 5%), unemployed (mothers, 5%; fathers, 3%), or classified themselves as ‘other’ or did not disclose this information (mothers, 3%; fathers, 16%). In total, 72% of mothers and 69% of fathers in the sample had a professional degree or diploma, or a university degree (undergraduate or graduate). A further 25% of mothers and 20% of fathers reported high school as their highest level of education, although several people identified that they had at least some post-secondary education. The remainder of the sample was classified as ‘other’ or did

not disclose this information. In most families, the youth with ASD participating in the current study was not an only child; 75% of the sample had at least one other child.

At the time of participation, each parent confirmed that their child had a clinical diagnosis of an ASD and were asked for details regarding their child's diagnosis such as when their child was diagnosed, the name of the diagnosing clinician, and the name of the clinic/hospital where their child was diagnosed. For 15 participants (approximately 30%) who participated in 2012, parents confirmed that they received funding from the British Columbia Ministry of Children and Family Development Autism Funding Program. In order to qualify for funding, children must be assessed by a pediatrician, psychologist, or psychiatrist trained to administer gold standard autism diagnostic tools (i.e., Autism Diagnostic Interview-Revised, ADI-R, Le Couteur et al., 1989; Autism Diagnostic Observation Schedule, ADOS, Lord et al., 2001). Of the remaining participants in the sample, 5 participants (9%) provided a copy of their official diagnostic report to confirm diagnosis and a final subset of 12 participants (22%) were administered the ADI-R by a trained psychologist or clinical psychology student in the ADDL to confirm their diagnosis at the time that they participated.

The sample of youth participants included 16 individuals (29%) that were diagnosed with an additional mental health disorder. This group consisted of 9 participants (16%) diagnosed with Attention Deficit Hyperactivity Disorder or Attention Deficit Disorder, 9 participants (16%) diagnosed with an Anxiety Disorder (including 2 individuals diagnosed with Obsessive Compulsive Disorder and 1 individual diagnosed with Post Traumatic Stress Disorder. This group of 16 individuals also included 1 participant with Dysthymia and another participant with Bipolar I Disorder. Finally, 7 participants (12%) had a learning disability or a language or sensory processing disorder. In total, of the 16 participants with ASD that had a comorbid condition, 9 of these individuals (16%) had more than one comorbid condition.

2.2. Measures

2.2.1. Predictor Variables

Autistic Social Impairment

The Social Responsiveness Scale (SRS; Constantino, 2005) is a 65-item parent questionnaire presented in a Likert scale format (1-4). Questions focus on the socially relevant behaviour of children and adolescents between 4 and 18 years of age. The SRS was normed on a sample of over 1,600 children between 4 and 18 years of age. This measure has been demonstrated to have good internal consistency (αs are all between .94 and .97 which are considered to be good reliability for behavioural assessments; Constantino, 2005); good test-retest reliability (.85 for males and .77 for females) and strong interrater reliability for all combinations of raters (mother-father, mother-teacher and father-teacher). Upon scoring, a raw score between 0 and 195 is obtained (T scores area also available); higher scores are strongly associated with a clinical diagnosis of ASD and represent higher levels of autistic social impairment. Specifically, a T score of 60 through 75 represents a mild to moderate level of social impairment that is characteristic of children with high functioning ASD, and a T score of 76 or higher is most strongly associated with a clinical diagnosis of ASD and is suggestive of severe interference in social functioning (Constantino & Gruber, 2005). For the purpose of this study, T scores will be utilized. A comprehensive list of the questions that comprise the total score for the SRS can be found in Appendix C.

Generalized Anxiety Symptoms

The Behaviour Assessment System for Children, Second Edition (BASC-2; Reynolds & Kamphaus, 2004) includes parent-, teacher-, and self-report scales that are widely used to measure adaptive and problem behaviours in children and adolescents. Separate norms have been developed with very large samples for male and female youth in three different age categories (preschool, child, adolescent) for each type of form (parent-, teacher- and self-report). The parent-report scale which has 150 questions and uses a four point response format (Never, Sometimes, Often, Almost Always) will be used to rate the child's behaviour. The BASC-2 provides both raw and T scores for an Internalizing Problems composite, which includes a scale that measures

generalized anxiety symptoms. Both raw and T scores for anxiety are available from this measure, however, for the purposes of this study, T scores will be used. This subscale has been demonstrated to have good internal consistency reliability (αs > .81), as well as acceptable test-retest reliability (.73 on the child form; .84 on the adolescent form) and interrater reliability (.80 on the child form; .66 on the adolescent form). The Anxiety scale consistently correlates the lowest with other scales on the BASC-2 suggesting that it is measuring a distinct construct from the other subscales. As expected, results from confirmatory factor analyses confirm that the Anxiety subscale has a significant loading on the Internalizing Problems factor (.82 on the child and adolescent forms), and not on the Externalizing Problems factor (.24 on the child form; .25 on the adolescent form). Questions from the Anxiety scale can be found in Appendix D.

Depression Symptoms

Also included in the Internalizing Problems Composite on the BASC-2 is a scale that measures depression symptoms. For the purposes of this study, T scores will also be used from this measure. This subscale has been demonstrated to have strong reliability overall (αs > .85), good test-retest reliability (.84 on the child form; .82 on the adolescent form), and acceptable interrater reliability (.67 on the child form; .78 on the adolescent form). Confirmatory factor analyses demonstrate that the Depression scale has a significant loading on the Internalizing Problems factor (.82 for the child and adolescent forms); however, intercorrelations with the Depression scale are moderately high with several other scales. This is expected since depression and depressive symptoms often co-occur with other mental health disorders and related challenges (Kessler et al., 2003; Birmaher et al., 1996; Biederman, Faraone, Mick, & Lelon, 1995). Questions from the Depression scale can be found in Appendix E.

Covariates

In order to assess and adjust for the potential impact of intelligence (IQ), chronological age, and gender on the relationship between the predictor variables and the outcome variable, these variables were also measured. In order to assess IQ, participants were administered one of two possible IQ measures: The Stanford Binet Intelligence Scale, Abbreviated Battery (Roid, 2003), or the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999). Abbreviated full scale IQ scores from either of

these measures, which were administered at the time of participation, will be utilized as an approximation of intellectual functioning. Data on chronological age and gender have also been collected.

2.2.2. Outcome Variable

Peer Relations

The Peer Relations Questionnaire consists of 7 items that require parents to rate their child's peer relations. Each question asks the parent how well certain statements describe their child on a 5 point scale (Rarely, Often, Sometimes, Almost Always, I Don't Know): Examples of such items include "gets along with his/her classmates", "is invited to parties or social events outside of school by other kids his/her age", "is considered 'odd' or 'weird' by peers at school". A complete list of the questions that comprise this scale can be found in Appendix F. A total score out of 35 is calculated for each participant; possible scores range between 7 (very poor peer relations) and 35 (very good peer relations).

2.3. Procedure

The existing data being utilized in this study was collected as part of a general clinical battery administered to each youth with ASD who participated in research in the ADDL between 2007 and 2012. One of the youth's parents were asked to complete the BASC-2, Peer Relations Questionnaire, SRS, and Family Demographics forms while their child participated with a researcher in the next room to complete the IQ measure. Standard ADDL protocol and administration procedures for the clinical battery were followed including all informed consent procedures (see Appendix A for a copy of the parent/guardian consent form and Appendix B for the adult consent; both were completed at the time of participation). After participating, families were compensated with a small honorarium.

2.4. Data Analysis

Throughout the following section, the predictor variables that will be referred to are IQ, age, gender, autistic social impairment, depression, and generalized anxiety, and the outcome variable of interest is peer relations.

First, a descriptive statistical analysis was done on the data to determine the mean, standard deviation, min, max, skewness, and kurtosis for each of the variables. Type 1 error was set at .05.

2.4.1. Correlation Analyses

Research Question 1a

In order to test the associations between each of the predictor variables and the outcome variable, Pearson Product Moment Correlations (PPMCs) were calculated for all continuous variables (age, IQ, social impairment, depression, and generalized anxiety) and a point biserial correlation was calculated for correlations including gender. T tests were used to test the significance of each of these correlations. In addition, 95% confidence intervals were calculated (using Fisher (z') transformation of *r*) as an estimate of the margin of error around each significant correlation (*r*).

Research Question 1b

Since anxiety and depression may be related, it is possible that the relationship between these variables and the peer relations (outcome variable) may be the same. To address this, a t test on the equality of these two dependent correlations (anxiety and peer relations; and depression and peer relations) was employed.

2.4.2. Regression Analyses

Ordinary least square multiple regression analyses were used in the context of these research questions. The overall structure of the first regression model was as follows: Block 1 of the model included age, IQ, and gender, Block 2 added a measure of autistic social impairment to the model, Block 3 added a measure of generalized anxiety symptoms. The overall structure of the second regression model was as follows: Block

1 of the model included age, IQ, and gender, Block 2 added a measure of autistic social impairment to the model, Block 3 added a measure of depressive symptoms to the model, and Block 4 added a measure of generalized anxiety symptoms to the model. The following is a description of the planned data analyses broken down according to each research question.

First Regression Analysis, Research Question 2a

After controlling for age, IQ, and gender in block 1 of the regression model, in order to assess the proportion of additional variance in peer relations that can be accounted for by adding autistic social impairment to the model, a measure of autistic social impairment (as indexed by SRS scores) was included in Block 2. In order to assess the amount of variance in peer relations that can be accounted for by adding autistic social impairment to the model, the ΔR^2 value was examined. To test the significance of ΔR^2 an F test was employed.

First Regression Analysis, Research Question 2b

In order to assess whether adding generalized anxiety to the model represented a significant improvement in the predictive ability of the model over and above autistic social impairment, a measure of generalized anxiety symptoms (as indexed by BASC-2 scores on the Anxiety scale) was added in block 3. In order to assess the amount of variance in peer relations that can be accounted for by adding depression to the model, the ΔR^2 value was examined. To test the significance of ΔR^2 an F test was employed.

Second Regression Analysis, Research Question 3a

Next, in order to assess whether adding depression to the model represented a significant improvement in the predictive ability of the model over and above autistic social impairment, a measure of depressive symptoms (as indexed by BASC-2 scores on the Depression scale) was added in block 3. In order to assess the amount of variance in peer relations that can be accounted for by adding depression to the model, the ΔR^2 value was examined. To test the significance of ΔR^2 an F test was employed.

Second Regression Analysis, Research Question 3b

Finally, in order to assess whether adding generalized anxiety to the model represented a significant, independent contribution to the predictive ability of the model over and above autistic social impairment and depressive symptoms, a measure of generalized anxiety symptoms (as indexed by BASC-2 scores on the Anxiety scale) was added in block 4. In order to assess the amount of variance in peer relations that can be accounted for by adding generalized anxiety to the model, the ΔR^2 value was examined. To test the significance of ΔR^2 an F test was employed. In this final model, an overall F test was employed to test the significance of the model at block 4. T tests were also used to determine if each predictor variable made a statistically significant contribution to the model above and beyond the other variables in the model. Additionally, standardized regression coefficients (B values) were examined to determine the direction of the relationship between the predictor variables and the outcome variable and the degree to which they affect the outcome variable.

2.4.3. Supplemental Data Analysis

Third Regression Analysis, Research Question 4

In the event that anxiety is not found to account for a significant proportion of the variance in peer relations, a third regression analysis would be conducted in order to examine if an internalizing composite score, which measures both anxiety and depression, had improved predictive power. In this third regression, internalizing symptoms (as indexed by BASC-2 scores) would be added in block 3. In order to assess the amount of variance in peer relations that can be accounted for by adding internalizing to the model, the ΔR^2 value would be examined. To test the significance of ΔR^2 an F test would be employed.

Fourth Regression Analysis, Research Question 5

This regression would be used in the event that the internalizing symptoms composite score is not found to account for a significant proportion of the variance in peer relations, in order to see if the interaction between anxiety and depression has improved predictive power. In this fourth regression, the interaction between anxiety and depression would be added in block 3. In order to assess the amount of variance in

peer relations that can be accounted for by adding the interaction to the model, the ΔR^2 value would be examined. To test the significance of ΔR^2 an F test would be employed.

2.4.4. Assumptions

Prior to running any correlation analysis, the assumptions of independence of observations, bivariate normal data, and homoscedasticity were checked to ensure that there were no violations. Additionally, the data was examined for potential outliers using stem and leaf plots and scatterplots for each of the variables; outliers were eliminated before any analyses were conducted. The assumption of independence of observations was also considered. To test the assumption of bivariate normal data, normal qq plots were examined for each variable (values clustered around the line were seen to be in support of the assumption of normality). Additionally, skewness and kurtosis values were examined to see if the values are in keeping with the assumption of normality (confidence intervals including 0 and within 3 SD of their respective means were judged to be in support of the assumption of normality). The assumption of homoscedasticity was also checked using Levene's test for equality of variances on the residuals.

Prior to running the regression analyses, to test the assumption of correct specification of the form of the relationship between the predictor variables and the outcome variable, a scatterplot of predicted values and residuals was examined. This scatterplot was also used to test the assumption of constant variance of error to see if there was equal spread. Additionally, the assumption that there is no measurement error in the predictor variables was considered. The assumption of independence of errors was checked using a Durbin Watson test to test for lag 1 autocorrelation. The assumption of normality of errors was checked using a Kolmogorov-Smirnov test of normality. Additionally, qq plots of the residuals were used to test this assumption. Multicollinearity was checked by examining variance inflation factor and tolerance statistics; variance inflation factors above 10 and tolerance values below .10 as per Steven's (1994) recommendations were considered to be evidence of multicollinearity. The data was also examined for outliers and influential points using cut off values cited in Cohen, Cohen, West, & Aiken (2003) as follows for centered leverage values (cut-off: min=0, max=1-1/n), Cooks Distance (cut-off: values over 1), DFBETAs for each predictor

(cut-off: values over ±1), studentized deleted residuals (cut-off: values over ±3), and standardized residuals (cut-off: values over ±3).

3. Results

3.1. Descriptive Data Analysis

Table 1 presents descriptive statistics for each of the variables in this study except for gender, which was unevenly distributed in this population with 89% of the sample being male. Participants ranged from 7 years, 11 months to 18 years, 2 months. Abbreviated intelligence scores were slightly higher than average (M=105.73), and ranged between 85 and 139. Independent samples t tests were used to determine if there were any statistically significant differences in scores on each of the variables based on gender. Overall, there were no statistically significant differences between males and females on any of the variables.

Table 1.

Descriptive Statistics

Continuous Variables	Mean	SD	Range
Age (months)	144.10	30.51	89-218
IQ	105.73	13.22	85-139
Autistic Social Impairment	81.92	4.33	54-111
Generalized Anxiety Symptoms	60.12	13.99	36-100
Depression Symptoms	64.92	16.52	41-112
Peer Relations	20.57	4.33	11-32

Note. T scores were used for autistic social impairment, generalized anxiety symptoms, and depression symptoms.

Although there was a broad range of symptom severity on both generalized anxiety symptoms and depressive symptoms, there was also a high proportion of participants scoring over the cutoff of 60T on both, which is indicative of clinically significant levels of anxiety and depression. Specifically, 38.12% of the sample for

anxiety, and 54.54% of the sample for depression scored at or above the clinical cutoff of 60T.

With regards to autistic social impairment, 17 participants (36.36%) scored above 60T, placing them in the Mild to Moderate Range of severity. Scores in this range are indicative of significant and problematic impairment in everyday social interactions and are typical scores for youth with high functioning ASD, Asperger's Disorder, and PDD-NOS. There were also 35 participants (63.63%) of the sample who scored above 75T, placing them in the Severe Range. Scores in this range are indicative of severe and extremely problematic interference in everyday social interactions and is considered to be strong evidence of a clinically diagnosable ASD (Constantino, 2005). Three participants scored below 60T in the high end of the Normal Range; their scores were 54, 55, and 59. According to the test developers, since the SRS measures the full range of severity seen in the general population, especially high functioning individuals may occasionally score in the upper end of this range (between 55T and 59T), as seen in this case.

The mean on peer relations, the outcome variable of interest, was 20.57 indicating that on average, participants scored 58.77% out of 100 on this measure. The lowest score possible on this measure is 7 and the highest score is 35; in the current sample, scores ranged between 11 and 32, indicating a wide range of responses.

3.2. Planned Correlation Analyses

3.2.1. Research Question 1a

In order to test the associations between each of the variables, PPMCs were calculated for all continuous variables and a point biserial correlation was calculated for correlations including gender. T tests were used to test the significance of each of these correlations. Overall, there were several statistically significant correlations as summarized in Table 2. Research question 1a inquired about the relationship between the predictor variables and peer relations. Addressing this, IQ was significantly positively correlated with peer relations ($r = .386$, $p = .005 < .01$, 95% CI: $.135 \leq \rho \leq .59$) and negatively correlated with SRS scores ($r = -.352$, $p = .010 < .05$, 95% CI: $-.564 \leq \rho \leq -$

.096). The SRS was also significantly negatively correlated with peer relations(r= -.381, *p*=.004<.01, 95% CI: -.586 ≤ ρ ≤ -.129); and positively correlated with anxiety (r= .517, *p*=.000<.01, 95% CI: .292 ≤ ρ ≤ .687) and depression (r= .483, *p*=.000<.01, 95% CI: .25 ≤ ρ ≤ .663). Depression symptoms were significantly negatively correlated with peer relations (r= -.407, *p*=.002<.01, 95% CI: -.606 ≤ ρ ≤ -.159), as was anxiety symptoms (r= -.305, *p*=.024<.05, 95% CI: -.527 ≤ ρ ≤ -.044). Finally, anxiety and depression were also significantly positively correlated (r= .757, *p*=.000<.01, 95% CI: .616 ≤ ρ ≤ .851).

Table 2.

Correlation Table

	1	2	3	4	5	6	7
1. Age	1.00	.009	-.122	.053	.034	.226	-.147
2. Gender		1.00	-.021	-.211	.073	-.110	.006
3. IQ			1.00	-.352**	-.203	-.254	.386**
4. Autistic Social Impairment				1.00	.483**	.517**	-.381**
5. Depression Symptoms					1.00	.757**	-.407**
6. Gen. Anxiety Symptoms						1.00	-.305*
7. Peer Relations							1.00

** Correlation is significant at the .01 level (2 tailed);
* Correlation is significant at the .05 level (2 tailed);
Note: Gender is coded 0=female, 1=male

3.2.2. Research Question 1b

Since, anxiety and depression are closely related, it is possible that the relationship between these variables and the outcome variable (peer relations), may be the same. Research question 1b inquired as to whether the relationship between anxiety and peer relations and the relationship between depression and peer relationships is equal. To address this, a t test on the equality of these two dependent correlations (anxiety and peer relations, and depression and peer relations) was employed. Results of this test are not statistically significant (t_{52}=-1.34)<(|t_{crit}|=2.003), *p*=.18>.05) meaning that anxiety and depression are correlated the same with the outcome variable, peer relations.

3.3. Planned Regression Analyses

3.3.1. First Regression: Research Questions 2a and 2b

Ordinary least squares regression analyses show that the variables in Model 1 (age, IQ, and gender) explained a statistically significant proportion of the variance in peer relations (R^2=.158, $F_{(3,51)}$=3.187, *p*=.031<.05). T tests show that IQ has the only statistically significant regression coefficient in the model (IQ: β=.372, t_{51}=2.873, *p*=.01<.05; age: β=-.102, t_{51}=-.788, *p*=.43>.05; gender: β=.015, t_{51}=.113, *p*=.91>.05). In other words, the predictive relationship between IQ and peer relations is statistically significant when controlling for age and gender. These results are consistent with the previous correlation analyses which indicated that age and gender were not significantly related to peer relations. In this case, a one standard deviation unit increase in IQ is associated with a .37 standard deviation increase in peer relations. Research question 2a inquires as to whether autistic social impairment is predictive of peer relations after controlling for age, IQ, and gender. Model 2, which pertains to hypothesis 2a, included social impairment, which accounted for an additional 7% of the variance in peer relations (ΔR^2=.072, $\Delta F_{(1,50)}$= 4.709, *p*=.03<.05). Research question 2b inquires as to whether generalized anxiety symptoms are predictive of peer relations after controlling for age, IQ, gender, and autistic social impairment. Model 3, which pertains to hypothesis 2b, added generalized anxiety, however it was not found to explain a significant proportion of variance in peer relations (ΔR^2=.007, $\Delta F_{(1,49)}$=.481, *p*=.49>.05). Table 3 presents a summary of the final regression model at step 3.

Table 3.

Summary of the Final Regression Model at Step Three for the First Multiple Regression Analysis

Variable	B	SE B	β	*p*
Age	-.011	.018	-.078	.55
Gender	-.698	1.765	.051	.69
IQ	.090	.045	.266	.05
Autistic Social Impairment	-.072	.046	-.243	.12
Generalized Anxiety Symptoms	-.032	.046	-.104	.49

Note. R^2 = .158 for Step 1; ΔR^2= .072 for Step 2; ΔR^2= .007 for Step 3.

3.3.2. Second Regression: Research Questions 3a and 3b

Research question 3a inquires as to whether depressive symptoms are predictive of peer relations after controlling for age, IQ, gender, and autistic social impairment. After controlling for age, IQ, gender in Model 1, and autistic social impairment in Model 2, a measure of depressive symptoms was added in Model 3 to address research question 3a. This model was statistically significant and depression symptoms accounted for an additional 6% of the variance in peer relations (ΔR^2=.057, $\Delta F_{(1,49)}$=3.955, p=.05≤.05). Research question 3b inquires as to whether generalized anxiety symptoms are predictive of peer relations above and beyond age, IQ, gender, autistic social impairment, and depressive symptoms. To address research question 3b a measure of generalized anxiety was added in Model 4. Generalized anxiety symptoms accounted for an additional 1% of the variance in peer relations, but was not statistically significant (ΔR^2=.014, $\Delta F_{(1,48)}$=.978, p=.33>.05). However, Model 4 was found to be statistically significant overall ($F_{(6,48)}$=3.462, p=.01<.05). T tests show that IQ (β=.276, t_{48}=2.122, p=.04<.05) and depressive symptoms (β= -.420, t_{48}= -2.101, p=.04<.05) have the only statistically significant regression coefficients in the model; age, gender, autistic social impairment, and anxiety were not statistically significant (β= -.136, t_{48}= -1.065, p=.29>.05; β= .029, t_{48}= .223, p=.83>.05; β= -.176, t_{48}= -1.156, p=.25>.05; β=.204, t_{48}= .989, p=.33>.05, respectively). In this case, a one standard deviation unit increase in IQ is associated with a .27 standard deviation increase in peer relations and a one standard deviation unit decrease in depression is associated with a -.42 standard deviation

decrease in peer relations. Table 4 presents a summary of the regression model at step 4.

Table 4.

Summary of the Final Regression Model at Step Four for the Second Multiple Regression Analysis

Variable	B	SE B	β	*p*
Age	-.109	.018	-.136	.29
Gender	.398	1.785	.029	.83
IQ	.093	.044	.276	.04
Autistic Social Impairment	-.052	.045	-.176	.25
Depression Symptoms	-.110	.052	-.420	.04
Generalized Anxiety Symptoms	.063	.064	.204	.33

Note. R^2 = .158 for Step 1; ΔR^2= .072 for Step 2; ΔR^2= .057 for Step 3; ΔR^2= .014 for Step 4. R^2 in the final model was .302, indicating that 30.2% of the variance in peer relations was explained by this model.

3.4. Supplemental Analyses

3.4.1. Third Regression, Research Question 4

Since generalized anxiety symptoms were not found to account for a statistically significant proportion of the variance in peer relations in the second regression analysis including depression, a third regression analysis was conducted using an internalizing composite score which measures both anxiety and depression. In this third regression analysis, internalizing symptoms was added in block 3. Internalizing accounted for an additional 1% of the variance in peer relations, but was not statistically significant (ΔR^2=.008, $\Delta F_{(1,49)}$=.507, p=.48>.05). However, Model 3 was found to be statistically significant overall ($F_{(5,49)}$=3.065, p=.02<.05). T tests show that IQ has the only statistically significant regression coefficient in the final model (IQ: β=.268, t_{49}= 1.995, p=.05≤.05; age: β= -.085, t_{49}= -.674, p=.50>.05; gender: β= -.045, t_{49}= -.352, p=.73>.05; autistic social impairment: β= -.230, t_{49}= -1.405, p=.17>.05; internalizing: β= -.111, t_{49}= -.712, p=.48>.05).

Table 5.

Summary of the Final Regression Model at Step Three for the Third Multiple Regression Analysis

Variable	B	SE B	β	*p*
Age	-.012	.018	-.085	.50
Gender	-.622	1.767	-.045	.73
IQ	.090	.045	.268	.05
Autistic Social Impairment	-.068	.048	-.230	.17
Internalizing Symptoms	-.028	.040	-.111	.48

Note. R^2 = .158 for Step 1; ΔR^2= .072 for Step 2; ΔR^2= .008 for Step 3.

3.4.2. Fourth Regression, Research Question 5

Adding a measure of internalizing symptoms in Model 3 did not account for a statistically significant proportion of the variance in peer relations. Therefore, in order to see if the interaction between generalized anxiety and depression has improved predictive power, a fourth regression analysis was conducted accounting for the main effect of generalized anxiety and depression symptoms in block 3 and the interaction term in block 4. The interaction term did not account for any additional variance in peer relations over and above the other variables in the model (ΔR^2=.000, $\Delta F_{(1,44)}$=.024, p=.87>.05). However, Model 4 was found to be statistically significant overall ($F_{(7,44)}$=2.835, p=.02<.05). Again, t tests show that IQ and depressive symptoms have the only statistically significant regression coefficients in the final model (IQ: β=.269, t_{44}= 1.976, p=.05≤.05; depression symptoms: β= -.423, t_{44}= -2.091, p=.04<.05); age, gender, autistic social impairment, generalized anxiety, and the interaction term were not statistically significant (age: β= -.135, t_{44}= -1.021, p=.31>.05; gender: β= .017, t_{44}= .116, p=.90>.05; autistic social impairment: β= -.183, t_{44}= -1.178, p=.26>.05; generalized anxiety symptoms: β=.176, t_{44}= .817, p=.41>.05; interaction: β=.117, t_{44}= .807, p=.42>.05).

Table 6.

Summary of the Final Regression Model at Step Four for the Fourth Multiple Regression Analysis

Variable	B	SE B	β	*p*
Age	-.019	.019	-.135	.31
Gender	.228	1.958	.017	.90
IQ	.090	.046	.269	.05
Autistic Social Impairment	-.056	.048	-.183	.25
Generalized Anxiety Symptoms	.058	.071	.176	.42
Depression Symptoms	-.116	.056	-.423	.04
Interaction (Anxiety, Depression)	.000	.003	.024	.88

Note: R^2 = .160 for Step 1; ΔR^2= .071 for Step 2; ΔR^2= .079 for Step 3; ΔR^2= .000 for Step 4.

3.5. Tested Assumptions

In advance of conducting any data analysis, assumptions related to correlation and regression analyses were checked.

3.5.1. Assumptions for Correlation Analyses

The assumption of independence of observations was accepted to be true because sound data collection strategies were employed. Scatterplots, histograms, and stem-and-leaf plots for each of the variables revealed a single outlier that was more than 3 standard deviations away from the mean on peer relations, which was contributing to this variable being significantly positively skewed. Consequently, this participant was eliminated and a re-examination of the data confirmed that the peer relations distribution was no longer significantly skewed with this participant removed from the dataset (final n=55). To test the assumption that each of the variables were normally distributed, a one-sample Kolmogorov-Smirnov Test was conducted on each of the variables and results from this analysis support the assumption of normality for all. Normal qq plots show that the data points for each of the variables do not deviate markedly from the line, which is also in keeping with the assumption of normality. Confidence intervals for skewness and kurtosis were also calculated for each of the continuous variables and

both anxiety and depression symptoms were found to be moderately positively skewed (anxiety skew= 1.02; depression skew= 1.15). Finally, Levene's Test for equality of the variances on the residuals was checked by dividing the residuals along the predicted values into two groups (above and below the mean) and conducting a t test to compare the two groups. Results of this test were not statistically significant, therefore, the assumption of homoscedasticity was retained.

3.5.2. Assumptions for Planned Regression Analyses

The assumption that there is no measurement error in the predictor variables was assumed to be correct as the psychometric properties (i.e. reliability coefficients) of the SRS (measure of social impairment) and the BASC-2 (measure of depression, and anxiety) are good. Scatterplots revealed reasonably equal spread; as such the assumption of correct specification of the form of the relationship between the predictor variables and the outcome variable and the assumption of constant variance of error were retained. The assumption of independence of errors was checked using a Durbin Watson test to test for lag 1 autocorrelation and results of this test are not statistically significant, which is in support of this assumption. Results from the Kolmogorov-Smirnov test of the standardized residual were also not statistically significant, which supports the assumption of normality of errors. Additionally, qq plots of the residuals revealed some marginal deviation from the line for plots for the second regression analysis only; however, overall, the residuals do follow approximately a normal distribution. Variance inflation factors are not elevated above 10 and tolerance statistics are not below .10, indicating that there are no major multicolinearity issues. However, as expected, there is still a strong positive relationship between anxiety and depression (r= .75). Finally, none of the diagnostic statistics for outliers and influential points (Centered Leverage Values, Cooks Distance, DFBETAs for each of the predictors, Studentized Deleted Residuals, and Standardized Residuals) detected any outliers or influential points in the data; therefore the above regression analyses used the complete dataset.

3.5.3. Assumptions for Supplemental Regression Analyses

Both internalizing symptoms and the interaction term for anxiety and depression were positively skewed (internalizing skew= 1.11; interaction term skew; 3.185).

However, the skew for the interaction term was considered to be severe. Further examination of the interaction term data revealed two outliers that were over 3 SD over the mean; consequently, for this analysis (the fourth regression analysis), the two outliers were eliminated. Further examination of Centered Leverage Values, Cooks Distance, and DFBETAs for each of the predictors, and Standardized Residuals did not detect any additional outliers or influential points in the data. However, one influential point (above 3) was detected on the Studentized Deleted Residuals for the interaction term. Therefore, for the fourth regression analysis, this additional outlier was removed. This makes a total of 3 outliers removed from the data for the fourth regression including the interaction term. Data for the interaction term remained significantly skewed, even after the removal of the three outliers (internalizing skew with outliers removed= 2.65). However, results from the Kolmogorov-Smirnov test of the standardized residuals (for both analyses) were not statistically significant, which supports the assumption of normality of errors.

Scatterplots revealed reasonably equal spread for internalizing, however spread was not as equal for the interaction; as such, the assumption of correct specification of the form of the relationship between the predictor variables and the outcome variable and the assumption of constant variance of error were retained for the third regression (with internalizing), but not the fourth regression (with the interaction term). Further, qq plots of the residuals revealed minor deviation from the line for plots from the third regression analysis (including internalizing), which indicates that the residuals follow approximately a normal distribution. However, qq plots revealed marked deviation from the line for plots from the fourth regression analysis (including the interaction term), which suggests a violation of the assumption of error normality for this analysis. The assumption of independence of errors was checked using a Durbin Watson test to test for lag 1 autocorrelation and results of this test are not statistically significant for either analysis, which is in support of this assumption. Also, variance inflation factors are not elevated above 10 and tolerance statistics are not below .10, indicating that there are no major multicolinearity issues.

4. Discussion

4.1. Generalized Anxiety Symptoms

The aim of the present study was to explore the relationship between generalized anxiety symptoms, and peer relations in high functioning youth with ASD. In the current sample, which included a subset of individuals diagnosed with an anxiety disorder (9 participants; 16% of the sample), 38% fell in the clinically significant range for generalized anxiety symptoms, which is well within the range observed in previous literature examining prevalence rates of anxiety in ASD. Generalized anxiety symptoms were found to be significantly negatively correlated with parent-rated peer relations in the expected direction; that is, higher generalized anxiety was associated with lower scores on peer relations (i.e. poorer peer relations). This finding is in contrast with previous literature suggesting that anxiety is associated with better social outcomes, specifically more dyadic friendships (as measured by parent responses question 65 on the ADI-R, current score; r= -.15; Mazurek & Kanne, 2010).

However, Mazurek and Kanne's study used item 65 on the ADI-R (which inquires about the presence of a best-friend relationship) as a measure of dyadic friendships. In isolation, this item is limited in its ability to measure friendship quality which is a complex and variable construct, and unlikely to be adequately captured within the limits of a single question designed to tap into abnormalities in the areas of shared interests and reciprocity in peer relationships. This item is also not able to adequately capture the number of friendships the youth may have, since only one clear case of friendship with the specified qualities (such as sharing of interests and clear reciprocity) is needed to obtain a score of 0 (no impairment). In the current study, 7 questions regarding different aspects of peer relations were used as an outcome measure. A second reason for the contrasting findings may be the use of different measures for anxiety and depression; Mazurek and Kanne (2010) used the anxiety/depression scale on the Child Behaviour Checklist (CBCL; Achenbach & Rescorla, 2001) which includes questions assessing

both anxiety and depression, whereas the current study utilized the BASC-2 which has separate scales for anxiety and depression. Having separate scales for anxiety and depression was an advantage in the current study as it allowed for investigation of the independent contributions of each of these variables in the prediction of social outcomes. Finally, a third reason for the difference in findings could be that there may be a subgroup of youth with ASD for which the relationship between anxiety and friendship outcomes is mediated by other variables that can account for this association.

Consistent with the finding that generalized anxiety is negatively related to peer relations, the current study also found that generalized anxiety symptoms were associated with increases in autistic social impairment. However, results from hierarchical multiple regression analyses show that generalized anxiety did not predict peer relations over and above age, IQ, gender, autistic social impairment, or depression symptoms. These findings are in line with research suggesting that, unlike social anxiety, generalized anxiety may not have as much of a negative impact on social functioning and social outcomes (Ginsburg, Greca, & Silverman, 1998; Chang et al., 2012).

This finding is congruent with the degree of socially relevant features associated with social anxiety as compared to generalized anxiety. Although generalized anxiety may have some social features, such as worrying about what others think, generalized worry is more broad and distributed across different contexts. For instance, generalized anxiety may include worry about school work, worry about making mistakes, worry about something bad happening, and can also be accompanied by general feelings of nervousness, tenseness, and fearfulness. In contrast, features associated with social anxiety, such as strong avoidance and withdrawal from social situations, likely contribute to much higher levels of social difficulties in these individuals. Chang et al. (2012) also suggest that individuals with social anxiety may have more negative attributions of other's social behaviour which may also contribute to social challenges and poorer social outcomes.

4.2. Depression Symptoms

In the current sample, approximately 55% had clinical levels of depression; however, only one participant was formally diagnosed with a depressive disorder. This indicates that although the sample had high levels of depression, these depressive symptoms have remained undetected (and therefore undiagnosed) by professionals. One reason for this could be due to the fact that certain clinical features that can be observed in depressed individuals, such as social isolation and withdrawal, overlap with behaviours associated with ASD, and therefore may not be as noticeable. Atypical symptom presentation, such as increased agitation and aggressiveness or compulsiveness, may make detecting depression in youth with ASD particularly challenging for clinicians (Magnuson & Constantino, 2011). In addition, individuals with ASD often struggle in the area of communication and tend to have less self-awareness and emotional insight into their symptoms, which may also make it harder to detect depression in this population. Further, due to the complex nature of ASD and the high demand it can place on the family unit, parents may be so focussed on dealing with difficulties associated with ASD, that other symptoms may be less salient until they are at a critical level and demand attention.

Consistent with the literature showing a high co-occurrence of anxiety and depression, there is a strong positive correlation between anxiety and depression in the current sample indicating that higher levels of anxiety tend to be associated with higher levels of depression. Depression was also negatively associated with peer relations; that is, higher levels of depression were associated with poorer peer relations. Although this relationship was slightly stronger than the relationship between anxiety and peer relations, further analysis indicated that anxiety and depression are both correlated in the same way with peer relations. Consistent with findings in the current study regarding anxiety, higher levels of depression were also associated with more autistic social impairment.

Depression was also found to account for a significant proportion (6%) of the variance in peer relations after accounting for covariates and autistic social impairment. In fact, generalized anxiety was not found to make a significant independent contribution in the prediction of peer relations after accounting for depression and the other predictor

variables. It is not surprising that depressive symptoms predict poorer peer relations given that the clinical features of depression, like social anxiety, often include social disengagement, irritability, and reduced ability to think or concentrate (including in social situations).

In TD youth, research has found that early onset (defined as occurring before age 15), recurrent depression has been found to be associated with poorer social functioning at age 15 and worse social outcomes at age 20 (Hammen, Brennan, Keenan-Miller, & Herr, 2008). As cited in the introduction to this paper, depression has also been associated with lower teacher and self ratings of social competence in TD youth (Dalley, Bolocofsky, & Karlin, 1994; Shah & Morgan, 1996). Further, depression in adolescence has been found to be a marker for future maladjustment; TD youth with depression are at higher risk for other negative psychosocial outcomes such as substance use, educational underachievement, recurrent unemployment, early parenthood, as well as negative mental health outcomes such as later depression, suicidal behaviours, and anxiety (Fergusson & Woodward, 2002).

Combined with existing social difficulties, youth with ASD and comorbid depression may find it especially challenging to attend to and participate in social interactions. Higher cognitive abilities and levels of self awareness in youth with high functioning ASD may also make these youth more vulnerable to developing depression. In fact, Vickerstaff et al. (2007) found that higher cognitive abilities and insight led to lower self-reported social competence and higher levels of depressive symptoms. In reality, the relationship between social difficulties and depression is likely to be reciprocal in nature and due to methodological limitations the current study is not able to examine this. It could be that increased social difficulties combined with more self awareness may lead to depression, and that higher levels of depression may also lead to increased social difficulties. To this end, research has found that increases in loneliness and depressive symptoms in adolescents with Asperger's syndrome were predicted by the degree of conflict and betrayal in their friendships (Whitehouse, Durkin, Jaquet, & Ziatas, 2009).

4.3. IQ

In the current sample, over 60% of participants scored in the severely socially impaired range, as indexed by SRS scores. Despite significant social difficulties, the sample average on IQ was 106, which is slightly higher than average. Results indicate that IQ is strongly predictive of better peer relations and also associated with lower autistic social impairment. These findings are consistent with research showing that in samples of children with ASD, IQ and language abilities (measured at earlier time points) are frequently found to predict social outcomes (Anderson, Oti, Lord, & Welch, 2009). It is possible that youth with higher IQs are able to utilize compensatory strategies that lead to improved social functioning in these individuals.

4.4. Limitations and Future Research

A few limitations should also be acknowledged. First, due to a modest sample size, the current study does not have the power to detect a small effect; almost 400 participants would have been required in order to have adequate statistical power in this regard. In addition, only parent ratings were used to evaluate peer relations, social impairment, generalized anxiety symptoms and depression symptoms. In future studies, researchers should consider incorporating behavioural observations as well as multiple reporters (e.g. peer-, teacher-, and self-report) in measuring these variables. In future research examining peer relations it may also be advantageous to consider expanding the number of questions used to assess this construct and incorporating qualitative data (such as data from interviews) which may provide additional useful information.

4.5. Conclusions

Although previous research with TD children has suggested that generalized anxiety symptoms may not have as large of an impact on social skills and social outcomes as social anxiety, there is a paucity of research examining the impact of generalized anxiety symptoms on social outcomes in high functioning youth with ASD. Results from the current study show that although generalized anxiety symptoms were

associated with poorer peer relations, it did not predict peer relations over and above age, IQ, gender, autistic social impairment, or depression symptoms. These results are consistent with the TD literature and imply that generalized anxiety may not have a large impact on social outcomes in youth with high functioning ASD.

Results also indicate that IQ is predictive of better peer relations and also associated with lower autistic social impairment. Therefore, it is possible that youth with higher IQs are able to utilize compensatory strategies that lead to improved social functioning in these individuals. Moreover, depressive symptoms were also very high in this sample and were strongly predictive of peer relations. This speaks to the importance of screening for potential depression and other mental health issues in high functioning youth with ASD, and also the potential need for clinical intervention for these issues. High levels of depressive symptoms, even without a clinical diagnosis of a depressive disorder, may put youth with high functioning ASD at higher risk for impaired social functioning and may require special consideration. Specifically, it may be beneficial to screen for high levels of depressive symptoms in this population in order to address these issues proactively.

The effects of depression may be very impairing and, combined with the social and communicative deficits seen in youth with ASD, may contribute negatively to social outcomes (such as peer relations). Combined, research over the last decade has done a lot to inform us of the high prevalence rates of comorbid mental health issues in youth with ASD. However, continued research in this area, especially in the area of measuring and treating these symptoms in this population, is tremendously important due to the potentially negative impact that these mental health issues can have on the quality of life of youth with ASD, who already have substantial difficulties to overcome.

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Appendices

Appendix A.

Parent/Guardian Consent (for Youth Participation)

DEPARTMENT OF PSYCHOLOGY
8888 UNIVERSITY DRIVE
BURNABY, BC
CANADA, V5A 1S6

PARENT/ GUARDIAN CONSENT FORM

It has been explained to me that the purpose of this research project is to examine the social competence and family functioning of children and adolescents with Autism Spectrum Disorder (ASD). This study may provide valuable insight into our understanding of social development and ultimately help to develop and evaluate important social interventions for youth with ASD and their families. I understand that as a participant in this study, my child will participate in a variety of activities including answering questions and completing various computer tasks. I have been advised that all of the tasks and procedures that my son/daughter will be asked to complete present no known risk and have been used before with children of the same age as my child.

I understand that my consent for my child's participation in this research is entirely voluntary and that I may withdraw this consent at any time. My child may also choose not to participate even though I have given consent.

Any specific information collected in this study is confidential and is protected under the Freedom of information and Protection of privacy Act 1989 (Bill 49). The researchers will disclose information only if compelled by law. I understand that the information collected in this study will be securely stored. Our privacy will be protected in any scientific publication or presentation resulting from this study.

I have been informed that the University and those conducting this project subscribe to the ethical conduct of research and to the protection at all times of the interests, comfort, and safety of subjects. My signature on this form will signify that I have received a letter that describes the procedures, possible risks, and benefits of this research project, that I have received an adequate opportunity to consider the information in the document and that I voluntarily agree on behalf of my child and myself to participate in the project.

I may bring any complaint about this study forward to Dr. Grace Iarocci (the chief researcher) and/or to Dr. Don Read, Chair, Department of Psychology, Simon Fraser University. Should I so desire, I may obtain a copy of the findings of this study, upon its completion by contacting: Dr. Grace Iarocci, Department of Psychology, Simon Fraser University at (778) 782-6668.

As the parent/guardian of _____ (name of child),

who was born on _____ (YY-MM-DD), I consent to allow my child to participate in the research project described above.

Signature:_____ Date (YY-MM-DD):_____

Sometimes we will contact participants after they have participated in order to clarify information (e.g. if there is a part of the data that is missing or unclear such as a missed item on a questionnaire). Do we have your permission to contact you in future if such an instance arises?

☐YES ☐NO

Do we have your permission to contact you in future about our findings or upcoming research projects in our lab (sometimes in the form of a lab newsletter)?

☐ YES ☐ NO

NAME OF PARENT/GUARDIAN: (should you wish to be sent a copy of our findings)

_____ PHONE: _____

EMAIL: _____

ADDRESS: _____

Appendix B.

Adult Consent (for Parent Participation)

DEPARTMENT OF PSYCHOLOGY
8888 UNIVERSITY DRIVE
BURNABY, BC
CANADA, V5A 1S6

ADULT CONSENT FORM

It has been explained to me that the purpose of this research project is to examine the social competence and family functioning of children and adolescents with Autism Spectrum Disorders (ASD). This study may provide valuable insight into our understanding of social development and ultimately help to develop and evaluate important social interventions for youth with ASD and their families. I understand that as a participant in this study, I will be asked to complete some questionnaires about my child's development, social competence, and our family functioning.

I understand that my consent to participate in this study is entirely voluntary and that I may withdraw this consent at any time. Any specific information collected in this study is confidential and is protected under the Freedom of information and Protection of privacy Act 1989 (Bill 49). The researchers will disclose information only if compelled by law. I understand that the information collected in this study will be securely stored. Our privacy will be protected in any scientific publication or presentation resulting from this study.

I have been informed that the University and those conducting this project subscribe to the ethical conduct of research and to the protection at all times of the interests, comfort, and safety of subjects. My signature on this form will signify that I have received a letter that describes the procedures, possible risks, and benefits of this research project, that I have received an adequate opportunity to consider the information in the document and that I voluntarily agreed to participate in the project.

I may bring any complaint about this study forward to Dr. Grace Iarocci (the chief researcher) and/or to Dr. Don Read, Chair, Department of Psychology, Simon Fraser University. Should I so desire, I may obtain a copy of the findings of this study, upon its completion by contacting: Dr. Grace Iarocci, Department of Psychology, Simon Fraser University at (604) 268-6668.

I (print please) _____ consent to participate in the research project described above.

Signature:_____ Date(YY-MM-DD): _____

Witness: _____

Sometimes we will contact participants after they have participated in order to clarify information (e.g. if there is a part of the data that is missing or unclear such as a missed item on a questionnaire). Do we have your permission to contact you in future if such an instance arises?

☐YES ☐NO

Do we have your permission to contact you in future about our findings or upcoming research projects in our lab (sometimes in the form of a lab newsletter)?

☐ YES ☐ NO

PHONE:_____ EMAIL:_____

ADDRESS: _____

Appendix C.

Social Responsiveness Scale (SRS) Items

Likert Scale Answer Options

Not true

Sometimes true

Often true

Almost always true

Item Content

- Seems much more fidgety in social situations than when alone
- Expressions on his or her face don't match what he or she is saying
- Seems self-confident when interacting with others
- When under stress, he or she shows rigid or inflexible patterns of behaviour that seem odd
- Doesn't recognize when others are trying to take advantage of him or her
- Would rather be alone than with others
- Is aware of what others are thinking of feeling
- Behaves in ways that seem strange or bizarre
- Clings to adults seems too dependent on them
- Takes things too literally and doesn't get the real meaning of a conversation
- Has good self-confidence
- Is able to communicate his or her feelings to others
- Is awkward in turn-taking interactions with peers (e.g. doesn't seem to understand the give-and-take of conversations)
- Is not well coordinated
- Is able to understand the meaning of other people's tone of voice and facial expressions
- Avoids eye contact or has unusual eye contact
- Recognizes when something is unfair
- Has difficulty making friends, even when trying his or her best
- Gets frustrated trying to get ideas across in conversations
- Shows unusual sensory interests (e.g. mouthing or spinning objects) or strange ways of playing with toys
- Is able to imitate others' actions
- Plays appropriately with children his or her age
- Does not join group activities unless told to do so
- Has more difficulty than other children with changes in his or her routine
- Doesn't seem to mind being out of step with or "not on the same wavelength" as others
- Offers comfort to others when they are sad
- Avoids starting social interactions with peers or adults
- Thinks or talks about the same thing over and over

- Is regarded by other children as odd or weird
- Becomes upset in a situation with lots of things going on
- Can't get his or her mind off something once he or she stars thinking about it
- Has good personal hygiene
- Is socially awkward, even when he or she is trying to be polite
- Avoids people who want to be emotionally close to him or her
- Has trouble keeping up with the flow of a normal conversation
- Has difficulty relating to others
- Has difficulty relating to peers
- Responds appropriately to mood changes in others (e.g. when a friend's or playmate's mood changes from happy to sad)
- Has an unusually narrow range of interests
- Is imaginative, good at pretending (without losing touch with reality)
- Wanders aimlessly from one activity to another
- Seems overly sensitive to sounds, textures, or smells
- Separates easily from caregivers
- Doesn't understand how events relate to one another (cause and effect) the way other children his or her age do
- Focuses his or her attention to where others are looking or listening
- Has overly serious facial expressions
- Is too silly or laughs inappropriately
- Has a sense of humor, understands jokes
- Does extremely well at a few tasks, but does not do as well at most other tasks
- Has repetitive, odd behaviours, such as hand flapping or rocking
- Has difficulty answering questions directly and ends up talking around the subject
- Know when he or she is talking too loud or making too much noise
- Talks to people with an unusual tone of voice (e.g. talks like a robot or like he or she is giving a lecture)
- Seems to react to people as if they are objects
- Knows when he or she is too close to someone or is invading someone's space
- Walks in between two people who are talking
- Gets teased a lot
- Concentrates too much on parts of things rather than seeing the whole picture. For example, if asked to describe what happened in the story, he or she may talk only about the kind of clothes the characters were wearing
- Is overly suspicious
- Is emotionally distant, doesn't show his or her feelings
- Is inflexible, has a hard time changing his or her mind
- Give unusual or illogical reasons for doing things
- Touches others in an unusual way (e.g. he or she may touch someone just to make contact and then walk away without saying anything)
- Is too tense in social settings
- Stares or gazes off into space

(Constantino, 2005)

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Appendix D.

Behaviour Assessment Scale for Children (BASC 2): Anxiety Scale Items

Child Version

- Worries
- Worries about what teachers think
- Is too serious
- Worries about making mistakes
- Worries about what parents think
- Worries about school work
- Is fearful
- Tries too hard to please others
- Is nervous
- Worries about thinks that cannot be changed
- Says “I’m afraid I will make a mistake”
- Says “I’m not very good at this”
- Says “It’s all my fault”
- Worries about what other children think

(Reynolds & Kamphaus, 2004)
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Adolescent Version

- Worries about making mistakes
- Is nervous
- Says “I’m not good at this”
- Worries about what teachers think
- Tries too hard to please others
- Says “I get nervous during tests” or Tests make me nervous”
- Worries about things that cannot be changed
- Worries about what other adolescents think
- Is fearful
- Worries
- Says “I’m afraid I will make a mistake”

(Reynolds & Kamphaus, 2004)
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Appendix E.

Behaviour Assessment Scale for Children (BASC 2): Depression Scale Items

Child Version

- Is easily upset
- Complains about being teased
- Cries easily
- Says “Nobody understands me”
- Complains about not having friends
- Says “Nobody likes me”
- Is negative about things
- Says “I don’t have any friends”
- Says “I want to die” or “I wish I were dead”
- Says “I hate myself”
- Is sad
- Seems lonely
- Says “I want to kill myself”
- Changes moods quickly

(Reynolds & Kamphaus, 2004)
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Adolescent Version

- Cries easily
- Complains about being teased
- Says “Nobody understands me”
- Is negative about things
- Says “I hate myself”
- Says “I want to kill myself”
- Changes moods quickly
- Is easily upset
- Says “I want to die” or “I wish I were dead”
- Seems lonely
- Says “Nobody likes me”
- Says “I don’t have any friends”
- Is sad

(Reynolds & Kamphaus, 2004)
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Appendix F.

Peer Relations Questionnaire

Likert Scale Answer Options

Never

Rarely

Sometimes

Often

Almost Always

Don't Know

Item Content

- Is liked by peers at school
- Is considered "odd" or "weird" by peers at school
- Gets along with his/her classmates
- Is teased or bullied at school
- Is ignored by peers at school
- Is invited to parties/social events (outside of school) by kids his/her age
- Attends parties/other social events with other kids

Scoring

Total = /35 (min=7, max=35)

*Higher scores are better

1 Never

2 Rarely

3 Sometimes

4 Often

5 Almost Always

- Don't Know

*A limit of two items classified as "I don't know" or left blank were accepted per participant and, when this occurred, the average score for the participant was substituted in place of the missing score. When a participant occasionally circled more than one response, the average of the two responses was taken for that particular question.

**items 2, 4, and 5 are worded 'negatively' and are thus reverse coded

(Yager & Iarocci, 2008)

Appendix G.

A Priori Power Analyses

Power for Correlation Analyses

Using Cohen's (1988) conventions of .1, .3 and .5 for small, medium, and large effect sizes (*r*) respectively, with alpha=.05 and power=.8, I would need 783 participants to have the power to detect a small effect, 84 participants to have the power to detect a medium effect and 28 participants to have the power to detect a large effect.

Note: In past research, effect sizes (*r*) for anxiety and social skills (e.g. assertive social skills such as initiating conversations, or responsible *social skills* such as asking permission to borrow something) have been small to medium (e.g. .12, .31, .19, .24). However, effect sizes for anxiety and *social outcomes* (e.g. levels of social acceptance, negative social interactions, friendship quality), have been medium to large (e.g. .46, .45, .22). The current study is examining the relationship between anxiety and *social outcomes*; therefore, it would be ideal to have the power to detect a medium to large effect. However, with the current sample size at 50 participants, the study is currently underpowered to detect a medium or small effect.

Power for Linear Multiple Regression Analyses: F Test, Fixed Model, R^2 increase

Using Cohen's (1988) conventions of .02, .15, and .35 for small, medium, and large effect sizes (f^2) , with alpha=.05, power=.8, with 6 predictors in total (including 3 covariates, autistic social impairment, depression, and anxiety), and 1 tested predictor (anxiety), in my final model I would need 395 participants to have the power to detect a small effect, 55 participants to have the power to detect a medium effect, and 26 participants to have the power to detect a large effect.