

Emotional Intelligence in Adolescents with Autism Spectrum Disorders

by

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## Abstract

Impairments in social interactions are considered core symptoms of Autism Spectrum Disorders (ASD). Given recent findings demonstrating a relationship between emotional intelligence (EI) and social outcomes, this research examined the EI of adolescents with ASD to generate novel information for addressing their social deficits. Twenty-five adolescents with ASD and 25 typical adolescents (13 -17 years) completed a battery of tests examining their intellect, EI, and social skills. Their parents also provided information regarding their social skills. The findings revealed that aspects of both trait and ability EI were significantly weaker in adolescents with ASD. In addition, while the ability EI model did not predict the social outcomes of this group, the trait EI model was able to predict 32% of self-reported interpersonal skills and 30% of parent-reported social skills. Implications for the development of social skill interventions for this group and future research are discussed.

*Keywords:* Autism Spectrum Disorders, Emotional Intelligence, adolescents, social relationships, interpersonal skills

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## Dedication

This M.A. thesis is dedicated to the individuals living with Autism Spectrum Disorder and their families who are working tirelessly to find appropriate supports and interventions in their communities for developing and refining skills. It is my hope that issues pertaining to children and youth with ASD will continue to be investigated to facilitate the development of evidence-based interventions that are feasible to implement within school settings as this would allow more students with ASD to have access to effective services and may help to improve their outcomes for the future.

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### Emotional Intelligence in Adolescents with Autism Spectrum Disorders

Among the numerous changes that occur during the period of adolescence is the restructuring of social relationships. Typically, this change involves an increase in the importance attributed to peer relationships while the importance attributed to the support and advice from parents remains constant or decreases (Helsen, Vollebergh, & Meeus, 2000; Hombrados-Mendieta, Gomez-Jacinto, Dominguez-Fuentes, Garcia-Leiva, & Castro-Trave, 2012). Unfortunately, while friendships become more significant during adolescence, some youth struggle with forming and maintaining meaningful peer relationships as a result of social skill deficits. Encountering difficulties with navigating the social world is problematic for youth as it increases their likelihood of developing disorders such as anxiety and depression when they transition to adolescence. This increased risk has been reported for both typical youth as well as youth with Autism Spectrum Disorder (ASD), a disorder characterized by deficits in social skills (Costello, Erkanli, & Angold, 2006; Epkins & Heckler, 2011; Inderbitzen-Nolan, Anderson, & Johnson, 2007; Kuusikko et al., 2008; Mayes, Calhoun, Murray, & Zahid, 2011; Vickerstaff, Heriot, Wong, Lopes, & Dossetor, 2007).

Fortunately, while the transition to adolescence has been identified as a risky period for those with ASD as well as typical youth, transition periods have also been described as prime opportunities for interventions. In their meta-analysis of classroom wide social skills interventions, January, Casey, and Paulson (2011) reported that while interventions implemented in the early years generate the most positive outcomes, the improvements made by preschoolers and kindergartners are not significantly different from those made by early adolescents. Moreover, in a similar meta-analysis involving school-age children with ASD, Bellini, Peters, Benner, and Hopf (2007) reported that the highest treatment, maintenance, and generalization



effects are found among secondary age students. Given that adolescence seems to offer “a second smaller window of opportunity to intervene” (January et al., 2011, p. 251), it may be a very important period to consider for developing and providing interventions that improve outcomes.

Despite these encouraging findings, an obstacle to providing effective interventions for remediating the social deficits of youth with ASD remains, namely, it is not yet known which interventions are most likely to be effective because few studies have investigated matters related to adolescence. In fact, most authors of meta-analyses and research syntheses report that although certain interventions seem to produce positive outcomes, there is a need for more research corresponding to the period of adolescence (Bellini et al., 2007; Reichow & Volkmar, 2010; Wang & Spillane, 2009; Weiss & Harris, 2001). One reason for the lack of studies examining the effectiveness of interventions for youth with ASD is that many of the interventions applied to this population are simply adaptations of interventions known to be effective for younger children (Walton & Ingersoll, 2013). Though interventions for children provide a promising framework for developing those for youth, they may not always target the particular skills that adolescents require to be successful in social situations involving their peers. The reason for this is because adolescence is a period marked by social relationships and expectations that differ significantly from those evident in childhood. As a result, to inform the development of interventions appropriate for adolescents with ASD, it may be beneficial to continue exploring the specific skills that require remediation in this population. This research aimed to do so by comparing the social strengths and weaknesses of adolescents with and without ASD using the construct of Emotional Intelligence (EI).

EI is a construct that was initially developed to describe how individuals process emotional information using a combination of affect and cognition (Mayer & Salovey, 1997). This model of EI now referred to as ability EI, divides the construct into four major branches of emotion-related mental skills: the ability to perceive, use, understand, and manage emotions (Salovey, Mayer, & Caruso, 2002). In general, these four branches describe individuals' "ability to process emotion-laden information competently" and their capability to use this information to solve problems and focus their energy (Salovey et al., 2002, p.160). Mayer, Salovey, and Caruso (2014) note that ability EI, "allows one to think and plan by taking emotions into consideration" (p.1). A second model of EI, trait EI, has also been developed. It offers an alternative account of the construct that encompasses self-perceived capabilities and various personality characteristics such as optimism and flexibility, rather than cognitive processes (Mayer, Salovey, & Caruso, 2000; Petrides & Furnham, 2001). It is important to note that low correlations between these two models have been reported in the literature (O'Connor & Little, 2003; Van Rooy, Viswesvaran, & Pluta, 2005; Warwick & Nettlebeck, 2004), indicating that the ability and trait models of EI do not simply provide two means of describing the same construct; they are two independent constructs that offer unique and complementary information about individuals.

EI offers an opportunity to explore the social skill deficits of adolescents with ASD for a number of reasons. First, both the trait and ability models of EI have been found to predict the social outcomes of typical adolescents. For instance, adolescents who score high on measures of trait EI are more likely to display pro-social and cooperative behaviours (Frederickson, Petrides, & Simmonds, 2012; Mavroveli, Petrides, Rieffe, & Bakker, 2007) and less likely to be bullies or the victims of bullying (Lomas, Stough, Hansen, & Downey, 2012). Trait EI has also been shown to be positively associated with life satisfaction and adaptive coping styles, and negatively

associated with perceived stress and the likelihood of developing psychological disorders such as depression and anxiety (Extremera, Duran, & Rey, 2007; Fernandez-Berrocal, Alcaide, Extremera, & Pizarro, 2006; Mavroveli et al., 2007). Less is known about ability EI in typical adolescents because prior to June 2014, the only reliable and valid measure of ability EI available, the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT), was designed for individuals 17 years and older. Though research involving adult samples has revealed that ability EI is positively related to a number of variables influencing social outcomes, such as, perceived satisfaction with relationships (Lopes, Salovey, & Straus, 2003) and social competence (Brackett, Rivers, Shiffman, Lerner, & Salovey, 2006; Yip & Martin, 2006), it is less well established whether these findings extend to adolescent samples. Since the creation of the research and publication editions of the Mayer-Salovey-Caruso Emotional Intelligence Test-Youth Research Version (MSCEIT-YRV) for pre-adolescents and adolescents, investigations of ability EI among youth have begun to emerge. For instance, Cha and Nock (2009) report that ability EI may act as a protective factor for suicidal behaviours and Wols, Scholte, and Qualter (2015) note that lower ability EI scores are related to higher ratings of loneliness over time among youth. In relation to social outcomes, Rivers et al. (2012) report that students who demonstrate higher MSCEIT-YRV scores also display higher self-ratings and teacher ratings of social and emotional competence. Given that these initial findings mirror those reported in investigations involving adult samples, it is likely that ability EI also predicts the social outcomes of typical youth.

Second, EI has been found to be a better predictor of the social outcomes of persons with ASD than alternative models such as Theory of Mind (ToM) and Executive Functions (EF; Joseph & Tager-Flusberg, 2004; Montgomery, Stoesz, & McCrimmon, 2012). Proponents of the

ToM explanation suggest that persons with ASD struggle in social situations because their inability to distinguish between their own and others' mental states hinders their capacity to explain and predict others' behaviour (Baron-Cohen, 1989; Baron-Cohen, Leslie, & Frith, 1985). In turn, the EF explanation posits that the difficulties with social relationships are the result of deficits in executive functions such as planning, self-monitoring, and inhibition (Robinson, Goddard, Dritschel, Wisley, & Howlin, 2009). Though it is well established that persons with ASD struggle with certain ToM and EF tasks, two recent studies have revealed that both constructs appear to be independent of social outcomes. The first study by Joseph and Tager-Flusberg (2004) examined the relationship between ToM, EF, and autistic symptomatology in a group of school age children. Their analyses revealed that although performance on ToM and EF tasks were strongly associated with communication symptoms, they were not significantly related to social symptom severity and repetitive behaviours once language abilities were controlled for. The second study by Montgomery et al. (2012) explored the associations between ToM, EF, EI, and social outcomes in young adults with Asperger Syndrome. Their findings revealed that while ToM and EF abilities were independent of self-reported interpersonal relations, as reported by Joseph and Tager-Flusberg, the EI variables could explain 56% of the variance in this social outcome variable. Taken together, these findings suggest that investigations of EI may be effective in generating meaningful information about the social capacities of persons with ASD.

Third, EI has been shown to improve with training. Though no known study has attempted to improve EI in a group of adolescents with ASD, numerous investigations involving typical adolescents have generated encouraging findings. For instance, using a yearlong school-based EI intervention, Qualter, Whiteley, Hutchinson, and Pope (2007) were able to significantly

improve the EI scores of those adolescents who had the lowest scores at the beginning of the academic year. Similarly, Castillo, Salguero, Fernandez-Berrocal, and Balluerka (2013), implemented a two-year school-based EI intervention involving monthly one-hour sessions. Their intervention resulted in significant decreases in adolescents' levels of aggression and anger as well as improvements in their levels of perspective taking. Durlak, Weissberg, Dymnicki, Taylor, & Schellinger (2011) conducted a meta-analysis of school-based social-emotional learning programs for students from kindergarten to Grade 12. Overall, their analyses revealed that these interventions were able to significantly improve students' social and emotional skills, empathy, ability to recognize emotions, stress management, and prosocial behaviours. Given that EI appears to be related to social outcomes and responsive to intervention among typical children and adolescents, it may be a valuable construct to explore for informing the development of social skill interventions that meet the needs of adolescents with ASD.

Finally, EI is a concept that is relatively well accepted in schools. This is evident from the growing body of literature advocating for the professional development of school staff on EI constructs to improve school environments and increase student success (Richardson, 2002; Jones & Hutchins, 2004). Moreover, in addition to the EI interventions that have been effectively implemented in schools (Castillo et al., 2013; Durlak et al., 2011; Qualter et al., 2007), some have suggested that social-emotional competencies can be further developed by integrating EI in academic course work of various subjects (Beland, 2007). Given that most adolescents with ASD attend a school in their community, programs for remediating social skills could be made more accessible and target more youth if they are conducted in schools. As such, schools' acceptability of EI is noteworthy as it could facilitate the development and implementation of social skill interventions having a focus on EI for adolescents with ASD within school settings.

To our knowledge, evaluations of EI in persons with ASD have only been conducted with adults diagnosed with Asperger Syndrome (AS). These studies have revealed that young adults with AS (aged 16-21 years) obtain scores similar to the normative group on measures of ability EI but lower than the normative group on measures of trait EI (Montgomery, McCrimmon, Schwean, & Saklofske, 2010; Petrides, Hudry, Michalaria, Swami, & Sevdalis, 2011). Together, these findings suggest that adults with AS “have intact knowledge about how to reason through emotionally-based scenarios (ability EI) when provided with ample time to process information and evaluate options, yet [they] feel that their performance in real life situations is poor (trait EI)” (Montgomery et al., 2010, p.575). Raters familiar with the adults (e.g., parents) provided validation of these perceptions (Montgomery, 2007). Though no known study has examined EI in youth with ASD, Climie (2012) explored both models of the construct in a different adolescent population known to display social skill deficits, namely, adolescents with Attention-Deficit/Hyperactivity Disorder (ADHD). Interestingly, similar to the adults with AS, the adolescents with ADHD displayed intact ability EI scores but poor trait EI scores (Climie, 2012). Despite the similarities observed between adults with AS and adolescents with ADHD on measures of EI, it is unconfirmed whether these findings extend to adolescents with ASD. As such, to understand the social strengths and weaknesses of adolescents with ASD, this research sought to compare the presentation of EI in adolescents with ASD and typical adolescents. An examination of the relationship between EI and social outcomes was also conducted to identify areas of deficit that interventions could target to improve the social outcomes of youth with ASD.

## **Method**

### **Participants**

Thirty-three adolescents with a formal diagnosis of ASD and 27 typical adolescents between the ages of 13 and 17 years were recruited for this study through word of mouth, newspaper publications, posters, and community organizations. Of the participants recruited, 25 adolescents with ASD (aged 13-17 years,  $M = 15.08$ ,  $SD = .96$ ; 18 males, 7 females) and 25 adolescents without ASD (aged 13-17 years,  $M = 15.05$ ,  $SD = 1.47$ ; 14 males, 11 females) met the inclusion criteria for this study. Adolescents in the clinical group were required to have a formal diagnosis from a medical doctor, psychologist, or psychiatrist based on the DSM-IV-TR or DSM-5 criteria. To provide additional validation of the diagnoses of the adolescents with ASD and the absence of ASD characteristics in typical adolescents, parents and/or legal guardians were asked to complete the *Social Communication Questionnaire-Lifetime Form (SCQ)*. This questionnaire has been reported to have high sensitivity (0.88) and specificity (0.72) in distinguishing ASD from non-ASD cases (Chandler et al., 2007). Though the recommended cut-off value for discriminating between ASD and non-ASD cases is  $\geq 15$  (Rutter, Bailey, & Lord, 2003), a cut-off value of  $\geq 10$  was used for the purpose of this study. This value was thought to be more appropriate as the study participants were higher functioning and studies suggest that lowering the cut-off value could help to avoid false negatives among this group of individuals (Goin-Kochel & Cohen, 2008; Schanding, Nowell, & Goin-Kochel, 2012). According to Schanding et al. (2012), a cut-off value as low as seven on the SCQ-Lifetime form could derive elevated sensitivity (.974) and specificity (.965) scores among higher functioning individuals with ASD. Six parents of typical adolescents did not complete the SCQ because it had not been added to the battery of measures for this group when they took part in the study.

To participate, adolescents also had to obtain a verbal intelligence quotient (VIQ) of  $\geq 80$  on the *Wechsler Abbreviated Scale of Intelligence (WASI)* because many of the measures

required the ability to read and speak. As such, the group of adolescents with and without ASD who participated in this study were considered to be higher functioning. Adolescents were excluded if they did not complete all of the measures or if they were reported to have suffered a serious head injury. Participants with co-existing medical or mental health conditions were not excluded from this study in order to generate results representing a more naturalistic sample of adolescents with and without ASD (Montgomery et al., 2010). Table 1 summarizes the parent-reported co-existing mental health and medical conditions for the adolescents who met the inclusion criteria within each group.

Table 1

*Parent-Reported Co-Existing Mental Health and Medical Conditions*

Condition	ASD	Typical
No Mental Health Condition	5	23
No Medical Condition	13	18
ADHD	18	2
Anxiety	8	-
Depression	4	-
Asthma	3	1
Allergies	3	5
Sensory Processing Disorder	2	-
Fine and Gross Motor Delays	2	-
Seizures	2	-
Disruptive Behaviour Disorder	1	-
Obsessive-Compulsive Disorder	1	-
Chronic Motor Tic	1	-
Expressive Receptive Language Disorder	1	-
Nonverbal Learning Disability	1	-
Infantile Strabismus	1	-
Detrusor Instability	1	-
Benign Tumors in Ears	1	-
Trigonocephaly	1	-
Insomnia	1	-
Phonological Disorder	1	-
Hypotonia	1	-
Type 1 Diabetes	-	1
High Blood Pressure	-	1



Eight participants with ASD did not meet the criteria to participate in the study: one had been hospitalized for a head injury, one did not complete all of the measures, one did not meet the cut-off score on the SCQ, and five obtained a VIQ < 80. In the group of typical adolescents, two participants were excluded because their score on the SCQ was above the cut-off value (> 10). The characteristics of the participants included in the study are presented in Table 2.

Table 2

*Participant Characteristics: Means (Standard Deviations)*

Group	Age	VIQ	SCQ
ASD	15.08 (.96)	101.40 (12.97)	21.84 (6.39)
Typical	15.05 (1.47)	109.04 (13.00)	2.11 (2.08) <sup>a</sup>

<sup>a</sup>These values were computed for nineteen participants only as six parents of typical teens did not complete the SCQ.

The adolescents' parents and/or legal guardians and a teacher who had known them for a minimum of six weeks also had the opportunity to participate. While parents and/or legal guardians were required to complete a series of measures, it was not mandatory for teachers to participate. Only five teachers of adolescents with ASD and two teachers of typical adolescents participated in this study. Given the small sample of data recruited from teachers, none of the analyses outlined below include results gathered from this group.

## Procedures

Adolescents whose parents provided informed consent first completed the *WASI*, followed by a battery of measures in a randomized order. These measures included the *BarOn Emotional Quotient Inventory: Youth Version, Short form (BarOn EQ-i:YV(S))*, the *Mayer-Salovey-Caruso Emotional Intelligence Test-Youth Research Version (MSCEIT-YRV)*, and the *Behavior Assessment System for Children, Second Edition: Self-Report of Personality (BASC-2: SRP)*. The collection of measures were administered in a local library, at the participants' home,

or in the Social Cognition Laboratory at the University of Manitoba and required approximately 90 minutes to complete. The adolescents were offered breaks throughout the session and given a \$20 gift card as an honorarium for their time.

Parents and/or legal guardians were asked to complete a Participant Information Questionnaire, the *SCQ*, and the *Behavior Assessment System for Children, Second Edition: Parent Rating Scale (BASC-2: PRS)* while the adolescents were with the researcher. They also had the option to provide the name and contact information of a teacher who had known the adolescent for a minimum of six weeks. With the adolescent's assent, this teacher was contacted and asked to complete the *Behavior Assessment System for Children, Second Edition: Teacher Report Scale (BASC-2: TRS)*. The procedures outlined above were approved by the Psychology/Sociology Research Ethics Board of the University of Manitoba.

## Measures

**Social Communication Questionnaire-Lifetime Form (SCQ).** The SCQ-Lifetime form is a parent-report measure comprised of 40 yes/no items evaluating the social functioning and communication skills of individuals four years and older. It is a valid screening tool for distinguishing ASD from non-ASD cases and requires approximately 10 minutes to complete (Chandler et al., 2007).

**Wechsler Abbreviated Scale of Intelligence (WASI).** The WASI is a brief and reliable measure of intellectual functioning intended for individuals aged 6 to 89 years. For the purpose of this study, only the Vocabulary and Similarities subtests were administered. Together, they required approximately 20 minutes to complete and helped to verify the participants' ability to understand and answer questions by providing a VIQ. Excellent psychometric properties have been reported for the WASI (Saklofske, Caravan, & Schwartz, 2000).

**BarOn Emotional Quotient Inventory: Youth Version, Short form (BarOn EQ-i: YV (S)).** The BarOn EQ-i: YV (S) is a self-report questionnaire that measures the trait EI of children and adolescents between the ages of 7 to 18 years. Its thirty items provide a total Emotional Quotient (EQ) score and four subscale scores representing adolescents' level of social and emotional functioning (Adaptability, Interpersonal, Intrapersonal, Stress Management). A positive impression scale is also included to identify adolescents who have a tendency to portray themselves more positively. The short form of the BarOn EQ-i: YV was used for this study. It required approximately 15 minutes for the adolescents to complete and has been reported to have adequate reliability and validity (Bar-On & Parker, 2000).

**Mayer-Salovey-Caruso Emotional Intelligence Test-Youth Research Version (MSCEIT-YRV).** The MSCEIT-YRV was recently published in June 2014. It evaluates the ability EI of pre-adolescents and adolescents aged 10 to 17 years by assessing their capacity to perform tasks and solve emotional problems using the four branches of the ability EI model: perceiving, using, understanding, and managing emotions. The adolescents completed the online administration version of the MSCEIT-YRV in approximately 20 minutes. Standardization studies indicate that it provides valid and reliable measurements of ability EI in adolescents (Peters, Kranzler, & Rossen, 2009; Rivers et al., 2012).

**Behavior Assessment System for Children, Second Edition (BASC-2).** The BASC-2 assesses the behavioural and emotional functioning of individuals aged 2 to 25 years. It includes three rating forms (Self-Report of Personality, Parent Rating Scale, Teacher Rating Scale) that can be administered to derive more accurate and complete information about individuals. In this study, the rating forms for adolescents between the ages of 12-21 years were used as well as four particular scales probing social abilities. These scales were the Social Stress and Interpersonal

Skills scales from the BASC-2: SRP and the Social Skills and Adaptability scales from the BASC-2: PRS and BASC-2: TRS. The Developmental Social Disorders and Emotional Self-Control content scales from the BASC-2: PRS were also used in this study. The time required to complete the BASC-2: SRP was approximately 30 minutes while the BASC-2: PRS and the BASC-2: TRS required approximately 15 minutes to complete. The reliability and validity of the BASC-2 is well established (Reynolds & Kamphaus, 2004).

### **Analysis**

The data for this project was entered by the researcher and verified by a trained research assistant. Descriptive statistics were used to summarize the sample characteristics and examine the distribution of scores. To identify the similarities and differences between adolescents with ASD and typical adolescents on measures of EI and social outcomes, Mann-Whitney *U* Tests were conducted. For each of the groups, correlations were subsequently computed to assess the relationships between age, IQ, EI, and social skills. Based on the results from the correlational analyses, multiple regressions were conducted to determine whether particular EI measures predict social outcomes. The analyses conducted in this study were considered exploratory because the examination of EI in individuals with ASD is a relatively new area of research and the sample of participants recruited was relatively small. The only known publications of investigations of EI in individuals with ASD, which involved similar sample sizes, were also considered exploratory (Montgomery et al., 2010; Montgomery et al., 2012).

## **Results**

### **Preliminary Analyses**

Preliminary descriptive analyses were conducted to examine the distributions for normality, the presence of outliers, and homogeneity of variances. The Shapiro-Wilk test was

used to verify normality and significant results were found, indicating that certain distributions were not normally distributed. More specifically, for the adolescents with ASD, significant results were obtained on the distributions for the BarOn EQ-i: YV Intrapersonal, MSCEIT-YRV Perceiving Emotions, and BASC-2: SRP Interpersonal Relations subscales. For the adolescents in the control group, significant results were obtained on the distributions for the BarOn EQ-i: YV Total EQ composite and the BASC-2: PRS Adaptability, BarOn EQ-i: YV Interpersonal, and MSCEIT-YRV Positive-Negative Bias subscales. Skewness and kurtosis values were also examined to verify the shape of the distributions. According to Tabachnick and Fidell (2007), when distributions are normal, values of skewness and kurtosis are zero. When values deviate from zero, a positive skewness value indicates that there is a pileup of cases to the left and a negative skewness value indicates that there is a pileup of cases to the right. In addition, a positive kurtosis value indicates that the distribution is too peaked, while a negative kurtosis value indicates that the distribution is too flat. George and Mallery (2010) note that skewness and kurtosis values between  $\pm 2$  are considered acceptable in order to prove normal univariate distribution. Significance levels from the Shapiro-Wilk tests of normality as well as the skewness and kurtosis statistics from each distribution are presented in Table 3.

Table 3

*Significance Levels from Shapiro-Wilk Tests and Skewness and Kurtosis Statistics*

Variable	ASD			Control		
	<i>p</i>	Skewness	Kurtosis	<i>p</i>	Skewness	Kurtosis
<b>BarOn EQ-i: YV</b>						
Intrapersonal	.025*	.565	-.850	.144	-.398	-.930
Interpersonal	.824	-.052	-.602	.048*	-.991	2.131
Stress Management	.114	-.563	.215	.052	-.943	.413
Adaptability	.204	.422	-.737	.239	.702	.028
Total EQ	.518	.188	-.690	.04*	-.941	.286
Positive Impression	.771	.053	-.539	.272	.180	-.956
<b>MSCEIT-YRV</b>						

Perceiving Emotions	<.001***	-1.793	3.158	.568	.314	-.302
Facilitating Thought	.285	.715	.599	.707	.347	-.510
Understanding Emotions	.093	-.752	.227	.675	-.033	-.777
Managing Emotions	.304	-.174	-.671	.285	-.116	-1.179
Total EI	.735	-.272	-.460	.687	.195	-.356
Positive-Negative Bias	.668	.404	1.473	.041*	-.941	1.229
<b>BASC-2: SRP</b>						
Social Stress	.101	.900	.432	.407	.466	-.452
Interpersonal Relations	.01**	-1.045	.378	.052	-.463	-.500
<b>BASC-2: PRS</b>						
Social Skills	.913	-.141	-.484	.637	-.168	-.705
Adaptability	.526	.203	-.903	.05*	.197	-1.368
Developmental Social Disorders	.944	.310	.168	.162	-.534	-.470
Emotional Self-Control	.116	.288	-.930	.064	-.027	-1.239

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

To verify whether outliers were present, a visual inspection of boxplots of the observations and an analysis of their standard deviation units (z-scores) was conducted. When examining standard deviation units for outliers, Aguinis, Gottfredson, and Joo (2013) recommend using a cut-off value of  $\pm 2.24$  standard deviation units, as this captures observations in the top and bottom 2.5% of distributions. Both methods of inspection led to the identification of outlying observations. Rather than applying corrections to the outlying observations, non-parametric procedures that are robust to the presence of outliers were chosen for the analyses (Zimmerman, 1994). A summary of the findings is presented in Table 4.

Table 4

*Outliers Identified in Boxplots and Observations  $\pm 2.24$  Standard Deviation Units (SD)*

Participant	Subscale	Outlier in Boxplot	Z-Score
ASD2	Verbal IQ	yes	3.13
ASD7	BASC-2: SRP Social Stress	yes	2.53
ASD7	BASC-2: SRP Interpersonal Relations	yes	-2.30
ASD10	Verbal IQ	yes	-
ASD10	BASC-2: SRP Interpersonal Relations	yes	-
ASD16	BASC-2: PRS Developmental Social Disorders	no	2.37
ASD16	BASC-2: SRP Interpersonal Relations	yes	-

ASD16	MSCEIT-YRV Understanding Emotions	yes	-
ASD18	MSCEIT-YRV Perceiving Emotions	yes	-2.96
ASD18	MSCEIT-YRV Positive-Negative Bias	yes	2.71
ASD24	MSCEIT-YRV Perceiving Emotions	yes	-2.48
ASD25	MSCEIT-YRV Facilitating Thought	yes	2.49
C1	MSCEIT-YRV Positive-Negative Bias	yes	-
C7	BarOn EQ-i: YV Total EQ	no	-2.36
C14	BarOn EQ-i: YV Adaptability	no	2.30
C14	MSCEIT-YRV Positive-Negative Bias	yes	-
C18	MSCEIT-YRV Positive-Negative Bias	yes	-2.49
C22	BarOn EQ-i: YV Interpersonal	yes	-3.05
C22	MSCEIT-YRV Positive-Negative Bias	yes	-
C24	MSCEIT-YRV Total EI	no	2.25

The statistics from Levene's test were examined to determine whether the variances representing similar variables were equal between the groups. The groups were found to have unequal variances on the following distributions: BASC-2: SRP Social Stress ( $F = 8.48, p = .005$ ), BASC-2: SRP Interpersonal Relations ( $F = 9.09, p = .004$ ), and BASC-2: PRS Emotional Self-Control ( $F = 10.41, p = .002$ ).

### **Verification of Validity Indices**

All of the composite scales and subscales of the BarOn EQ-i: YV and MSCEIT-YRV are based on a mean/median score of 100 and a standard deviation of 15. In addition, both measures include a scale that aims to evaluate the validity of the responses provided. More specifically, while the BarOn EQ-i: YV contains the Positive Impression scale which evaluates individuals' tendency to respond in a way that creates an overly positive self-impression, the MSCEIT-YVR includes the Positive-Negative Bias scale which produces a score representing whether individuals displayed a stronger bias for providing more positive or negative responses to the pictorial representations of emotions presented on the Perceiving Emotions subscale. To verify whether these indices were within normal limits, One-Sample Wilcoxon Signed Rank Tests were

used to compare the group medians on these scales to 100, the median representing the normative sample. The One-Sample Wilcoxon Signed Rank Test was chosen because it is robust to non-normal distributions and the presence of outliers (Arnold, 1965; Whitley & Ball, 2002), which were both evident in our data.

The results from Wilcoxon Signed Rank Tests for the group of adolescents with ASD indicate that this group displayed a performance similar to the norm group on the Positive Impression scale of the BarOn EQ-i: YV ( $Z = -.601, p = .548$ , two-tailed) and the Positive-Negative Bias scale of the MSCEIT-YRV ( $Z = 1.870, p = .061$ , two-tailed). In contrast, the adolescents in the control group obtained significantly different scores from the norm group along the Positive Impression scale ( $Z = -.2528, p = .01$ , two-tailed) of the BarOn EQ-i: YV and the Positive-Negative Bias scale of the MSCEIT-YRV ( $Z = 3.269, p = .001$ , two-tailed). Altogether, these results suggest that while the adolescents with ASD displayed valid and appropriate responses, the adolescents in the control group displayed significantly more negative self-impressions than the normative group on the scales of the BarOn EQ-i: YV and a stronger bias for providing positive responses along the Perceiving Emotions subscale of the MSCEIT-YRV. It is important to note that for both groups, none of the group means representing scores from the subscales of the BarOn EQ-i: YV and the MSCEIT-YRV were above or below one standard deviation from the mean reported for the normative populations (i.e., 100). As such, even though the results obtained from the adolescents in the control group show some evidence of biased responding, the scores generated for this group were within the average range. The results from the One-Sample Wilcoxon Signed Rank Test are provided in Table 5.

Table 5

*One-Sample Wilcoxon Signed Rank Test Results*



Variable	ASD			Control		
	Median	Z	p	Median	Z	p
<b>BarOn EQ-i: YV</b>						
Positive Impression	95.00	-.601	.548	90.00	-2.528	.011*
<b>MSCEIT-YRV</b>						
Positive-Negative Bias	107.09	1.870	.061	114.01	3.269	.001**

\* $p < .05$ . \*\* $p < .01$ .

### Group Comparisons

A non-parametric procedure, the Independent Samples Mann-Whitney  $U$  Test, was used to compare the groups on the measures of EI and social outcomes. The Mann-Whitney test was chosen to account for the non-normal distributions, the presence of outliers, and the unequal variances between the groups (Brace, Kemp, & Snelgar, 2006; Gibbons & Chakraborti, 1991; Howell, 2013), as was the case with our data. Two-tailed tests were used and no Type I error correction procedure was performed because of the exploratory nature of this study (Bender & Lange, 2001). The results from the Mann-Whitney tests are presented in Table 6.

On the measure of trait EI, the BarOn EQ-i: YV, the adolescents with ASD provided self-ratings that produced a significantly weaker overall score ( $U = 178.00$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p = .009$ ) as well as significantly poorer Interpersonal ( $U = 159.50$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p = .003$ ) and Stress Management ( $U = 131.50$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p < .001$ ) subscale scores. In contrast, their ratings did not differ significantly from the control group on the subscales measuring Intrapersonal skills ( $U = 250.00$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p = .225$ ) and Adaptability ( $U = 305.50$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p = .892$ ).

On the measure of ability EI, the MSCEIT-YRV, the adolescents with ASD also displayed a significantly weaker overall performance ( $U = 174.50$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p = .007$ ) and obtained significantly weaker performance scores on the subscales measuring the ability to Understand ( $U = 207.50$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p = .042$ ) and Manage Emotions ( $U = 170.00$ ,  $N_1 =$

25,  $N_2 = 25$ ,  $p = .006$ ). Their performance was not significantly different from the control group on the Perceiving Emotions ( $U = 300.50$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p = .816$ ) and Facilitating Thought ( $U = 220.00$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p = .073$ ) subscales.

Evaluations of the adolescents' self-reported and parent-reported social outcomes using the BASC-2 produced significant results on all of the subscales measured. More specifically, the adolescents with ASD provided self-ratings indicating that they experience significantly more Social Stress ( $U = 198.00$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p = .026$ ) and poorer Interpersonal Relations ( $U = 155.50$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p = .002$ ). In a similar manner, the ratings provided by parents produced results indicating that the adolescents with ASD display significantly weaker Social Skills ( $U = 41.00$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p < .001$ ), Adaptability ( $U = 26.50$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p < .001$ ), and Emotional Self-Control ( $U = 92.00$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p < .001$ ). The adolescents with ASD were also rated as showing significantly more behaviours characterized by deficits in social skills, communication, interests, and activities on the parent-reported Developmental Social Disorders subscale of the BASC-2 ( $U = .000$ ,  $N_1 = 25$ ,  $N_2 = 25$ ,  $p < .001$ ).

Table 6

*Mann-Whitney U Test Results*

Subscales	Median Score		$U$	$p$
	ASD	Control		
<b>BarOn EQ-i: YV</b>				
Intrapersonal	87.00	98.00	250.00	.225
Interpersonal	95.00	105.00	159.50	.003**
Stress Management	98.00	113.00	131.50	< .001***
Adaptability	93.00	93.00	305.50	.892
Total EQ	92.00	106.00	178.00	.009**
<b>MSCEIT-YRV</b>				
Perceiving Emotions	113.38	111.55	300.50	.816
Facilitating Thought	95.22	101.75	220.00	.073
Understanding Emotions	97.30	105.49	207.50	.042*
Managing Emotions	97.02	110.36	170.00	.006**

Total EI	96.93	107.25	174.50	.007**
<b>BASC-2: SRP</b>				
Social Stress	51.00	45.00	198.00	.026*
Interpersonal Relations	48.00	53.00	155.50	.002**
<b>BASC-2: PRS</b>				
Social Skills	37.00	54.00	41.00	< .001***
Adaptability	33.00	53.00	26.50	< .001***
Developmental Social Disorders	74.00	47.00	.000	< .001***
Emotional Self-Control <sup>a</sup>	63.00	49.00	92.00	< .001***

<sup>a</sup> An elevated score on this measure suggests more difficulties with controlling emotions

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

### Relationships Among Variables

Correlations were computed to gather information about the relationships between age, VIQ, and measures of EI and social outcomes. A nonparametric test, Spearman's  $r_s$ , was used in order to account for the violations of parametric assumptions identified in the dataset (Brace et al., 2006). In addition, caution is warranted when interpreting the results as no Type I error correction procedure was performed due to the exploratory nature of this study. The two-tailed Spearman's  $r_s$  correlations between the measures of age, VIQ, EI, and social outcomes for the adolescents with ASD are presented in Table 7 and those for the control group are presented in Table 8.

Table 7

*Spearman's  $r_s$  Correlations for Adolescents with ASD*

	Age	VIQ	Intra	Inter	Str Mgm	Adapt	Total EQ	Perc	Fac	Und	Man	Total EI	SRP SS	SRP IR	PRS SS	PRS Adapt	PRS DSD	PRS ESC
1	-	-.37	-.09	.19	-.18	-.08	-.10	-.02	-.19	-.16	-.33	-.26	.29	.07	.02	-.06	.30	.32
2		-	-.03	.04	-.26	.23	.07	.45*	-.12	.43*	.11	.27	.00	.10	-.13	.03	-.19	-.01
3			-	.40	.22	.48*	.75***	.21	.44*	.09	.20	.28	-.31	.37	.74***	.07	-.53*	-.28
4				-	.10	.62***	.69***	.07	.37	.09	.17	.13	-.14	.35	.33	-.01	-.22	.03
5					-	.37	.52**	-.35	.32	.04	.33	.20	-.31	.27	.17	.03	-.24	-.20
6						-	.82***	.13	.23	.14	.20	.19	-.06	.30	.47*	-.10	-.44*	.03
7							-	.06	.50*	.18	.36	.36	-.33	.51*	.60*	.06	-.47*	-.25
8								-	-.02	.15	.36	.15	-.12	.29	.22	.22	-.18	.07
9									-	.34	-.03	.61***	-.51*	.49*	.41*	-.04	-.17	.01
10										-	.80***	.92***	-.05	.24	.15	.45*	-.32	-.26
11											-	.88***	-.17	.25	.23	.56**	-.40*	-.57*
12												-	-.21	.35	.32	.40*	-.39	-.31
13													-	-.80***	-.31	-.04	.04	.13
14														-	.45*	.22	-.16	-.14
15															-	.17	-.64*	-.14
16																-	-.45*	-.76***
17																	-	.38

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p \leq .001$ .

Table 8

*Spearman's  $r_s$  Correlations for Adolescents in the Control Group*

	Age	VIQ	Intra	Inter	Str Mgm	Adapt	Total EQ	Perc	Fac	Und	Man	Total EI	SRP SS	SRP IR	PRS SS	PRS Adapt	PRS DSD	PRS ESC
1	-	-.30	.11	-.23	-.16	-.09	-.11	.07	-.16	.03	.38	.12	.30	.08	-.14	.02	.01	.11
2		-	-.19	-.06	-.04	.49*	.15	.18	-.06	.52**	-.10	.16	-.26	.02	.39	.33	-.42*	-.36
3			-	.42*	.42*	-.01	.66***	-.16	.14	.09	.33	.12	-.34	.55**	.24	.22	-.41*	-.29
4				-	.48*	.02	.62***	-.11	.52**	-.09	.16	.29	-.13	.21	.44*	.35	-.29	-.31
5					-	.13	.71***	.20	.24	-.04	-.06	.11	-.56**	.47*	.15	.39	-.37	-.60*
6						-	.52**	.30	-.46*	.08	-.27	-.23	-.22	.14	.23	.27	-.26	-.40*
7							-	.11	.12	.13	.13	.13	-.45*	.58**	.44*	.50*	-.57*	-.64***
8								-	-.20	.20	.15	.15	-.25	.08	-.20	-.07	-.01	-.21
9									-	.09	.44*	.72***	.04	-.18	.30	.19	-.21	-.05
10										-	.55**	.64***	-.14	.14	.16	.26	-.42*	-.24
11											-	.80***	.12	-.01	.20	.10	-.35*	-.02
12												-	-.03	-.09	.27	.27	-.41*	-.18
13													-	-.57*	-.03	-.11	.28	.49*
14														-	.10	.17	-.29	-.41*
15															-	.55*	-.73***	-.34
16																-	-.62***	-.83***
17																	-	.52**

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p \leq .001$ .

**Age and VIQ.** Though there were no significant correlations between age and any of the EI or social outcome measures identified for either of the groups, significant correlations between VIQ and these measures were found. More specifically, for adolescents with ASD, significant positive correlations between VIQ and scores on the Perceiving ( $r_s = .45, p = .02$ , two-tailed) and Understanding Emotions ( $r_s = .43, p = .03$ , two-tailed) subscales of the MSCEIT-YRV were found, indicating that the adolescents with more sophisticated verbal skills displayed a stronger performance on these subscales. Among the adolescents in the control group, a significant positive correlation between VIQ and Understanding Emotions ( $r_s = .52, p = .01$ , two-tailed) was also found. In addition, this group demonstrated a significant positive correlation between VIQ and the Adaptability subscale of the BarOn EQ-i: YV ( $r_s = .49, p = .01$ , two-tailed) and a significant negative correlation between VIQ and the Developmental Social Disorders subscale on the BASC-2: PRS ( $r_s = -.42, p = .04$ , two-tailed).

**BarOn EQ-i: YV.** An examination of inter-correlations among the scales of the BarOn EQ-i: YV revealed that for the adolescents with ASD, the Total EQ composite score was moderately to strongly correlated with all of the subscales comprising this measure, namely, the Intrapersonal ( $r_s = .75, p < .001$ , two-tailed), Interpersonal ( $r_s = .69, p < .001$ , two-tailed), Stress Management ( $r_s = .52, p = .01$ , two-tailed), and Adaptability ( $r_s = .82, p < .001$ , two-tailed) subscales. Moderate associations were also found between the Adaptability subscale and the Intrapersonal ( $r_s = .48, p = .02$ , two-tailed) and Interpersonal ( $r_s = .62, p = .001$ , two-tailed) subscales. For the adolescents in the control group, moderate to strong correlations between the Total EQ composite and each of the subscales were also evident. More specifically, significant associations were found between the Total EQ composite and the Intrapersonal ( $r_s = .66, p < .001$ , two-tailed), Interpersonal ( $r_s = .62, p = .001$ , two-tailed), Stress Management ( $r_s = .71, p < .001$ , two-tailed), and Adaptability ( $r_s = .52, p = .01$ , two-tailed) subscales. Moderate

correlations were also found between Stress Management and the Intrapersonal ( $r_s = .42, p = .04$ , two-tailed) and Interpersonal ( $r_s = .48, p = .02$ , two-tailed) subscales and between the subscales measuring Intrapersonal and Interpersonal ( $r_s = .42, p = .04$ , two-tailed) skills. For both groups, these inter-correlations were similar to those reported in the technical manual of the BarOn EQ-i: YV (Bar-On & Parker, 2000).

**MSCEIT-YRV.** Within the MSCEIT-YRV, inter-correlations were noted between the Total EI composite score and the Facilitating Thought ( $r_s = .61, p = .001$ , two-tailed), Understanding Emotions ( $r_s = .92, p < .001$ , two-tailed), and Managing Emotions ( $r_s = .88, p < .001$ , two-tailed) subscales for the adolescents with ASD. This group also demonstrated significant associations between the Managing Emotions subscale and the Facilitating Thought ( $r_s = .49, p = .01$ , two-tailed) and Understanding Emotions ( $r_s = .80, p < .001$ , two-tailed) subscales. The group of adolescents in the control group displayed similar inter-correlations, with significant relationships between the Total EI composite and the Facilitating Thought ( $r_s = .72, p < .001$ , two-tailed), Understanding Emotions ( $r_s = .64, p = .001$ , two-tailed), and Managing Emotions ( $r_s = .80, p < .001$ , two-tailed) subscales. In addition, the adolescents in the control group also demonstrated significant correlations between the Managing Emotions subscale and the Facilitating Thought ( $r_s = .44, p = .03$ , two-tailed) and Understanding Emotions ( $r_s = .55, p = .01$ , two-tailed) subscales. The inter-correlations obtained by both groups were similar to those reported in the technical manual of the MSCEIT-YRV (Mayer et al., 2014).

**BASC-2.** Among the adolescents with ASD, inter-correlations were found between the self-report of Social Stress and Interpersonal Relations ( $r_s = -.80, p < .001$ , two-tailed) and between the self-report of Interpersonal Relations and parent-report of Social Skills ( $r_s = .45, p = .03$ , two-tailed). On the parent-report measures of the BASC-2, significant negative correlations were found between the Emotional Self-Control and Adaptability ( $r_s = -.76, p < .001$ , two-tailed)

subscales and between the Development Social Disorders and Social Skills ( $r_s = -.64, p = .001$ , two-tailed) and Adaptability ( $r_s = -.45, p = .02$ , two-tailed) subscales. The adolescents in the control group also demonstrated significant associations between Social Stress and Interpersonal Relations ( $r_s = -.57, p = .01$ , two-tailed) on the self-report component of the BASC-2. On the parent-report subscales, a positive correlation was found between Social Skills and Adaptability ( $r_s = .55, p = .01$ , two-tailed) and negative correlations were found between the Developmental Social Disorders and the Social Skills ( $r_s = -.73, p < .001$ , two-tailed), Adaptability ( $r_s = -.62, p = .001$ , two-tailed), and Emotional Self-Control ( $r_s = .52, p = .01$ , two-tailed) subscales. Moreover, significant correlations were identified between Emotional Self-Control and self-reported Social Stress ( $r_s = .49, p = .01$ , two-tailed) and Interpersonal Relations ( $r_s = -.41, p = .04$ , two-tailed) and parent-reported Adaptability ( $r_s = -.83, p < .001$ , two-tailed). For both groups, the inter-correlations identified were in a similar direction as those reported in the technical manual of the BASC-2 (Reynolds & Kamphaus, 2004).

**BarOn EQ-i: YV and MSCEIT-YRV.** On the trait and ability measures of EI, only the Facilitating Thought subscale of the MSCEIT-YRV was significantly correlated with subscales from the BarOn EQ-i: YV in both groups. In particular, for adolescents with ASD, significant positive correlations were found between the Facilitating Thought subscale of the MSCEIT-YRV and the Total EQ ( $r_s = .50, p = .01$ , two-tailed) composite score and Intrapersonal ( $r_s = .44, p = .03$ , two-tailed) subscale of the BarOn EQ-i: YV. In contrast, for the adolescents in the control group, there was a significant positive correlation between the Facilitating Thought subscale of the MSCEIT-YRV and the Interpersonal subscale ( $r_s = .52, p = .01$ , two-tailed) of the BarOn EQ-i: YV as well as a significant negative correlation between the Facilitating Thought subscale and the Adaptability subscale ( $r_s = -.46, p = .02$ , two-tailed) of the BarOn EQ-i: YV.



**BASC-2 and BarOn EQ-i: YV.** Many significant correlations between the self and parent-reported measures of social outcomes and the self-report measure of trait EI were identified. In the group of adolescents with ASD, there was a significant positive correlation between the self-report measure of Interpersonal skills on the BASC-2 and the BarOn EQ-i: YV Total EQ composite ( $r_s = .51, p = .01$ , two-tailed). There were also positive correlations between the parent-report of Social Skills on the BASC-2 and the self-report of Intrapersonal skills ( $r_s = .74, p < .001$ , two-tailed), Adaptability ( $r_s = .47, p = .02$ , two-tailed), and the Total EQ composite ( $r_s = .60, p < .01$ , two-tailed) of the BarOn EQ-i: YV. Moreover, negative correlations between the BASC-2's parent-report of Developmental Social Disorders and the self-report of Intrapersonal skills ( $r_s = -.53, p = .01$ , two-tailed), Adaptability ( $r_s = -.44, p = .03$ , two-tailed), and the Total EQ composite ( $r_s = -.47, p = .02$ , two-tailed) of the BarOn EQ-i: YV were identified.

Within the control group, the BarOn EQ-i: YV Total EQ composite was significantly correlated with all of the scales of the BASC-2, namely, the self-report of Social Stress ( $r_s = -.45, p = .03$ , two-tailed) and Interpersonal Relations ( $r_s = .58, p < .01$ , two-tailed) and the parent-report of Social Skills ( $r_s = .44, p = .03$ , two-tailed), Adaptability ( $r_s = .50, p = .01$ , two-tailed), Developmental Social Disorders ( $r_s = -.57, p < .01$ , two-tailed), and Emotional Self-Control ( $r_s = -.64, p < .01$ , two-tailed). In addition, significant positive correlations were found between the BASC-2 self-report of Interpersonal Relations and the BarOn EQ-i: YV Intrapersonal ( $r_s = .55, p < .01$ , two-tailed) and Stress Management scales ( $r_s = .47, p = .02$ , two-tailed), as well as the BASC-2 parent-report of Social Skills and the Interpersonal scale of the BarOn EQ-i: YV ( $r_s = .44, p = .03$ , two-tailed). Significant negative correlations were identified between the BASC-2 self-report of Social Stress and the BarOn EQ-i: YV Stress Management scale ( $r_s = -.56, p < .01$ , two-tailed), as well as the BASC-2 parent-report of Developmental Social Disorders and the

BarOn EQ-i: YV Intrapersonal scale ( $r_s = -.41, p = .04$ , two-tailed). The BASC-2 parent-report of Emotional Self-Control and the BarOn EQ-i: YV Stress Management ( $r_s = -.60, p < .01$ , two-tailed) and Adaptability scales ( $r_s = -.40, p = .05$ , two-tailed) were also negatively correlated. It is important to note that on the Emotional Self-Control scale of the BASC-2, elevated scores correspond to more difficulties with controlling emotions.

**BASC-2 and MSCEIT-YRV.** In the group of adolescents with ASD, the MSCEIT-YRV Facilitating Thought scale was negatively correlated with the BASC-2 self-report of Social Stress ( $r_s = -.51, p = .01$ , two-tailed) and positively correlated with the BASC-2 self-report of Interpersonal Relations ( $r_s = .49, p = .01$ , two-tailed) and parent-report of Social Skills ( $r_s = .41, p = .04$ , two-tailed). In addition, there were significant negative correlations between the MSCEIT-YRV Managing Emotions scale and the BASC-2 parent-report of Developmental Social Disorders ( $r_s = -.40, p = .05$ , two-tailed) and Emotional Self-Control ( $r_s = -.57, p < .01$ , two-tailed). Significant positive correlations were also identified between the BASC-2 parent-report of Adaptability and the MSCEIT-YRV Understanding Emotions scale ( $r_s = .45, p = .03$ , two-tailed), Managing Emotions scale ( $r_s = .56, p < .01$ , two-tailed), and Total EI composite ( $r_s = .40, p = .05$ , two-tailed). In the control group, there were only significant negative correlations between the BASC-2 parent-report of Developmental Social Disorders and the MSCEIT-YRV Understanding Emotions scale ( $r_s = -.42, p = .04$ , two-tailed) and Total EI composite ( $r_s = -.41, p = .04$ , two-tailed).

### **Prediction of Social Outcomes**

Multiple regressions were used to explore the influence of trait and ability EI on the social outcomes of adolescents with and without ASD. The BarOn EQ-i: YV Total EQ and MSCEIT-YRV Total EI composite scores were used as predictors as they were uncorrelated with one another for each of the groups (ASD:  $r_s = .36, p = .08$ , two-tailed; Control:  $r_s = .13, p = .52$ ,

two-tailed) and produced the fewest independent variables necessary to predict the dependent variables (Tabachnick & Fidell, 2007). The regression models were computed for each group separately and then together with group membership added as a predictor to demonstrate that while EI may predict certain social outcomes, there are other factors, such as those related to having a diagnosis of ASD, that are important to consider when examining success in social situations. The dependent variables chosen for the multiple regressions included the BASC-2 self-report of Interpersonal Relations and Social Stress and parent-report of Social Skills, Adaptability, and Emotional Self-Control. Prior to computing the regression analyses, the absence of multicollinearity among the predictor variables was verified and the residuals were screened for outliers, normality, and homoscedasticity. Given the small sample size and the exploratory nature of this study, the standard multiple regression method was used to evaluate the influence of overall trait and ability EI on social outcomes.

The first regression model explored the influence of the adolescents' overall trait and ability EI on their self-reported Interpersonal Relations. A significant model emerged for the group of adolescents with ASD ( $F(2,22) = 6.75, p = .005$ ), the control group ( $F(2,22) = 4.67, p = .020$ ), and the two groups together with Group added as a predictor ( $F(3,46) = 12.26, p < .001$ ). This model explained 32.4% of the variance for the group of adolescents with ASD (Adjusted  $R^2 = .324$ ), 23.4% of the variance for the adolescents in the control group (Adjusted  $R^2 = .234$ ), and 40.8% of the variance for both groups together (Adjusted  $R^2 = .408$ ). BarOn EQ-i: YV Total EQ was the only significant predictor identified for both groups individually and together. Table 9 provides information about the predictor variables entered into this model.

Table 9

*Standardized Regression Coefficients for the Variables Predicting Interpersonal Relations*

Predictor Variables	ASD		Control		Combined	
	Beta	<i>p</i>	Beta	<i>p</i>	Beta	<i>p</i>

BarOn EQ-i: YV Total EQ	.459	.017*	.551	.006**	.462	< .001***
MSCEIT-YRV Total EI	.286	.123	-.040	.825	.197	.123
Group	-	-	-	-	.186	.141

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

The second regression model evaluated the influence of overall trait and ability EI on the adolescents' self-reported Social Stress. A significant model emerged for the control group ( $F(2,22) = 6.25, p = .007$ ) and the two groups combined ( $F(3,46) = 7.08, p = .001$ ), however, it was not significant for the adolescents with ASD ( $F(2,22) = 2.80, p = .082$ ). Among the adolescents in the control group, the model explained 30.4% of the variance in self-reported Social Stress (Adjusted  $R^2 = .304$ ), and when the two groups were combined and Group was added as a predictor, it explained 27.1% of the variance (Adjusted  $R^2 = .271$ ). In the control group and the two groups combined, only BarOn EQ-i: YV Total EQ was found to be a significant predictor. Information about the predictor variables is reported in Table 10.

Table 10

*Standardized Regression Coefficients for the Variables Predicting Social Stress*

Predictor Variables	ASD		Control		Combined	
	Beta	$p$	Beta	$p$	Beta	$p$
BarOn EQ-i: YV Total EQ	-.349	.098	-.607	.002**	-.427	.003***
MSCEIT-YRV Total EI	-.192	.352	.132	.452	-.092	.510
Group	-	-	-	-	-.174	.215

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

The third regression model was designed to assess the impact of EI on parent-reported Social Skills. This model was significant for the adolescents with ASD ( $F(2, 22) = 6.30, p = .007$ ) and explained 30.6% of the variance in parent-reported Social Skills (Adjusted  $R^2 = .306$ ). Only the variable representing overall trait EI, the BarOn EQ-i: YV Total EQ, was found to be a significant predictor for this group. The model was not significant for the adolescents in the control group ( $F(2, 22) = 3.29, p = .056$ ), however, it was significant for the two groups

combined ( $F(3, 46) = 32.21, p < .001$ ). When the groups were combined, the model was able to explain 65.6% of the variance in the outcome variable (Adjusted  $R^2 = .656$ ) and BarOn EQ-i: YV Total EQ and Group were found to be significant predictors. Table 11 includes information about the predictor variables entered in this model.

Table 11

*Standardized Regression Coefficients for the Variables Predicting Social Skills*

Predictor Variables	ASD		Control		Combined	
	Beta	<i>p</i>	Beta	<i>p</i>	Beta	<i>p</i>
BarOn EQ-i: YV Total EQ	.562	.005**	.399	.047*	.345	.001***
MSCEIT-YRV Total EI	.102	.577	.214	.271	.117	.228
Group	-	-	-	-	.567	< .001***

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

The fourth regression model examined the impact of trait and ability EI on parent-reported Adaptability. This model was significant for the adolescents in the control group ( $F(2,22) = 3.90, p = .035$ ) and predicted 19.5% of the variance in the outcome variable (Adjusted  $R^2 = .195$ ). For this group, the only significant predictor identified was the trait EI variable, the BarOn EQ-i: YV Total EQ. The model was also significant when the groups were together ( $F(3,46) = 29.39, p < .001$ ). In this combined version, the model predicted 63.5% of the variance in parent-reported Adaptability (Adjusted  $R^2 = .635$ ) and the ability EI variable, the MSCEIT-YRV Total EI, and Group were identified as significant predictors. The model was not significant for the group of adolescents with ASD ( $F(2,22) = 2.71, p = .089$ ). Information about the predictor variables is included in Table 12.

Table 12

*Standardized Regression Coefficients for the Variables Predicting Adaptability*

Predictor Variables	ASD		Control		Combined	
	Beta	<i>P</i>	Beta	<i>p</i>	Beta	<i>p</i>
BarOn EQ-i: YV Total EQ	-.134	.516	.458	.022*	.082	.396

MSCEIT-YRV Total EI	.471	.030*	.169	.372	.223	.028*
Group	-	-	-	-	.654	<.001***

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

The fifth regression model was designed to assess the influence of EI on parent-reported Emotional Self-Control. Though this model was not significant for the adolescents with ASD ( $F(2,22) = 1.38, p = .272$ ), it was significant for the adolescents in the control group ( $F(2,22) = 5.82, p = .009$ ). Among the adolescents in the control group, it predicted 28.6% of the variance in parent-reported Emotional Self-Control (Adjusted  $R^2 = .286$ ) and the trait EI variable, the BarOn EQ-i: YV, was the only significant predictor. The model was also significant when both groups were combined ( $F(3,46) = 14.03, p < .001$ ) and predicted 44.4% of the variance in the outcome variable (Adjusted  $R^2 = .444$ ). Only Group was a significant predictor in this form of the model. Table 13 includes information about the predictor variables for this model.

Table 13

*Standardized Regression Coefficients for the Variables Predicting Emotional Self-Control*

Predictor Variables	ASD		Control		Combined	
	Beta	$p$	Beta	$p$	Beta	$p$
BarOn EQ-i: YV Total EQ	-.139	.520	-.559	.004**	-.236	.051
MSCEIT-YRV Total EI	-.260	.235	-.118	.507	-.169	.171
Group	-	-	-	-	-.469	<.001***

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

## Discussion

Given that EI has been shown to, i) predict the social outcomes of adolescents without ASD, ii) be a better predictor of social outcomes than Theory of Mind and Executive Functions among young adults with AS, iii) improve with training, and iv) be well accepted in school settings, it is a construct that holds promise for explaining and possibly remediating some of the social skill deficits evidenced in adolescents with ASD. For this reason, the primary purposes of

this project were to explore whether EI manifests differently in adolescents with and without ASD and examine the degree to which the ability and trait models of EI predict the social outcomes of these populations.

As a whole, the results from this study demonstrated that adolescents with higher functioning forms of ASD display significant weaknesses on most components of ability and trait EI as well as on measures of self and parent-reported social outcomes. Evaluations of the predictive ability of EI for social outcomes revealed that for both groups, the trait EI composite score from the BarOn EQ-i: YV Total EQ was a better predictor of social outcomes than the ability EI composite score from the MSCEIT-YRV Total EI. In addition, the regression analyses demonstrated that there seem to be other factors working alongside EI or independently, that are important to consider for predicting the social outcomes of these groups. Further discussions of the findings from this study and their implications are included.

### **Group Differences in EI**

Prior to evaluating group differences in EI, the validity of the adolescents' responses was examined using the Positive Impression scale of the BarOn EQ-i: YV and Positive-Negative Bias scale of the MSCEIT-YRV. This analysis revealed that while the adolescents with ASD displayed response patterns similar to the normative population, the adolescents in the control group demonstrated a bias for providing more negative self-impressions along the scales of the BarOn EQ-i: YV as well as a tendency to endorse more positive emotions along the Perceiving Emotions subscale of the MSCEIT-YRV. As a result, though the mean scores of the control group were within the average range along all of the subscales included, analyses of the validity indices suggest that caution is warranted when interpreting results as they show some evidence of biased responding relative to the normative population. In contrast, for the adolescents with

ASD, these results provide further evidence of this population's ability to complete self-report assessments of emotions with accuracy (Hill, Berthoz, & Frith, 2004).

**Trait EI.** Trait EI refers to individuals' self-perceived capabilities and personality characteristics. On measures of this construct, the adolescents with ASD obtained a significantly lower overall score ( $U = 178.00, p = .009$ ), and self-reported significantly more difficulties in the areas of interpersonal skills ( $U = 159.50, p = .003$ ) and stress management ( $U = 131.50, p < .001$ ). These results are consistent with those from the social outcome measures indicating that the adolescents with ASD self-report significantly more social stress ( $U = 198.00, p = .026$ ) and poorer interpersonal relations ( $U = 155.50, p = .002$ ). The results also coincide with the social outcome measures completed by parents, which indicated that the adolescents with ASD display significantly weaker social skills ( $U = 41.00, p < .001$ ), adaptability ( $U = 26.50, p < .001$ ), and emotional self-control ( $U = 92.00, p < .001$ ). Studies addressing the interpersonal and stress management skills of youth with ASD also report that these areas of functioning present challenges for this group (Attwood, 2003; Myles, 2003; Scheeren, Koot, & Begeer, 2012; Wang & Spillane, 2009).

In contrast, the adolescents with ASD were not identified as significantly different from the adolescents in the control group on measures of self-reported intrapersonal skills ( $U = 250.00, p = .225$ ) and adaptability ( $U = 305.50, p = .892$ ). Interestingly, on both of these subscales, the mean scores obtained from the adolescents in the control group (Intrapersonal:  $M = 95.88, SD = 14.13$ ; Adaptability:  $M = 95.16, SD = 15.11$ ) were slightly lower than we would expect based on the norms for the BarOn EQ-i: YV representing adolescents between the ages of 13 to 18 years ( $M = 100, SD = 15$ ). As such, the groups were not identified as significantly different on these subscales because the adolescents in the control group self-reported slight struggles in these areas that were similar to those reported by the adolescents with ASD



(Intrapersonal:  $M = 90.72$ ,  $SD = 16.95$ ; Adaptability:  $M = 95.00$ ,  $SD = 18.86$ ). This may reflect particular characteristics of our sample of typical adolescents such as their age, bias for negative self-impressions, comfort with sharing feelings, and self-perceived competence. Further discussion of these factors is included below.

The items on the BarOn EQ-i: YV evaluating intrapersonal skills target adolescents' comfort with describing and telling others about their feelings. Lower scores along this subscale were anticipated for the adolescents with ASD as studies of individuals with AS and high functioning autism have reported that this population experiences difficulties with identifying, describing, and processing their emotions (Hill et al., 2004; Samson, Huber, & Gross, 2012). For the adolescents in the control group, however, reduced scores along this subscale were not anticipated. Given that the scores provided by this group on the BarOn EQ-i: YV were identified as showing a bias toward more negative self-impressions, it is possible that this unanticipated weakness is related to our sample's underestimation of their skills. Another possible reason for this unexpected result may be related to the tendency for youth to display a heightened sense of awareness of the potential consequences of sharing their feelings during this developmental period. For instance, Zeman, Cassano, Perry-Parrish, and Stegall (2006) note that, "adolescents' heightened awareness of the interpersonal consequences for a particular display of emotion and changing social relationships with parents versus peers influences their decisions to express certain emotions to particular individuals" (p.158). Moreover, in a study of emotional outcome expectations, adolescent boys reported that they anticipated feeling weird, uncomfortable, or as though they were wasting their time after talking about their problems or feelings (Rose et al., 2012). As a result, it is possible that some of the adolescents in the control group reported experiencing difficulties with talking about their feelings because they anticipate that doing so will result in feelings of unease or discomfort, that may accompany adolescence for many.

With regard to the adaptability subscale scores, items on the BarOn EQ-i: YV evaluating this aspect of trait EI pertain to being able to understand and answer difficult questions and think of different solutions to problems. While the lower subscale score reported for the adolescents with ASD is likely related to the inflexible and rigid thinking patterns characteristic of this population (Kleinhans, Akshoomoff, & Delis, 2005; Semrud-Clikeman, Fine, & Bledsoe, 2014), it is unclear why the adolescents in the control group also self-reported slight difficulties in this area. In fact, studies demonstrate that problem solving improves gradually in adolescence and that creative problem solving abilities are well developed by middle-adolescence (Anderson, Anderson, Northam, Jacobs, & Catroppa, 2001; Blows, 2003; Kleibeuker et al., 2013). Moreover, Kleibeuker et al. (2013) note that, “adolescents, relative to adults, have a tendency to recruit relevant prefrontal brain areas during creative problem solving and show activity patterns common to persons with high divergent thinking capacities” (p. 203-204). As such, consistent with the bias for negative self-impressions identified on the validity index of this measure, it appears that the weaknesses reported by the adolescents in the control on this subscale may represent an underestimation of their actual abilities as they were beyond the age marked by a spurt in problem solving abilities (i.e., 12 years; Anderson et al., 2001) and within the particular age range (13-17 years;  $M = 15.05$  years,  $SD = 1.47$ ) in which creative problem solving skills are said to be well-developed (i.e., 15-17 years; Kleibeuker et al., 2013). According to research pertaining to self-perceived competence, adolescents’ perceptions of their abilities are strongly impacted by others’ appraisals of their performance (Bellmore & Cillessen, 2006; Hergovich, Sirsch, & Felinger, 2004). Given these findings and the fact that the adolescents in our control group have likely received direct or indirect feedback about their ability to understand difficult questions and generate solutions to problems, one possible contributing factor to the adolescents’

self-perceived weaknesses in this area may be the messages they have received from teachers, parents, or peers.

**Ability EI.** The ability EI model encompasses emotion-related cognitive skills such as the ability to “reason using feelings and the capacity to enhance thought with feelings” (Mayer, et al., 2014, p.1). On measures of this model of EI, the adolescents with ASD obtained a significantly poorer overall Total EI composite score ( $U = 174.50, p = .007$ ) and displayed significant weaknesses on tasks evaluating their ability to understand ( $U = 207.50, p = .042$ ) and manage emotions ( $U = 170.00, p = .006$ ). These results were anticipated as previous research demonstrates that individuals with ASD experience difficulties with understanding complex feelings and what leads to various emotions as well as with identifying and using effective strategies for managing emotions (Bauminger, 2004; Bodner, Engelhardt, Minshew, & Williams, 2015; Mazefsky, Borue, Day, & Minshew, 2014; Samson, Hardan, Podell, Phillips, & Gross, 2015; Shamay-Tsoory, 2008). The difficulties with recognizing appropriate strategies for managing emotions identified on this performance-based measure are congruous with the parent-reported challenges with emotional self-control for this group, as evidenced in the significant correlation between these scales ( $r_s = -.57, p < .01$ ). These findings are also consistent with a recent study involving children with ASD that demonstrated that cognitive factors, namely, executive functioning skills, were able to explain most of the variability in emotion regulation (Jahromi, Bryce, & Swanson, 2013).

The results from our examination of the ability EI of adolescents also indicated that the adolescents with ASD were able to recognize emotions from signals in facial expressions as well as the adolescents in the control group ( $U = 300.50, p = .816$ ). Studies investigating emotion recognition skills in individuals with ASD have derived mixed results (Harms, Martin, & Wallace, 2010; Uljarevic & Hamilton, 2012). While numerous explanations for these

contradictory findings have been offered (Harms et al., 2010), some suggest that the degree of intensity of the emotions represented in the different facial recognition tasks could account for some of the variability in the results reported. For instance, Law Smith, Montagne, Perrett, Gill, and Gallagher (2010) found that deficits in emotion recognition among adolescents with ASD were only evident when lower intensity presentations of anger, disgust, and surprise were employed. Others have also noted that adolescents with ASD require more intense portrayals of emotions in facial expressions in order to accurately identify emotions (Greimel et al., 2010; Wallace et al., 2011). As a result, it is possible that the adolescents with ASD in our sample displayed a strong performance on the task evaluating their ability to perceive emotions because the facial expressions representing the six basic emotions presented on the MSCEIT-YRV were sufficiently intense to facilitate recognition. Other factors that may have facilitated emotion recognition on this particular task are the fact that the facial expressions presented were static rather than dynamic and that the adolescents were able to examine the faces for as long as necessary (Cassidy, Mitchell, Chapman, & Ropar, 2015).

Both adolescents in the control group and those in the ASD group were able to use emotions to facilitate thought ( $U = 220.00, p = .073$ ). The Facilitating Thought task of the MSCEIT-YRV measuring this skill consists of items in which youth must match sensory experiences such as colours, temperature, and speed, to emotions (Mayer et al., 2014). This task is said to determine whether youth are able to pair physiological signals with various emotions. Though this task derived one of the lowest mean scores relative to the remaining tasks of the MSCEIT-YRV for the adolescents with and without ASD (ASD:  $M = 96.08, SD = 12.18$ ; Control:  $M = 102.48, SD = 12.59$ ), the scores for both groups were within the average range. As such, despite the fact that this task is relatively novel and abstract, it appears as though our

groups of adolescents with and without ASD were equally able to relate emotions to other sensations and use them to improve thinking.

**Comparison of Results for Similar Groups: Adults with AS and Adolescents with ADHD.** As outlined previously, recent studies investigating ability and trait EI in adults with AS and adolescents with ADHD have revealed that both groups display intact ability EI and poor trait EI relative to their respective normative populations (Climie, 2012; Montgomery et al., 2010). While the weaknesses in trait EI identified in our sample of adolescents with ASD coincide with those reported for both adults with AS and adolescents with ADHD, the weaknesses in ability EI are inconsistent. In fact, when ability EI was measured in adults with AS, their scores were significantly higher than those reported for the norm group on the subscales measuring the ability to perceive, use, and understand emotions (Montgomery et al., 2010). These preliminary results from investigations of EI in ASD suggest that while trait EI is weaker relative to individuals without ASD and remains fairly stable over time, the development of the knowledge-based component of EI that encompasses the ability to reason and problem solve about emotions is slightly delayed, but attains a level that is similar to or better than the normative population in adulthood. With regard to developmental considerations and interventions, these findings suggest that it is possible to generate improvements in ability EI in individuals from this population. On the other hand, these results also imply that the improvements in the knowledge-based aspects of EI (ability EI) over time do not directly translate to improvements in performance (trait EI). This is not surprising given the relative independence of these EI models reported in the literature (O'Connor & Little, 2003; Van Rooy et al., 2005; Warwick & Nettlebeck, 2004). As such, when developing interventions targeting the EI of this population, it will be important to keep in mind that simply developing knowledge will not be sufficient – opportunities for applying knowledge and practicing skills will likely be

necessary to derive the best outcomes. Further evidence of the importance of such practices are evident in reports of evidence-based practices for youth with ASD which note that social skills interventions involving role-play, practice, and feedback, as well as naturalistic interventions that are implemented within everyday settings and routines meet the criteria for being evidence-based (Otero, Schatz, Merrill, & Bellini, 2015; Wong et al., 2014).

### **EI and Social Outcomes**

Prior to examining the ways in which EI predicts social outcomes for each of the groups, correlations were computed to explore the relationships among the variables. Results from this analysis revealed that while age was not associated with any of the variables included in the study, VIQ was associated with some aspects of EI. For instance, VIQ was related to the ability to perceive and understand emotions among adolescents with ASD, and to the ability to understand emotions and generate various solutions to problems among the adolescents in the control group. These significant relationships are concordant with previous findings demonstrating a relationship between verbal skills and components of EI among individuals with and without ASD and suggest that more sophisticated verbal reasoning skills lead to improvements in EI (Lopes et al., 2003; Montgomery et al., 2010; Rivers et al., 2012). As reported in previous studies and demonstrated in our sample, this relationship seems to be especially evident between VIQ and the Understanding Emotions subscale of the MSCEIT and MSCEIT-YRV. Verbal skills may be especially associated with this aspect of EI as it encompasses the ability to label emotions and includes items in which individuals must identify the most appropriate words for describing particular feelings (Mayer et al., 2014). The assessment of inter-correlations within the scales of the BarOn EQ-i: YV, MSCEIT-YRV, and BASC-2 revealed that most correlations were consistent with the inter-relationships reported in

their respective technical manuals. As such, the measures used in this study were appropriate for use with both the adolescents with and without ASD.

Regressions were computed to understand the impact of EI on social outcomes. In the group of adolescents with ASD, two of the models were significant and for both of these models, only the score representing the adolescents' overall trait EI was a significant predictor. More specifically, the overall trait EI score was able to predict 32.4% of the variance in self-reported interpersonal relations and 30.6% of the variance in parent-reported social skills. The overall ability EI score was not a significant predictor for any of the social outcomes measured and neither the overall trait nor the ability EI score was able to predict self-reported social stress or parent-reported adaptability and emotional self-control. Altogether, these results suggest that among adolescents with ASD, the trait EI model is a better predictor of self and parent-reported social skills than the ability EI model. The findings also indicate that EI only predicts a small subset of social outcomes for this group, namely, social skills.

Among the adolescents in the control group, four of the five models were significant, and similar to the adolescents with ASD, only the overall trait EI score was a significant predictor in each of these models. For this group, trait EI predicted 30.4% of the variance in self-reported social stress, 28.6% of the variance in parent-reported emotional self-control, 23.4% of the variance in self-reported interpersonal relations, and 19.5% of the variance in parent-reported adaptability. Neither of the EI models was able to predict parent-reported social skills and comparable to the results obtained for the adolescents with ASD, the overall ability EI score did not predict any of the social outcomes. These results are consistent with findings from previous studies reporting a relationship between trait EI and social outcomes among adolescents (Frederickson et al., 2012; Mavroveli et al., 2007), however, they do not coincide with the findings reported by Rivers et al. (2012), that demonstrate a relationship between ability EI and

social outcomes. This difference may have occurred because in the study by Rivers et al., participants were pre-adolescents between the ages of 9 and 11 years, and the social outcome scores were based on measures completed by the adolescents and their teachers, rather than their parents.

The regression models were also computed with the groups combined and group membership added as a predictor to examine whether other factors, related to having or not having a diagnosis of ASD, contribute to social outcomes. All of the models computed in this manner were significant. More specifically, overall trait EI predicted 40.8% of the variance in self-reported interpersonal relations and 27.1% of the variance in self-reported social stress, and group membership predicted 44.4% of the variance in parent-reported emotional self-control. Together, group membership and trait EI predicted 65.6% of the variance in parent-reported social skills, and group membership and ability EI predicted 63.5% of the variance in parent-reported adaptability. The fact that group membership was significant in three of the five models computed suggests that among adolescents, there are factors other than EI, and related to having or not having a diagnosis of ASD (e.g., presentation of symptoms/characteristic features, presence of comorbid disorders), that are important to consider when attempting to predict social outcomes. This is evident in the findings reported for each group separately, indicating that trait EI is a significant predictor of more social outcomes for the control group than for the group of adolescents with ASD. It is also important to note that the additional factors related to having or not having an ASD diagnosis seem to predict social outcomes alone (e.g., emotional self-control) or in combination with components of the overall trait (e.g., social skills) or ability (e.g., adaptability) EI models. Further research investigating what these factors are and how they interact with EI would be beneficial for informing the development of future interventions.

## **Implications**



The findings of this study hold implications for the development of interventions targeting the social-emotional skills of adolescents with and without ASD. First, evaluations of trait EI suggest that for both groups, components of this model were underdeveloped, indicating that it may be beneficial to develop interventions that target the areas of weakness identified. More specifically, while adolescents with ASD may benefit from interventions that address all areas of trait EI, with a particular focus on interpersonal and stress management skills, adolescents without ASD may benefit from interventions that emphasize developing the capacity to share feelings with others and generate solutions to problems. With regard to the ability EI model, the findings suggest that adolescents with ASD could use additional instruction on the meanings of emotions, what leads to certain emotions, the feelings that comprise complex emotions, and effective strategies for managing various emotional experiences.

The results from this project also show that among adolescents with ASD, trait EI is closely related to social skills. This is encouraging as it suggests that addressing the weaknesses in trait EI in this population could result in improvements in their social functioning. Among adolescents without ASD, studies demonstrate that trait EI can be improved through interventions (Qualter et al., 2007) and that interventions focusing on developing social-emotional skills related to trait EI (e.g., self-awareness, self-management, social awareness, relationship skills, responsible decision making) can lead to improvements in their ability to problem-solve, manage stress, and recognize emotions (Durlak et al., 2011). Given these findings reported for adolescents without ASD and that fewer investigations have examined how to address the particular social deficits of adolescents with ASD, the relationship between trait EI and social outcomes identified in this study provides a promising course of action for improving this population's success within the social realm.

The finding that one of the EI models was a better predictor of social outcomes for adolescents with ASD also has implications for the way in which interventions could be delivered to this group to derive the best outcomes. The reason for this is because the models are two separate constructs that are conceptualized differently, for instance, while the ability EI model is knowledge-based, the trait EI model focuses on self-perceived capabilities and reflection on performance. As such, it may be more important to select and implement interventions that provide opportunities for the application of EI through role-plays of social situations and frequent practice of stress management and interpersonal skills, in order to develop the adolescents' skills as well as their confidence in navigating social relationships. This is in contrast to offering interventions that simply involve providing instruction to build knowledge of emotions and appropriate social behaviours, as captured on ability EI measures. Providing opportunities for practice and the direct application of skills has been shown to be effective for developing the social skills of youth with ASD and is considered an evidence-based practice for working with this population (Wong et al., 2014). An additional evidence-based practice for this group that holds promise for promoting self-perceived capabilities and the generalization of skills is the implementation of naturalistic interventions that promote the development of skills within everyday contexts (Otero et al., 2015; Wong et al., 2014).

It is important to note that though ability EI was not found to be a significant predictor of the social outcomes measured in this study, it may still be valuable to address the weaknesses associated with this model of EI among adolescents with ASD, namely, the ability to understand emotions and identify strategies for managing them. The reason for this is because preliminary findings among typical youth using the MSCEIT-YRV suggest that weaknesses in ability EI are related to ratings of loneliness over time and that ability EI is a protective factor for both suicidal ideation and attempts (Cha & Nock, 2009; Wols et al., 2015). Of note is that in both of these

studies, adolescents' self-report of loneliness and the protective impact of ability EI were primarily related to, and driven by, the ability to understand and manage emotions, the two areas in which our group of adolescents with ASD displayed significant weaknesses relative to the control group. As such, while ability EI may not be an important predictor of social outcomes for adolescents with and without ASD, it may nevertheless be essential to address the areas of weakness related to this model of EI as they could have important implications for the mental health and wellness of these populations.

An additional avenue of intervention for adolescents with ASD that may be beneficial to explore further is the development of their knowledge and application of self-regulation strategies. This is evident in the results from our study indicating that youth with ASD display weaknesses in areas related to self-regulation, such as, emotional self-control, stress management, and the identification of appropriate strategies for managing emotions. Investigations of self-regulation in children and adolescents with ASD have noted weaknesses in this area (Laurent & Rubin, 2004; Samson et al., 2015) and have shown that there is a relationship between self-regulation and social outcomes within this population (Jahromi et al., 2013). A relationship between EI and the ability to self-regulate among typical adolescents has also been reported in the literature (Peters et al., 2009) and a moderate and significant correlation between the ability to identify strategies for managing emotions (ability EI) and parent-reported emotional self-control was noted in our study in the group of adolescents with ASD. Given that both self-regulation and EI appear to be related to social outcomes and to one another, the application of interventions targeting self-regulation in adolescents with ASD may result in improvements in both social skills and EI. Evidently, additional research is needed to investigate the nature of these relationships and whether providing interventions targeting self-regulation results in such improvements for this population.

**Limitations and Future Directions**

It is important to note that though this study was designed to inform the development of interventions, it did not involve a direct assessment of whether incorporating the findings reported in interventions results in improvements in the social outcomes of adolescents with ASD. In addition, given the exploratory nature of this study and its limitations, caution is warranted when interpreting the results. First, the challenges associated with recruiting adolescents from a clinical population such as ASD resulted in a slightly smaller sample size than anticipated, which limits the statistical power of the findings reported. Moreover, as a result of the smaller sample of participants recruited and the novelty of this area of study, we considered this project to be exploratory and did not apply error correction procedures to any of the analyses conducted. Though this facilitated the exploration of all possible relationships, it resulted in an increased likelihood of committing Type I errors. Second, though comorbid disorders are common among adolescents with ASD (Simonoff et al., 2008), 72% of the adolescents with ASD in our sample were also diagnosed with a form of ADHD. Though this prevalence rate exceeds the 28%-31% reported in some studies exploring the presentation of comorbid ADHD in this population (Leyfer et al., 2006; Simonoff et al., 2008), it is relatively similar to the parent-reported prevalence rates of 59-67% presented in other studies (Gadow, Devincent, Pomeroy, & Azizian, 2005; Kaat, Gadow, & Lecavalier, 2013). Nevertheless, given the large proportion of adolescents with both ASD and comorbid ADHD in our sample, caution should be exercised when considering the generalizability of the findings for adolescents with ASD who do not present with behaviours characteristic of ADHD. Third, the adolescents who participated in the project and their parents were self-referred. This introduces a selection bias and also has implications for the generalizability of the results. An additional factor that may limit the generalizability of the results is the fact that the adolescents in the control group

displayed a particular bias for providing responses indicative of more negative self-impressions on the BarOn EQ-i: YV as well as a tendency to rate faces as displaying more positive emotions than the norm group on the MSCEIT-YRV. It is also important to note that few teachers completed the social outcome measure. Though this does not impact the findings reported, obtaining a third perspective of social outcomes may have generated additional information that could have been valuable for developing interventions within school settings. Given the limitations outlined above, future research should seek to replicate the results from this project by taking into account its weaknesses and using a larger sample.

This study's preliminary findings suggest promising directions for future research. First, it may be beneficial to directly assess whether providing EI-based interventions results in improvements in the social outcomes of adolescents with ASD. Second, because the transition to adolescence appears to be a sensitive developmental period marked by increases in the risk for developing depression and anxiety for both adolescents with and without ASD and that preliminary findings show a relationship between EI and risk factors for depression and anxiety, it may be beneficial to further explore the ways in which EI relates to variables associated with mental health and wellness in these populations. Moreover, given the relationship between variables associated with EI and self-regulation and the findings demonstrating a relationship between self-regulation and social outcomes, it may be beneficial to explore the links among these variables and whether addressing the self-regulation of youth results in improvements in social functioning and EI.

## **Conclusions**

Social skill deficits constitute a core difficulty and primary risk factor for developing mental health conditions such as depression and anxiety among youth with ASD (Kuusikko et al., 2008; Mayes et al., 2011; Vickerstaff et al., 2007). The preliminary findings from this study

indicate that adolescents with ASD display particular weaknesses in ability and trait EI relative to adolescents without ASD that may be impeding their success in social situations. Given that trait EI appears to be related to the social functioning of adolescents with ASD, more research is needed to determine whether it is beneficial to incorporate opportunities for the development of aspects related to this model of EI in interventions for this group. Based on the results from this study, developing and assessing such interventions would help to address the specific needs of youth with ASD and may result in programs that are more effective in enhancing the self-confidence and interpersonal skills of this population in social situations.

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