

# **Asperger Syndrome and Emotional Intelligence**

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By  
Janine Montgomery

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## ABSTRACT

Individuals with Asperger syndrome (AS), an autism spectrum disorder, are characterized by average to superior intelligence while at the same time experiencing severe and pervasive deficits in social interaction. While many individuals with AS report that they keenly desire social relationships, the combination of repeated social failures and intelligence sufficient to appreciate these difficulties increases the risk for developing depression, anxiety, and other mental health concerns (Tantam, 1998; 2000).

Emotional intelligence (EI) is a construct that offers potential to understand individual emotional and social characteristics. The broad purpose of the two studies in this project was to examine ability and trait approaches to EI to understand if EI offers enriched understanding of social outcomes in AS. Further, this study explored EI, executive functions (EF), and theory of mind (ToM) to understand whether EI singularly or in combination with other theoretical explanations best accounts for social outcomes in individuals with AS.

The participants in this study were 25 young adults (aged 16-21) diagnosed with AS in Alberta and Manitoba. In study 1, trends and differences between AS and normative groups were examined. Further, correlation and multiple regression were employed to explore relationships amongst variables. Results indicated that trait EI was impaired for individuals with AS; however ability EI was intact. Regression analyses revealed that trait and ability EI together predicted 57% the variance for self-reported interpersonal skills and 31% of the variance for parent-reported social skills. Trait EI alone predicted 19% of the variance for self-reported social stress.

In study 2, EI, EF, and ToM were explored as predictors of social outcomes. Low correlations between EF and outcome variables precluded further analysis with this particular set of variables. Multiple regression procedures revealed that together ToM and trait EI predicted 33 % of the variance for self-reported Social Stress. The findings suggest that including ToM and EI measures in assessment protocols for individuals with AS provides important information to inform interventions.

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## DEDICATION

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## LIST OF ABBREVIATIONS

AS	Asperger's disorder /Asperger's syndrome
DSM	Diagnostic and Statistical Manual of Mental Disorders
EI	Emotional intelligence
EF	Executive functions
EDF	Executive dysfunction
fMRI	Functional Magnetic Resonance Imaging
HFA	High functioning autism
ICD	International Classification of Diseases
PDD	Pervasive developmental disorder
PDD-nos	Pervasive developmental disorder, not otherwise specified
ToM	Theory of mind

## CHAPTER 1

### *General Introduction and Overview*

Various hypotheses have been advanced to explain the social deficits experienced by individuals with Asperger syndrome (AS) or Asperger disorder. Amongst these, deficits in theory of mind (Baron-Cohen, O'Riordan, Stone, Jones, & Plaisted, 1999) and executive functions (Ozonoff, Pennington, & Rogers, 1991a) have predominated the literature. While both of these theoretical explanations offer some insight into the social difficulties in AS, neither fully accounts for the impaired social skills of individuals with AS (Bonli, 2005; Shamay-Tsoory, Tomer, Yaniv, & Aharon-Peretz, 2002). Emotional intelligence (EI) is an emerging construct that is gathering evidence and has been shown to be predictive of social outcomes in typically developing individuals (Lopes et al., 2004; Lopes, Salovey, Cote, & Beers, 2005; Summerfeldt, Kloosterman, Antony, & Parker, 2006), but has not yet been examined in individuals with AS. The purposes of the studies in this research project are to 1) examine emotional intelligence (EI) in individuals with AS and 2) to investigate deficits in EI as an alternative explanatory hypothesis for the social difficulties of individuals with AS.

#### *Background*

In 1944, the Viennese physician, Hans Asperger, described a group of children who were affected by a severe, but sometimes well-camouflaged social impairment (U. Frith, 1991) he termed 'autistic psychopathy'. While Asperger initially described the syndrome in 1944, it was not until 1981 that Lorna Wing's seminal work re-introduced Asperger syndrome (AS) to North American researchers and practitioners. Subsequently, a myriad of research on the topic has been conducted (Klin, Volkmar, & Sparrow, 2000). Since the inclusion of tentative diagnostic criteria for AS in both the Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association) and the International Classification of Diseases (ICD; World Health Association), there has been a reported increase in the clinical incidence of AS (Fombonne & Tidmarsh, 2003; Wing & Potter, 2002). Recent estimates of prevalence range widely from 2.5 per 10,000 children (Fombonne & Tidmarsh, 2003) to 36 per 10,000 children (Ehlers & Gillberg, 1993). Anecdotally, many believe that the number of actual cases is very difficult to

establish because of various issues in epidemiological studies. For example, differing diagnostic schemes are often used, making comparisons between studies difficult (Klin, Pauls, Schultz, & Volkmar, 2005b). Additionally, many individuals with AS are not diagnosed until later in life (Attwood, 2007; Barnard, Harvery, Porter, & Prior, 2001), and thus are likely missed in studies focusing on childhood prevalence.

In contemporary understanding, AS is characterized as one of the pervasive developmental disorders (PDD) or autism spectrum disorders (Wing, 1979). It is expressed through impairments in social interaction, communication, behaviour, and language (Wing, 1981a). While considered as one of the PDDs, AS is usually differentiated from 'classical' or Kanner's autism (U. Frith, 1991) or Autistic Disorder (AD) by the degree of cognitive impairment, the course of early speech development, (Wing, 1981a) and age of onset. In contrast to those with classical autism, individuals with AS have average to above average intelligence and their speech and language develops similarly to that of typical children in the first three years of life. Additionally, highly specialized skills and circumscribed interests (e.g. specialized knowledge about a specific and restricted topic) are often present in individuals with AS (Wing, 1981a).

While individuals with AS typically have average to superior intellect, they often have limited understanding of their own emotions and the emotions of others and demonstrate deficient skills in social contexts (Gillberg, 2000; Wing, 1981). Impaired social interaction skills are considered to be the primary deficit in AS. The desire to succeed in social contexts, combined with awareness of social difficulties and frequent negative reactions and/or avoidant behaviour of others has been linked to an increased likelihood of affective, anxiety, and conduct disorders (Ghaziuddin, Weidmer-Mikhail, & Ghaziuddin, 1998; Szatmari, Bartolucci, & Bremner, 1989; Tantam, 1988, 2000).

#### *Purpose of Dissertation*

The purposes of the studies were: 1) to investigate the use of emotional intelligence (EI) measures for individuals with AS, 2) to explore EI as it relates to and predicts social deficits experienced by individuals with AS, and 3) to explore the potential of EI, ToM, and EF either singularly or in combination to predict social outcomes. Given the social difficulties experienced by individuals within this group, it was anticipated that information about the EI of this group would reveal clinically and

educationally-relevant information to assist intervention planning. Despite increased interest and research in both AS and EI, no known research has been conducted that examines EI in individuals with autism spectrum disorders. The studies were primarily oriented to increase understanding of the social-emotional functioning of individuals with AS, through an examination of the utility of the emerging construct of EI for individuals with AS.

### *Review of the Literature*

#### *Asperger Disorder*

*Diagnostic criteria.* There have been various iterations of the diagnostic criteria, however, the current ‘gold standards’ for diagnosis are found in the *ICD-10* and *DSM-IV*. “Because *DSM-IV* and *ICD-10* contain similar criteria and differ only slightly in their descriptive text, individuals meeting criteria by one set of standards generally do by the other as well” (Miller & Ozonoff, 2000, p. 227).

Within the *ICD-10* (World Health Organization., 1992) and the *DSM-IV* (American Psychiatric Association & DSM-IV, 1994), AS is considered distinct from the other PDDs (autistic disorder, Rett disorder, childhood disintegrative disorder, and pervasive developmental disorder-not otherwise specified) and from schizophrenia. In both systems, individuals with AS are described as having significant and sustained impairment in social interactions and restricted, repetitive, and stereotyped patterns of behaviour, interests, and activities. For a diagnosis of AS to be considered, the aforementioned behaviours must occur within the context of normal development in the domains of language, cognition, self-help skills, adaptive behaviour, and curiosity about the environment in childhood (see Appendix A for diagnostic criteria).

Both “the *DSM-IV* and *ICD-10* require that the criteria for autistic disorder not be met at any point in development, thus precluding a diagnosis of AS in any individuals who meet or have ever met criteria for autistic disorder (the so-called ‘precedence rule’) (Eisenmajer & Prior, 1996; S. D. Mayes, Calhoun, & Crites, 2001; Miller & Ozonoff, 2000). However, this criterion has been criticized as making a diagnosis of AS “virtually impossible” (Mayes, Calhoun, & Crites, 2001, abstract) and difficult for clinicians to understand. The confusion and controversy has contributed to the common practice of modifying criteria for research and has fuelled research examining the sources of validity

evidence for AS as a distinct diagnostic category. To clarify operational definitions for AS groups, research inclusion criteria often follows suggestions of leading researchers in the field (see Szatmari et al., 2005, Wing, 2000). For example, some researchers suggest that clearly defining the group in question via explicit inclusion criteria will increase the likelihood that results can be compared to other studies (Wing, 2000). This and other suggestions to improve subject selection procedures will be discussed in the respective *methodology* sections for each study.

### *Validity*

A body of research has attempted to ascertain the validity of AS as a unique diagnostic entity (C. Gillberg, 1998; Klin & Volkmar, 2003; Klin, Volkmar, Sparrow, Cicchetti, & Rourke, 1995; Kurita, 1997; Miller & Ozonoff, 2000; Myhr, 1998; Ozonoff, Rogers, & Pennington, 1991a; Prior et al., 1998; Schopler, Mesibov, & Kunce, 1998; South, Ozonoff, & McMahon, 2005; Szatmari, 1992, 2000; Szatmari et al., 1989; Szatmari, Bryson, Boyle, Streiner, & Duku, 2003; Woodbury-Smith, Klin, & Volkmar, 2005). In the midst of this research, however, clinicians have persisted in diagnosing AS, often using idiosyncratic, uncertain, and non-standard criteria (Ghaziuddin, Tsai, & Ghaziuddin, 1992). As a result, there has been an increase in the incidence of AS, while at the same time, the criteria have been under review and are considered questionable by some (Prior et al., 1998). Consequently, some assert that research examining differences between disorders and using these definitions to classify research participants is methodologically flawed (Szatmari, 2005) and leaves us no further ahead in efforts to validate the disorder. There are, however, several approaches to addressing these definitional discrepancies in research with this particular group. Approaches to research design that address this issue are discussed in the respective *methodology* sections.

Validity may be defined as “a statistical relationship between the results of a particular procedure and characteristic of interest, that is, between a contrived procedure and other independently observed events”(Franzen, 2000). These relationships are commonly described in terms of content, criterion, concurrent, and construct validity (Anastasi, 1982), however, various additional terms appear in the research. Consequently, validity is a complex construct and the distinctions made between various ‘types’ of validity are often confusing and uncertain, if not complete contradictions

(McDonald, 1999). To illustrate the problem of competing and confusing terminology, one needs only to conduct a search of the literature on AS and autistic disorder. Studies purporting to examine the external, internal, and diagnostic validity of the construct abound (for examples, see Klin & Volkmar, 2003; Miller & Ozonoff, 2000; Szatmari, 2005). Furthermore, within studies, discussions of other ‘validities’ purporting to examine discriminant and convergent validity, face validity, and predictive validity (see Volkmar & Klin, 2000) are used as would be expected, while at other times, the meanings do not coincide with common usage in measurement texts, and thus add to the confusion in the field. Consequently, it is important to review these definitional/terminological issues as they pertain to the discussion of the validity of AS, and propose some operational definitions.

Historically, the measurement literature has documented various ‘types’ of evidence for validity; however, the current view is that construct validity is the over-riding or umbrella validity that encompasses all other validities, each of which is considered a procedure to provide evidence for construct validity (McDonald, 1999). As is the case in many fields, terminology may change, depending on the field of study it originates from and trends in research. For the purposes of these studies, construct validity will be viewed as the over-riding validity. While these studies were not intended to directly address issues of validation, the data generated may provide additional evidence that likely has implications for construct validation in the fields of AS and EI.

#### *Validity for the Diagnostic Category: Addressing the Tautology*

As mentioned previously, claims that strict adherence to diagnostic criteria make diagnosis of AS “virtually impossible” (Mayes, Calhoun, & Crites, 2001, abstract) contribute to the complexity of conducting research with this group. Further, the apparent tautology of using the same criteria to differentiate between groups and measure outcomes has led to the argument that research in this area consistently results in circular reasoning. The following section provides an overview of the issues that complicate the diagnosis of AS and outlines the some of the common problems inherent in existing research.

Historically, the validity of the diagnostic category for AS has been controversial. Diagnostic confusion and the similarity of AS with high functioning autism/autistic



disorder were evident as early as Wing's (1981a) work, which introduced the syndrome to the North American audience. As an example, in Wing's paper which was written prior to AS being officially included in the ICD or DSM, all of the cases she described had previously been diagnosed with high functioning autism (HFA), "but were now adolescents or young adults with good language skills" (Szatmari, 2005, p. 231). Others have asserted that Asperger's cases would not likely conform to the current AS criteria (Miller & Ozonoff, 1997). While there appears to be a general consensus that the absence of a speech delay in early years is the differentiating feature for AS and HFA (Szatmari, 2005), this has been a common source of controversy (Volkmar & Klin, 2005). Many argue that this criteria is arbitrary and that the two groups are not significantly different (Eisenmajer et al., 1998; S. D. Mayes et al., 2001; Ozonoff, Rogers, & Pennington, 1991b). Others note different outcomes (Szatmari, Archer, Fisman, & Streiner, 1995) and distinct neuropsychological profiles (Klin et al., 1995; A. J. Lincoln, Courchesne, Allen, Hanson, & Ene, 1998) for individuals without a language delay when compared to those with a language delay. Finally, information gathered through the DSM-IV trials indicated various differences between the HFA and AS groups (Volkmar, 1996). The search for evidence of the validity of the AS diagnostic category has been further complicated by the common use of modified versions of DSM-IV or ICD-10 criteria and by the adoption of differing diagnostic formulas outside of the accepted systems in research (see Attwood, 1998). Consequently, much of the existing research on AS is based on differing diagnostic criteria, which does not facilitate comparison across studies.

To provide external evidence for the validity of a taxonomy, fundamental 'candidate' features of a disorder need to be identified. These candidate features should relate to differences in outcome, aetiology, or response to intervention (Szatmari, 2005). Szatmari (2005) suggests that in the case of AS, "the fundamental characteristic is preserved structural language abilities" (Szatmari, 2005, p. 233) and that this accounts for differences in presentation and prognosis. However, when language ability is used as the differentiating feature, it is logical to expect that consistent differences would exist in the language domain (and domains heavily influenced by language development). Thus, to avoid circular reasoning and to provide evidence for the external validity of AS, differences need to be demonstrated in areas other than language if it is used as part of

the inclusion criteria (for example, motor skills, repetitive behaviours, circumscribed interests, etc). Consequently, it becomes important to examine outcomes in domains not directly related to language. To avoid tautological errors in these studies, the intact structural language criteria was retained (see Szatmari, 2005); however, EI was examined as a domain that is relatively distinct from language or verbal ability (Mayer, Salovey, & Caruso, 2004). Finally, while these studies were not designed to examine validity, the findings may have implications for clarifying the diagnostic dilemma in terms of divergence and/or convergence with EI.

### *Social-emotional Deficits in Asperger Syndrome*

The presence of social and emotional difficulties has been widely accepted as a hallmark of AS. In most systems of classification and in research, one of the primary features of AS is the failure to develop age-appropriate social skills, despite typically-developing cognitive and language skills (Barnhill, 2001; Gutstein & Whitney, 2002). Wing (1981b) summarized the social interaction difficulties of individuals with AS as including: an absence of reciprocal social interaction; difficulties understanding hidden or implicit rules of socialization; naïve and/or inappropriate social behaviours; and a lack of empathy. Various researchers have further outlined weaknesses in appreciating social cues and socially/emotionally inappropriate behaviours, difficulty behaving according to social conventions (Tantam, 1991), difficulty sensing feelings of others, detachment from the feelings of others, and avoidance of others or preference for being alone (Szatmari et al., 1989). Additionally, atypical cognitive styles and idiosyncratic behaviours likely contribute to the social-emotional difficulties individuals with AS experience with peers (Ehlers & Gillberg, 1993). Significant difficulties developing social competencies, despite an eagerness to connect with others, has been advanced to explain difficulties in interpersonal relationships and work environments (Tantam, 1991, 2000). Further, these difficulties have been hypothesized to influence the development of co-morbid conditions (Ghaziuddin et al., 1998; Tantam, 1988). Failure to connect socially has far-reaching implications for quality of life and long-term outcomes (Gutstein & Whitney, 2002; Shaked & Yirmiya, 2003; Szatmari, 2000). Severe and noticeable behavioural issues, increased probability of developing clinical depression (Ghaziuddin et al., 1998), and/or

anxiety and suicide ideation (C. L. Gillberg, 1992; Wing, 1981b) are also significant risks for those with AS.

### *Theories of Social-emotional Deficits in AS*

While it is widely acknowledged that deficits in social-interaction and social-emotional functioning reflect the core behavioural deficit in AS, some theorists suggest that deficiencies in cognitive processes are responsible for these difficulties. Deficits in theory of mind (ToM) (Baron-Cohen, Leslie, & Frith, 1985; Leslie, 1994) and executive dysfunction (Ozonoff, Pennington et al., 1991a) have been advanced as cognitive explanations for social deficits specific to autism spectrum disorders. In contrast, others have argued that emphasis on cognitive explanations overlooks the role of emotional experience in successful social interactions (see Gillberg, 1991; Dyck, Ferguson, & Shochet, 2001). Consequently, some alternate theoretical explanations implicate deficiencies in emotional processes or the combined effects of cognitive and emotional deficits to explain the socialization difficulties of those with AS. The following sections provide an overview of existing explanatory hypotheses for the social deficits in AS.

*Cognitive explanations.* ToM, sometimes called ‘mind-reading’ or ‘mentalizing’ (Baron-Cohen, 1995) is explained as the ability to recognize that others have thoughts, feelings, beliefs, and perceptions different from our own (Astington, Harris, & Olson, 1988; Happe & Frith, 1996). Individuals with AS have been hypothesized as having a deficit in ToM; however, most studies have only demonstrated that individuals within the broader classification of autistic disorder (including those with average or above average intelligence) have impairments in this area (Baron-Cohen et al., 1999; Happe & Frith, 1996; Leslie & Frith, 1987). Conflicting data from numerous studies suggest that, in contrast to individuals with autistic disorder (or high functioning autism), individuals with AS actually have intact ToM skills (Bowler, 1992; Ziatas, Durkin, & Pratt, 1998). However, the application of these skills in real-life social situations remains problematic for individuals with AS (Dissanayake & Macintosh, 2003). Some authors assert that ToM skills are indeed impaired in AS, but note that most ToM tasks have a ceiling at a developmental age of approximately 6 years. Consequently, adult measures of ‘advanced’ ToM have been developed (see Baron-Cohen, et al. 1997; Klin et al. 2000).

Disordered executive function (EF) or ‘executive dysfunction’ has been proposed to explain social deficits in individuals with AS who are able to pass ToM tasks (Ozonoff, Pennington et al., 1991a). EFs include specific cognitive skills such as planning, cognitive and behavioural flexibility, ability to inhibit a prepotent response, set-shifting or mental flexibility, and working memory. Difficulties with EFs have also been put forward as a causal hypothesis for the social difficulties of individuals with PDDs. However, while various EFs have been shown to be impaired in individuals with AS, a direct link has not been documented between social impairments common to PDDs and either EF or ToM (Dissanayake & Macintosh, 2003; Griffith, Pennington, Wehner, & Rogers, 1999). While neither ToM nor executive functions have been shown to account for significant variance in social interaction or repetitive behaviours, it appears that a pattern of neuropsychological strengths and weaknesses may impact social functioning (Joseph & Tager-Flusberg, 2004). However, no definitive neuropsychological pattern that is unique to individuals with PDDs has been identified at this time (Kleinmans, Akshoomoff, & Delis, 2005).

Frith (1989) hypothesized that weak central coherence accounts for the social difficulties of those with autism and PDD’s. In the theory of weak central coherence, a tendency to attend to parts, rather than to understand the ‘gestalt’ of a situation is hypothesized to lead to fractured understanding of social interactions. More recent refinements to this theory have proposed that weak central coherence and ToM deficits combine to account for the social difficulties of those with autism (Frith & Happe, 1996). However, there are mixed results in research examining this theory (see Mottron, Burack, Stauder, & Robaey, 1999; Plaisted, Swettenham, & Rees, 1999) and the neuropsychological profile associated with this theory has not been systematically examined (Tager-Flusberg, Joseph, & Folstein, 2001). Further, measures of weak central coherence are not widely available. Consequently, this model was not examined in these studies.

*Emotion-based explanations.* While Asperger himself noted a “dissonance of cognition and affect” (pg. 79, Frith, 1991) in the individuals with whom he worked, and many other researchers have documented difficulties in processing of emotion, few studies have definitively demonstrated the link between affective abilities and difficulties

in social interaction for those with AS. Gillberg (1991) classified autism, and consequently AS, as a disorder of empathy. He described the construct of empathy as “the ability to conceptualize other people’s inner worlds and reflect on their thoughts and feelings” (Gillberg, 1991, p. 835). While seemingly similar to the ToM view, in this approach ToM is seen as one of various skills that are prerequisites required for more complex empathic skills. In other words, an understanding that others have thoughts, beliefs, and feelings must precede an empathic response. To further understand the role of empathy in PDD subtypes, Dyck, Ferguson, and Shochet’s (2001) construct of empathic ability did differentiate AD, but not AS, from other clinical groups (Attention Deficit Hyperactivity Disorder, Mental Retardation, Anxiety Disorder). Empathic ability for this study was measured by the Emotional Recognition Scales (ERS) which is described to measure component abilities that contribute to empathy: recognition of facial expressions; understanding emotional consequences of situations; reasoning incongruous emotions; and understanding emotional vocabulary. When intelligence was included as a covariate, those with AS differed in empathic ability from the control group and an ‘Anxious’ group, but not from other clinical groups. However, the authors argued that a pattern of deficits demonstrated on cognitive, empathy, and ToM measures was most promising for the differentiation of AD from AS (Dyck, Ferguson, & Shochet, 2001).

*Combined explanations.* Some researchers propose that the social difficulties of those with AS are due to a complex combination of affective and cognitive deficits not accounted for by any single prevailing model (Shamay-Tsoory et al., 2002). In a similar spirit, Baron-Cohen and Wheelwright (Baron-Cohen & Wheelwright, 2004) assert that the construct of empathy does not belong purely in the affective domain but combines both cognitive and affective elements. ToM (Astington et al., 1988; Leslie, 1994), or ‘mind-reading’ (Baron-Cohen, 1995), is described as a cognitive approach to empathy. In contrast, the affective approach “defines empathy as an observer’s emotional response to the affective state of another” (Baron-Cohen & Wheelwright, 2004, p. 164) and includes matching the feeling of the observed individual or having other appropriate feelings (such as concern or compassion) in light of an observed individual’s experience. Intuitive empathy or intuitive mentalizing (Klin, et al, 2003) is considered as the automatic emotional response to an individual’s situation and is thought to be impaired in those

with AS. Intuitive empathy would thus be included as an affective component of the broader construct of empathizing skills. Although there is evidence to suggest that individuals with AS experience success on mentalizing tasks that can be solved with reasoning (i.e. many of the traditional laboratory ToM tasks), intuitive mentalizing remains problematic (Castelli, Frith, Happe, & Frith, 2002; Frith, 2004; Klin et al., 2000). In other words, when given time to process the cognitive aspects of ToM tasks, individuals with AS are generally successful. In contrast, performance in naturalistic situations (where responses need to be automatic) is still impaired for these individuals.

Various theories have been advanced to explain the social deficits of those with autism spectrum disorders, including AS. Lines of research examining deficits in executive function and ToM as explanations for the core deficits (social interaction) in individuals with autism spectrum disorders have dominated the literature (Tager-Flusberg et al., 2001). Despite the large body of literature investigating EFs and ToM, neither theory has been successfully supported as the definitive cause of social difficulties in AS. Although various measures of executive functions have been developed that may benefit the inquiry into social-emotional abilities in individuals with AS, ToM measures have proven problematic. Most existing and accepted ToM tasks provide little or no information about their psychometric properties. As such, it is difficult to be confident that tasks purporting to measure this construct are actually providing information about ToM. Consequently, it is important to examine other potential constructs that may enhance understanding, in light of the contributions of the two leading theories, using measures that have been demonstrated to be reliable and valid.

#### *Performance of Individuals with PDD in Emotional Domain*

Individuals with AS are often reported as displaying limited empathy (Baron-Cohen, 2003; C. L. Gillberg, 1992). Few studies, however, have examined empathetic abilities in specific subcategories of PDD in this area or in other aspects of emotional understanding and processing. Examinations of affective abilities within the broad PDD category have demonstrated atypical recognition and expression of emotion (Capps, Yirmiya, & Sigman, 1992; Macdonald et al., 1989), as well as deficits in the perception of facial emotion (Weeks & Hobson, 1987). Various researchers have also noted marked impairments in the ability to discriminate and/or integrate perceptions of facial, gestural,

and vocal emotional expression (Hobson, 1986a, 1986b; Njokiktjien et al., 2001), difficulties labelling emotions (Davies, Bishop, Manstead, & Tantam, 1994; Yirmiya, Sigman, Kasari, & Mundy, 1992), and an absence of empathic reaction to the stress of others (Sigman, Kasari, Kwon, & Yirmiya, 1992) in individuals with PDD. More recent work with fMRI has described qualitative differences in the way that those with AS process facial expressions (Grossman, Klin, Carter, & Volkmar, 2000); process information on emotionally-based tasks (Baron-Cohen et al., 1999; Critchley et al., 2000; Wang, Dapretto, Hariri, Sigman, & Bookheimer, 2004); and, integrate various skills related to emotional processing (Hall, Szechtman, & Nahmias, 2003). Although individuals with AS appear to cope adequately with emotional information in laboratory situations (Hobson, 1986b), natural environments pose difficulties because these same individuals struggle with the emotional aspects of social interactions (Dissanayake & Macintosh, 2003). Mixed findings on direct measures of empathy (Baron-Cohen & Wheelwright, 2004; Dyck et al., 2001) may mean there are factors other than poor empathy contributing to the social deficits of those with AS. Though difficulties in the domain of socialization have long been recognized, only recently have researchers argued for an explicit connection between socialization difficulties and impairments in emotional processing (Dyck et al., 2001; C. L. Gillberg, 1992; Tonge, Brereton, Gray, & Einfield, 1999).

#### *Limitations in Research of Asperger Syndrome and Social-emotional Deficits*

In light of the reported social difficulties of those with AS and the potential for developing co-morbid disorders, assessment of emotional competencies and processing skills may provide insight into the intervention needs of individuals with AS. Studies of the performance of individuals with AS on constructs related to social and emotional functioning have been conducted using various measures including: Student Social Attribution Scale (SAS: Bell & McCallum, 1995); Children's Depression Inventory (CDI: Kovaks, 1992); The Children's Attributional Style Questionnaire (CASQ: Seligman, et al., 1984) (see Barnhill, 2001); Social Skills Rating System (SSRS: Gresham & Elliot, 1990); Child Behavior Checklist (CBC: Achenbach, 1991); and, the Child and Adolescent Social Perception Measure (CASP: McGill Evans, et. al, 1995)(see Koning,

2001). However to date, no known studies have compared these measures to EI measures nor has EI been examined in individuals with AS.

While various researchers have explored the role of the dominant theories in understanding social impairment in PDDs, none have explored the emerging field of EI for its implications for this group. Additionally, much of the current literature has explored the dominant theories in the broader PDD population without differentiating between individuals on extreme ends of the ‘spectrum’ who likely have significantly different cognitive and/or language skills. Differences in these areas may significantly impact individual experiences and the way that deficits impact daily living. As such, it is important that the range of cognitive and language skills be clarified so as to promote a richer understanding of the factors that impact those with AS.

### *Emotional Intelligence*

Proponents of EI suggest that the construct facilitates an enhanced understanding of individual differences (beyond that accounted for by personality and intelligence) and may impact important theoretical outcomes, such as social skills and general quality of life (Austin, Saklofske, & Egan, 2005). Over the past two decades, theorists have generated several distinctive models of EI and two predominant approaches have emerged: ability and trait EI. The ability model formulated by Mayer et al. (1990; Mayer et al., 2000), and captured within the Mayer-Salovey-Caruso Emotional Intelligence Tests (e.g., MSCEIT; Mayer, Salovey, & Caruso, 2002a), defines EI as involving the abilities to: a) accurately perceive emotions in oneself and others; b) use emotions to facilitate thinking; c) understand emotional meanings; and d) manage emotions. In contrast, Bar-On (1998) proposed a trait approach to defining and assessing the emotional quotient (EQ). In the Bar-On EQ-i (Bar-On, 1997), EQ is operationalized according to the broad, yet interdependent, domains of intrapersonal skills, interpersonal skills, adaptability, stress management, and general mood. The notion that EI significantly impacts life outcomes and can be acquired through instruction has led educators, business, and indeed, the general public, to embrace EI as the solution to a myriad of problems. Increasingly, EI was viewed as a potential panacea for the many problems facing modern society, “promising profitability, cleanliness, and better immune responses” (McCrae, 2000, p. 264). While this claim is obviously an overstatement,



recent studies have found positive relationships between various measures of EI and the quality of an individual's social interactions (Lopes et al., 2004; Lopes et al., 2005; Summerfeldt et al., 2006). These findings support the importance of exploring EI in youth with AS, and ultimately its clinical utility in informing socially or affectively-mediated interventions (Lopes et al., in press; Lopes et al., 2003) and subsequently, may impact on long-term outcomes for those with AS.

### *Models of Emotional Intelligence*

*Ability EI.* Salovey and Mayer (1990) described EI as the “ability to monitor one’s own and others’ feelings and emotions, to discriminate among them, and to use the information to guide one’s thinking and actions” (p. 189). More recently, the construct has been revised and refers to a concept represented by a four-branch ability based model (Brackett, Lopes, et al., 2005) that includes “the ability to recognize the meanings of emotion and their relationships, and to reason and problem-solve on the basis of them” (Mayer, 1999, p.267). While the ability model correlates moderately with IQ and academic achievement (Brackett, Lopes, Ivcevic, Mayer, & Salovey, 2005; Brackett & Mayer, 2003; Mayer, Salovey, & Caruso, 2002b), it does not correlate highly with personality measures (Brackett & Mayer, 2003; Lopes, 2003). Mayer, Caruso and Salovey assert that the use of the term EI “stresses the concept of an intelligence that processes and benefits from emotions. From this perspective, EI is composed of mental abilities, skills, or capacities” (2000c, p.105).

*Trait EI.* Both Daniel Goleman (1995) and Reuven Bar-On (1997) advanced conceptualizations of EI that include non-cognitive competencies such as self-esteem, self-actualization, general mood, and general well-being. As would be expected, measures based on trait approaches to EI do not correlate highly with measures of intelligence; however, they strongly correlate with personality measures, leading some researchers to refer to this approach as EI-as-personality (Matthews, Zeidner, & Roberts, 2002a). Measures based on this approach generally rely on self-report (Brackett et al., 2005), and consequently, individuals with self-perception difficulties may have difficulty accurately rating themselves. However, recent research has demonstrated that individuals with AS are able to accurately self-report on both emotional regulation and symptoms of alexithymia (Aydemir, 2000; Berthoz & Hill, 2005), a disorder characterised by limited

ability to identify and verbally express feelings (Picardi, Toni, & Caroppo, 2005). Further, converging features have been demonstrated in AS and alexithymia (Berthoz et al., 2002; Gunter, Ghaziuddin, & Ellis, 2002; Jessimer & Markham, 1997; Schultz et al., 2000) and it appears that the two constructs overlap (Tani et al., 2004). For example, many individuals with AS report alexithymic symptoms (Tani et al., 2004) and both conditions are thought to impact the right hemisphere of the brain (Gunter, Ghaziuddin, & Ellis, 2002; Jessimer & Markham, 1997). Given the evidence that individuals can accurately self report symptoms of alexithymia, it is likely that individuals with AS will be able to accurately report on their own EI.

#### *Summary of Approaches to EI*

The two competing approaches to EI are very different, yet may offer unique and complimentary perspectives in understanding social outcomes for individuals with AS. The ability approach may offer insight into the cognitive skill set of those with AS, while the trait approach may reveal information about the self-perceptions of experience in social situations. Recent investigations have found that EI has incremental validity for psychological outcomes (Day, Therrien, & Carroll, 2005; Slaski & Cartwright, 2002), life satisfaction, loneliness, depression-proneness (Austin et al., 2005; Dawda & Hart, 2000; B. Palmer, Donaldson, & Stough, 2002; Saklofske, Austin, & Minski, 2003), and social network size (Austin et al., 2005). Further, low EI on the EQ-i has been associated with alcohol use, while low EI on the MSCEIT has been associated with social deviance (Brackett & Mayer, 2003). The implication is that poorly developed EI, from either perspective, results in negative outcomes while stronger EI results in positive outcomes.

#### *Summary and Critique*

While explanations for the social-emotional difficulties encountered by individuals with PDD have been provided by various researchers, the procedures for assessing these areas are often time consuming and inaccessible to many clinicians. Further, it appears that neither ToM nor executive dysfunction theories can wholly account for the social difficulties of individuals with AS. Moreover, neither approach has provided evidence that improving ToM or EF skills results in improved daily functioning or better social outcomes (Klin, 2000; Tager-Flusberg et al., 2001). Finally, neither

explanation adequately addresses the capabilities of those with higher-functioning PDDs, nor do they acknowledge the role of emotional experience in social interactions.

In practice, EI measures require little training, are relatively inexpensive, and are easy to administer. Recent research has provided evidence for the incremental validity and practical value of both models of EI. As mentioned, high ability EI has been correlated with successful social interactions (Lopes et al., 2004; Lopes et al., 2005), while low EI using either approach predicts poor social outcomes (Austin et al., 2005; Brackett & Mayer, 2003; Dawda & Hart, 2000). Given the difficulties individuals with AS seem to have in the aforementioned areas, it could be expected that they would also demonstrate low EI. If this is indeed the case, assessing EI may enhance current assessment practices for AS. Theoretically, using both types of EI measures would appear to provide a multidimensional approach to understanding EI that may subsequently impact intervention approaches. Further, assessment of EI may have practical implications for practitioners assessing and designing interventions for those with AS by providing information that is not available from assessing, for example, ToM or executive functioning.

### *The Studies*

The current work is divided into two consecutive studies intended to investigate EI in individuals with AS in relation to social outcomes and in light of competing explanations for the social deficits in AS. The same group of individuals participated in both studies and the procedures were part of a broader protocol for a larger study. While detailed procedures are outlined in each respective study, to provide the reader with the context, a brief introduction to each study and general elements common to the broader study are presented.

In Study 1, 25 youth (aged 16-21) with AS were invited to complete an ability-based (MSCEIT) and a trait (Bar-On EQ-i) measure of EI. The results from the sample were compared to the age corrected information for the norm group to understand whether this measure significantly discriminates individuals with AS from those in the normative group for each of the measures. Further, results on the two EI measures were compared to each other and to ratings on an outcome measure (Social Skills, Social

Stress, Interpersonal Skills, and Adaptive Composite of the Behaviour Assessment System for Children, 2<sup>nd</sup> Edition, BASC-2).

In Study 2, the same group of 25 youth as in Study 1 (aged 16-21) were requested to complete measures of ToM, EF, and EI to understand whether EI singularly, or in combination with other measures, best predicts social and adaptive outcomes for individuals with AS. The BASC-2 was used as an outcome measure, as it measures social and adaptive skills, and provides other interesting clinical information (depression, anxiety, atypicality, etc) that may be analyzed in future research.

For both studies, The BarOn EQ-i:S was chosen as the trait EI measure and the MSCEIT was selected as the ability EI measure.

Study 1:

The following research questions were addressed:

- a) Does trait EI (as measured by the Baron-EQ-i:S) and ability EI (as measured by the MSCEIT) differ in individuals with AS from typically developing individuals?
- b) Does ability or trait EI provide better information about social competence of individuals with AS?
- c) Does either the ability (as measured by the MSCEIT) or trait (as measured by the Baron-EQ-i:S) approach to EI predict social outcomes in individuals with AS?

Study 2:

The following research question was addressed:

- a) Does performance on measures of EI (Baron EQ-i:S and MSCEIT), ToM (Eyes Test-Revised), and/or EF (D-Kefs) singularly or in concert, best predict social outcomes for individuals with AS?

### *Participants*

The participants were 25 individuals (between the ages of 16 to 21) who were diagnosed with Asperger disorder (or Asperger syndrome). Additionally, where possible, parents and teachers/instructors of individual participants were invited to participate. Because finding a true random sample in a clinical group is difficult, if not impossible

(Endacott & Botti, 2005), accessibility sampling was used for this study. In accessibility sampling, the target population is defined (in this case, individual with AS between the ages of 16-21) and then important characteristics of that population are detailed. For this study, individuals with a diagnosis of AS were targeted to enable the best likelihood of being similar to prototypical cases of AS in this same age group. More specifically, the accessible population for this study included individuals from the communities in and around the research sites who responded to recruitment ads in various venues. The next step in accessibility sampling is to define the inclusion and exclusion criteria. This step is important to ensure that a homogenous sample is selected and that individuals with unique cases which may confound the research are excluded (see method sections for specific inclusion criteria for this study). Next, the type of sample to be drawn from the initial sample was selected. Because of the relative rarity of AS, a consecutive approach to sampling, where all available cases that meet inclusion criteria are included, was adopted. Consecutive sampling is different from convenience sampling in that all available cases are chosen from several sites, as opposed to convenience sampling where only easily accessible cases (perhaps in a clinic or school) are chosen (Endacott & Botti, 2005). For this particular study, efforts were made to recruit from a variety of organizations not just those that were easily accessed by the researcher. Given that consecutive sampling is a non-random approach to sampling, it is important to be aware of the limitations to generalizability that occurs when it is used. Further, one should highlight that like much of the research on PDDs, this study will not provide results that can be generalized to the entire population of individuals with AS.

The student researcher (at the University of Saskatchewan) was the primary contact for recruiting participants; however, the supervisors of this project also assisted in recruiting, particularly for the Alberta cohort. Further, graduate students with graduate level training in psycho-educational assessment and psychometric theory at the University of Calgary and the University of Manitoba were involved in data collection, analysis, and interpretation of various aspects of the wider study. The researcher directed clinical aspects of this study at the University of Manitoba. In Calgary, Drs. Vicki L. Schwean and Donald H. Saklofske directed the data collection.

Ethical approval for this study was obtained first from the University of Saskatchewan, where the lead student researcher was based. Once approval was issued at the University of Saskatchewan, proposals were submitted to and granted from the Universities of Calgary and Manitoba. Further, as per ethical guidelines, prior to any contact with parents, instructors, or participants, approval to advertise in school newsletters was obtained from the various education board representatives (i.e., Coordinators of Research) in Manitoba and Alberta School Divisions (see appendix D).

The participants were drawn from schools, mental health settings, university clinics, and service organizations for those with Pervasive Developmental Disorders in Alberta and Manitoba. In addition, media campaigns in Alberta and Manitoba helped to highlight the research project, which also resulted in inquiries about participation. Participants were recruited from the sites listed below through advertisements in local papers and community newsletters, posters placed in various service centres (e.g., Autism Services, private service centres, school run facilities), and by word of mouth.

*Alberta.* Participants were recruited by word of mouth and through posters and advertisements placed in various Centres of the University of Calgary including: University of Calgary Applied Psychological and Educational Services (UCAPES) and the Developmental Disabilities Resource Centre, as well as on bulletin boards around the university campus. Additionally, advertisements were placed in the newsletters Autism Calgary Association, and the Autism/Asperger's Friendship Society.

*Manitoba.* Participants were recruited by word of mouth and by posters at various locations at the University of Manitoba including: the Psychological Services Centre, Student Counselling, and Disability Services. Further, the Winnipeg Health Science Centre distributed brochures and posted advertisements for the study. Additionally, advertisements were placed in high school newsletters and in the newsletters of the Autism Society of Manitoba and Asperger Manitoba, Inc.

#### *Methods/Procedures*

*Inclusion Criteria.* Participants were required to meet the following criteria to participate in both studies:

- a. Participants must have received a diagnosis of Asperger disorder or Asperger syndrome from a medical doctor, psychologist, or psychiatrist licensed to practice

in the appropriate jurisdiction (see Participant Information Questionnaire: Appendix F).

- b. Verbal IQ (VIQ) - participants must attain a standard score of 85 or higher on the VIQ score on the Wechsler Abbreviated Scale of Intelligence (WASI).
- c. Language development- participants must not have experienced a language delay in early childhood (as ascertained on the Participant Information Questionnaire: Appendix F).
- d. Confirmation of Asperger Diagnosis- participants should achieve a classification within the low to very high ranges (standard score of 70 or higher) on the Krug Asperger Disorder Index (KADI).

*Main Study-Stages.*

1. Individuals who consented to participate and met the inclusion criteria were formally invited to participate in the study. Inclusion criteria were established after the initial consent to participate and through the collection of information from 1) the parent and 2) the youth/young adult. A researcher contacted the parents of minor participants, or directly contacted participants who were the age of majority, to schedule a mutually convenient time to administer tests involved in this study. In addition, the name of a teacher/instructor who had known the primary participant for at least six months was solicited. Permission to contact these individuals was part of the consent/assent for participation in this study (see Appendix A and B).
2. Parents of the primary participants were asked to complete the *Krug Asperger Disorder Index (KADI)*. In addition, they were asked to complete a researcher created Participant Information Questionnaire (see appendix F). These forms were completed away from the research site and returned to the researcher by mail. Researchers then used the information to determine whether the primary participant met criteria 1 and 3 of the inclusion criteria. If parents were not available to complete these forms, a close relative or partner was asked to act as a secondary source of information about the primary participant. If the participant met criteria 1 and 3, a testing time was scheduled and the parent and youth/adult were invited to the research site. Criterion 2 was then ascertained by

administering an intelligence test (see below for details). If criterion 2 was achieved, the parent was asked to complete the parent forms of the Behaviour Assessment System for Children, Second Edition (BASC-2). If preferred, the parents were permitted to complete this form away from the testing site and return it by mail to the researchers in the provided envelopes. The total time required for parents of primary participants was approximately one hour.

3. Primary participants were required to complete several measures including: *the Bar-On Emotional Quotient Inventory: Short Version (Bar-On EQ-i:S)*, the *Mayer-Salovey-Caruso Emotional Intelligence Test, (MSCEIT)*, selected subtests from the *Wechsler Abbreviated Scale of Intelligence (WASI)*, the 'Reading the Mind in the Eyes' or 'Eyes Test-Revised', selected subtests from the *Delis-Kaplin Executive Function System (D –Kefs)*, and a self-report of the *Behavior Assessment System for Children, Second Edition (BASC-2)*. In addition, collaborators in this research required the participants to complete additional measures for further studies that are not outlined in this project. The first measure administered was the WASI, which determined if the individual participants met criterion 2 (IQ of 85 or greater). Next, one of the self-report measures was administered to enable the clinician to concurrently score the WASI to see if the inclusion criterion was met. Those who did not meet criterion 2 were thanked for their participation, had their names entered in a draw for prizes, and were allowed to leave. For those who did meet the criterion, all other measures were administered in random order. The total testing time for these participants ranged from four to five hours. For individuals under the age of 18, parents were required to consent to the primary participant's involvement in this research project; however, youth assent was also required. Individuals between the ages of 18-21 were required to indicate their consent to participate in this study (See Appendices A and B for consent/assent forms). A clinician remained with the participant throughout testing, providing instruction when necessary and appropriate. Clinicians were required to read a script (see appendix F) introducing the testing procedures and inviting the participants to ask for breaks when needed. In addition, the clinicians were instructed to watch for signs of fatigue or stress and



offer a break if these conditions were noted. Standardized administration (as per assessment instrument manuals) was followed for test administration.

4. Teachers/ Instructors were requested to complete a rating scale for the primary participants: the *BASC-2 TRS*. Total time required to complete these forms was 15 minutes. These forms were completed off-site and placed in a signed, sealed envelope that was either mailed directly to the researcher, or was brought by the participant the day of their research session. In addition, teacher consent was obtained (See appendix I).

### *Significance*

No known studies have examined the relationship between EI and AS in a systematic manner using standardized instruments. It was anticipated that the knowledge gained from this study would provide information about how EI tests can be used for individuals with AS. Further, this study was expected to provide important information for intervention planning for individuals with AS. For example, if specific areas or patterns of deficits were found using the EI measures, interventions designed to target the particular areas noted to be deficient would be appropriate. Likewise, if there were areas of strength evident, these strengths may be utilized to design compensatory strategies for individuals with AS. Finally, this study was anticipated to provide information that may have import for supporting theoretical frameworks of EI.

### *Limitations*

The two studies outlined were limited to an examination of EI, ToM, EF and social outcomes for individuals with AS in Alberta and Manitoba who were between the ages of 16-21. Since AS is a relatively rare condition, the sample size in these studies was relatively small. Further, as mentioned in the section describing the participants, non-random procedures were used to assemble a sample for this study. Consequently, any information collected is applicable only to this age group in these two prairie provinces.

The Autism Diagnostic Interview-Revised (ADI-R) is often considered the ‘gold standard’ test (Lord & Corsello, 2005) in PDD research and is used in many studies to clarify diagnostic issues. However, this instrument is less appropriate for use with those who have AS (Cox et al., 1999; Mahoney et al., 1998; Yirmiya, Sigman, & Freeman, 1994). Further, while several independent studies have examined the instrument with

small samples and attest to the psychometric properties of the instrument (Constantino, Gruber, Davis, Hays, & Przybeck, 2004; Cuccaro et al., 2003; de Bilt, Sytema, Ketelaars, Mulder, & Volkmar, 2004), examination of the test manual reveals that the standardization sample for this instrument was unusually small (between 70-90 participants for 112 items). Alternate procedures for validating the diagnosis with AS groups are discussed in the respective methodology sections for each study. Because of concerns about specificity for diagnosing AS and time constraints, the ADI-R was not included in this study. Consequently, this study will not be directly comparable to research that employs this instrument.

Many studies of autistic disorder and related conditions such as AS compare performance of individuals to typically developing controls. However, much of the existing research does this with insufficient sample sizes. Further, many researchers have noted that individuals with AS often have uneven intellectual profiles. Consequently, it would be difficult, if not impossible to find controls who mirror the uneven intellectual performance without testing very large numbers (Motttron, 2004). Given these considerations, the scope of this project, and the time required for each individual to participate, it was not deemed feasible to incorporate the use of controls at this time.

While at least two measures of executive function and EI were included in the research protocol, only one ToM measure was included. Information on the psychometric properties of most ToM measures are absent, consequently, only the Eyes Test-Revised, for which there is some evidence for reliability and validity, was used in this study. In addition, several of the measures included in these studies are self-report forms. As such, there is a risk of error due to common method variance. While several safeguards were implemented to decrease the impact of this potential for error (see method sections in each study), it remains an important consideration for these studies.

Finally, factor analysis of performance on EI measures for this particular group was not conducted in these particular studies. Consequently, only correlational information about the factor structure for this particular group was generated in this study. However, the information required for factor analysis was generated in the course of this study. As such, future studies may indeed provide information about the factor structure of EI measures for this particular clinical group.

### *Organization of the Dissertation*

This dissertation follows the manuscript style. This approach has been used to enable the completion of two related studies that are prepared for submission to the relevant journals. It differs from the traditional thesis in that a broad introductory chapter is followed by two complete, stand-alone studies. Consequently, the chapter structure differs from traditional approaches. Chapter one provides an overview of the studies, the purpose, research questions, context, literature review, and methodological frameworks. In chapter two, Study 1 will be presented while Study 2 will be presented in Chapter 3. As required at the University of Saskatchewan, a brief rationale linking the two studies is provided between the two studies. Finally, Chapter 4 integrates the findings of both studies.

## CHAPTER 2

### *Study 1: Emotional Intelligence in Adolescents with Asperger Disorder: An Exploration of Performance on the MSCEIT and Bar-On EQ-i:S*

The construct of emotional intelligence (EI) has emerged to explain differences in the ways that individuals understand and use emotional information to successfully navigate the social world. There are two dominant approaches to explaining and measuring EI: ability versus trait (Bar-On, 1997; Goleman, 1995; 1998; Mayer, Salovey, Caruso, & Sitarenios, 2001). These approaches hold promise for providing information about social impairments (Leslie, 1994; Lopes et al., 2004; Lopes et al., 2005) that may impact interventions. Individuals with Asperger syndrome (AS), a pervasive developmental disorder (PDD) are described as having deficits in social interaction that may contribute to the development of serious co-morbid conditions. Given this potential, it is essential that clinicians fully understand the characteristics of AS so that they can assist in designing appropriate interventions. This study investigated the use of EI measures for individuals with AS to understand: 1) if EI measures are appropriate for this clinical group, and 2) if EI is indeed impaired in individuals with AS. Additionally, to understand how EI relates to actual social outcomes, EI was correlated with relevant subscales on a measure of adaptive and clinical behaviours (Behavior Assessment System for Children, Second Edition). The study was anticipated to have implications for an alternative hypothesis for social deficits in AS (see study 2) and provide information useful to interventions.

#### *Asperger Syndrome*

Asperger syndrome or Asperger disorder (AS) is a PDD characterized by impairments in social interaction, communication, and behaviour (Wing, 1981a). As is the case in other PDDs, such as pervasive developmental disorder-not otherwise specified (PDD-NOS) and high functioning autism (HFA), social interaction is thought to be the primary deficit and a great deal of research has been conducted in this area (U. Frith, 1991; Klin, 2000; Smith Myles, Barnhill, Hagiwara, Griswold, & Simpson, 2001; Sperry, 2005; Wing, 1981b). In contrast to those with other PDDs, individuals with AS exhibit

average or higher cognitive abilities (particularly verbal IQ) and intact structural language skills (Szatmari, 2005). Repeated failures in social situations combined with an awareness of social inadequacies facilitated by average or better verbal IQ (VIQ) are considered to contribute to the development of serious co-morbid conditions such as depression, anxiety, and conduct issues (Tantam, 1991) for individuals with AS. While various researchers have proposed explanations for the social deficits in AS and autism, two dominant hypotheses predominate the literature: theory of mind deficits and executive dysfunction.

Theory of mind or ToM (Premack & Woodruff, 1978) is described as the ability of an individual to infer the intentions, desires, thoughts, and beliefs of others to understand and predict behaviour. The ToM deficit hypothesis has been advanced by a number of researchers to explain the social deficits of those with autism and AS. Baron-Cohen (1985) and Leslie (1987; 1994) propose that deficits in ToM are a result of impairment in the development and functioning of a specialized cognitive mechanism. Deficits in ToM have been advanced to account for difficulties with pragmatics, absence of pretend play and imaginative activities, and lack of empathy (Baron-Cohen, 1988) in individuals with autism and AS. Further, deficits in ToM skills correlate with poor educational, vocational, social, and emotional outcomes (Ehlers & Gillberg, 1993; Ghaziuddin et al., 1998; Tantam, 2000).

Neuropsychological approaches have been used to explain social impairments in autism and AS. Executive dysfunction, or deficits in the cognitive processes that constitute executive functions (planning, cognitive and behavioural flexibility, ability to inhibit a prepotent response, set-shifting, and working memory) is one neuropsychological conceptualization that has surfaced in the AS literature to explain social deficits (Ozonoff, Pennington et al., 1991a). Proponents of this hypothesis suggest that executive dysfunction is the “main psychological cause of autism” (Bonli, 2005, p. 38) and indeed, similar behaviours are reported between autism and acquired prefrontal damage, which lends credence to this account. In this approach, ToM deficits are accounted for by dysfunction in processes of the executive system.

### *Limitations of Existing Hypothesis for Social-emotional Deficit in AS*

While the ToM and EF hypotheses have been proposed to account for the social difficulties of individuals with classical (lower than average IQ) autism, contradictory findings and methodological issues have made this explanation questionable for individuals with AS.

A common practice in research exploring this assertion is to group individuals with autism, HFA, AS, and PDD-NOS into one broad group. Given the diverse presentation of characteristics across PDD subtypes, adopting this approach is problematic (i.e, the resulting information does not necessarily apply to higher functioning individuals with autism and may attenuate findings). Moreover, the research literature emphasizes the heterogeneous nature of the PDD group (Klin, 2003; Szatmari, 2005) and highlights the influence of language and cognitive abilities in both developmental and social outcomes (Kasari & Rotheram-Fuller, 2005; Ozonoff et al., 1991b; Szatmari, 2005; Szatmari et al., 2003). Indeed, even within subgroups (PDD-NOS, AS, autism, and HFA), there is considerable heterogeneity. As a consequence of not clearly defining and separating subtypes, existing studies do not necessarily provide information that is relevant for those with average or above average intellect, as is the case in AS, HFA, and sometimes PDD-NOS.

With respect to the ToM hypotheses, those studies that have discriminated between PDD subtypes have found that individuals with AS are likely to perform significantly better than those with autism or HFA (Bowler, 1992; Dahlgren & Trillingsgaard, 1996b; Ziatas et al., 1998) and often perform similarly to those with nonverbal learning disabilities (NLD) (Klin et al., 1995; Rourke, 1989; Tsatsanis & Rourke, 2001), particularly on tasks of a cognitive nature. Further, many have criticized the ToM hypothesis for AS (Bowler, 1992; Dahlgren & Trillingsgaard, 1996b), arguing that language skills and/or cognitive abilities impact how well individuals perceive the mental states of others (Dahlgren, 2003; Eisenmajer & Prior, 1996; Fisher, 2005; Joseph & Tager-Flusberg, 2004; Kaland, 2002; Ozonoff et al., 1991b; Shamay-Tsoory et al., 2002; Szatmari, 2005; Szatmari et al., 2003). Moreover, while the ToM explanation for social deficits in AS is commonly cited in the clinical literature, several researchers have found that individuals with AS or high-functioning autism are able to pass first and

second order theory of mind tasks (Bowler, 1992; Happe, 1994; Happe & Frith, 1996; Ozonoff, Pennington et al., 1991a) and some individuals with autism have been observed to apply ToM skills in naturalistic situations (Eisenmajer & Prior, 1996). Others contend that the ToM hypothesis does not account for many behavioural symptoms (i.e., repetitive behaviours, restrictive interests, cognitive inflexibility, preoccupation with parts of objects, savant abilities, and rote memory strengths) in autism (Happe, 1997) and ToM deficits are not specific to PDDs (Dahlgren, 2003; Fisher, 2005). Consequently, it is apparent that while the ToM hypothesis is accepted by many, there are numerous problems with this theoretical framework as an explanation for social difficulties in those with AS.

Like the ToM hypothesis, the EDF approach also has many critics. Some researchers point to studies that demonstrate executive deficits are not specific to autism but have been implicated in various disorders including attention deficit hyperactivity disorder, fragile X syndrome, Parkinson's disease, schizophrenia, conduct disorder, and frontal lobe dementia (Diamond, Prevor, Callender, & Druin, 1991; Ozonoff, 1994, 1997; Ozonoff & Jensen, 1999; B. F. Pennington, 1996). Further, conflicting results have been found for executive deficits in AS and related conditions (Kleinmans et al., 2005; Lopez, Lincoln, Ozonoff, & Lai, 2005; Ozonoff & Jensen, 1999; Ozonoff, Strayer, McMahon, & Filloux, 1994). It appears that individuals with autism and AS differ only on planning and cognitive flexibility when compared to normal controls but not necessarily in other processes considered to be executive functions (Lopez et al., 2005). Further, Happe, Booth, Charlton, and Hughes (2006) found that individuals across the spectrum had less pronounced difficulties than did individuals with AD/HD. Studies such as these question the primacy of executive dysfunction as an explanatory hypothesis has not been established (Tager-Flusberg et al., 2001). Finally, recent fMRI studies have documented a dissociation between ToM and executive functions (Fine, Lumsden, & Blair, 2001). More specifically, in individuals with AS and left amygdala damage, deficits in ToM were found but EF was intact. In summary, neither the ToM or executive dysfunction hypotheses singularly accounts for the behavioural manifestations of those with autism, or more specifically, AS. Consequently, it is important to examine other constructs that may be helpful in understanding the strengths and difficulties of individuals with AS.

### *Emotional Intelligence and Social-emotional Functioning*

Two approaches to defining the EI construct are prevalent in the literature. The EI-as-ability (Petrides & Furnham, 2001) approach “stresses the concept of an intelligence that processes and benefits from emotions” (Mayer, Caruso & Salovey, 2000c, p. 105). In contrast, the trait, or EI-as-personality (Petrides & Furnham, 2001) approach views EI as a set of competencies in areas related to emotion including optimism, self awareness, self esteem, and self-actualization (Bar-On, 1997; Goleman, 1995; 1998; Mayer et al., 2001). Indeed, the ability model is often viewed more as cognitive approach to EI, while trait EI is regarded as more similar to personality (Petrides & Furnham, 2001). Weak correlations have been demonstrated between self-report trait measures and ability measures (for examples see: Brackett & Mayer, 2003), highlighting the assertion that the two approaches are distinct. The two approaches to conceptualizing EI have resulted in the development of distinct ways of measuring EI. Ability EI is usually measured using performance based tasks while trait EI is usually measured using self-report formats.

Both trait and ability EI have been demonstrated to relate to successful social interactions (Lopes et al., 2004; Lopes et al., 2005). Further, intact skills in emotion perception (as part of the EI construct as measured by both trait and ability measures) have been related to successful social adjustment (Engelberg & Sjoberg, 2004). Trait EI has been associated with social network size (Austin et al., 2005) while ability EI has been demonstrated to account for small, yet significant variance in life satisfaction (Ganon & Ranzijn, 2005a; B. R. Palmer & Stough, 2001). Consequently, evidence of a link between EI and social outcomes is accumulating.

In the trait approach, EI is considered “a dispositional tendency like personality which can be assessed by self-report questionnaire” (Austin, et al., 2005, p.548). While some have criticized that trait EI as relating too closely to personality to be seen as a unique construct (Matthews et al., 2002a), recent research has demonstrated that trait EI has incremental validity over personality to predict, life satisfaction, loneliness and depression-proneness (B. Palmer et al., 2002; Saklofske et al., 2003). Trait EI has been positively associated with life satisfaction, social network size and quality, and negatively associated with loneliness (Ciarrochi, Chan, & Bajgar, 2001; Dawda & Hart, 2000; B.



Palmer et al., 2002; Saklofske et al., 2003; Schutte et al., 1998b), alexithymia, (Dawda & Hart, 2000; Parker, Taylor, & Bagby, 2001; Schutte et al., 1998b), psychological distress (Slaski & Cartwright, 2002), and depression (Dawda & Hart, 2000; Schutte et al., 1998b). Additionally, factor analysis of trait EI revealed a distinct EI factor in both the Eysenck personality scales and the five-factor model scales (Petrides & Furnham, 2001). Consequently, it appears that tests of trait EI measure something above and beyond personality that may provide insight into interpersonal functioning.

Ability EI is considered to be a set of cognitive abilities, skills, or capacities that include: recognizing the meanings of emotion; recognizing the complex relationships between emotions; and reasoning and problem solving on the basis of this information (Mayer, Caruso, & Salovey, 1999, 2000). This form of EI is traditionally measured by performance-based tests but has also been measured using self-report formats (for example see Schutte et al., 1998). Ability EI has been demonstrated to be distinct from personality (Brackett & Mayer, 2003; Lopes, 2003) and predictive of social deviance (Brackett & Mayer, 2003). On a self report of ability EI, life satisfaction and feelings of powerlessness were correlated with strong job performance ratings and showed incremental validity over the Big Five Factors of Personality (Law, Wong, & Song, 2004). Further, ability EI has been positively correlated with self-reported empathy (Ciarrochi, Chan, & Caputi, 2000; Rubin, 1999; Sullivan, 1999), life satisfaction, and self-reported relationship quality (Ciarrochi et al., 2000). Consequently, it seems that this form of EI also holds promise for predicting important outcomes beyond traditional measures of personality of intelligence.

EI has not, however, been a universally accepted construct. Many assert that trait EI is not substantially different from personality (Matthews, Zeidner, & Roberts, 2002b). However, recent studies have demonstrated that both trait and ability EI predicts important outcomes above and beyond that predicted by personality measures (Brackett & Mayer, 2003; VanRooy & Viswesvaran, 2004). Others have questioned whether EI meets the criteria to be considered as an 'intelligence' (Austin & Saklofske, 2005). The authors of the MSCEIT, and ability test of EI, assert that their construct does indeed meet this criteria (Mayer, 1999). Further, the debate about which form of EI is legitimate has been contentious (for example, see Brackett & Mayer, 2003; Davies, Stankov, & Roberts,

1998, Matthews et al., 2002) and ongoing. While the aim of this study was not to prove that either approach is more valid than the other, it was expected to provide useful information about what clinicians can expect if using EI to assess individuals with AS. The purpose of this study was to explore the use of both forms of EI in youth with AS, a clinical condition that theoretically, would appear negatively associated with EI. Further, both cognitive and personality type approaches were anticipated to provide interesting and important information about the characteristics of individuals with AS. For example, personality approaches may provide insight about how individuals with AS feel they perform in social interactions, while the cognitive approach may provide information about individuals manage content and are able to reason in such situations. Further, it was anticipated that each measure would provide unique and clinically useful information about individuals with AS that relates to interventions, thus providing support for using EI measures in this specific clinical group. Finally, it was predicted that the results of this study would provide evidence that both forms of EI provide important information to enhance understanding of individuals with AS.

#### *The Study*

To address the limitations of existing explanatory hypotheses for the social deficits in individuals with AS, the present study explored the application of EI measures in this clinical group. Further, results for individuals with AS were examined to understand associations with adaptive and social outcomes (BASC-2).

#### *Research Questions*

1. Does EI in individuals with AS differ from that of typically developing individuals?
2. Does ability or trait EI provide better information about social competence and adaptive outcomes for individuals with AS?
3. Do ability or trait approaches to EI singularly or in combination have more utility for enhanced understanding of for youth with AS?

#### *Method*

##### *Participants*

Thirty-nine individuals were recruited from school and mental health settings in Manitoba and Alberta as part of a broader project examining autism spectrum disorders (AsD). Of the thirty-nine individuals recruited for the AsD study, twenty-five young

adults (aged 16-21 years,  $M = 18.2$ ,  $SD = 1.38$ ; 20 male, 5 female) met inclusion criteria and were invited to participate in this study. All participants were required to have an official diagnosis of AS conveyed by a medical doctor or psychologist. Further, to ensure individuals were not better characterized by another AsD diagnosis, a verbal intelligence quotient (VIQ) of  $\geq 85$  was required to participate in this study. To include participants with the range of characteristic of individuals with AS, those with co-existing conditions were not excluded from the study unless the condition interfered with their ability to complete tasks (e.g. one participant attended the clinic, but on arrival the parent reported this young adult also had selective mutism and the individual would not speak to the examiner). Further, to differentiate AS participants from individuals with HFA, those with parent-reported language delays assessed via a parent questionnaire (no single words by age 2, no phrases by 3) were excluded from this study. Individuals were also excluded if parents could not recall if their child met the aforementioned language milestones. Since diagnosis of AS is sometimes controversial and differing clinicians may interpret criteria in unique ways, it is necessary to use an external measure to confirm diagnostic status. Consequently, parents were asked to 1) document the onset of and quality of language development and 2) complete the *Krug Asperger Disorder Index* (KADI; Krug & Arick, 2003) to provide validation of the initial diagnosis. A KADI score  $\geq 70$  was considered sufficient validation of the participant's original diagnosis as 86% of AS participants in the standardization study scored at or above this threshold.

Of the thirty-nine participants originally recruited for this project, fourteen were excluded: three individuals were reported to have language delays before the age of three; four had a VIQ  $< 85$ ; two individuals had a diagnosis of high-functioning autism; one individual did not have their diagnosis issued by a medical doctor or psychologist; and four individuals received a KADI score of  $< 70$ . The characteristics of the sample are summarized in Table 1.1.

*Table 1.1. Participant Characteristics: Means (standard deviations)*

	<b>Males</b>	<b>Females</b>	<b>Total</b>	
	N = 20	N = 5	N = 25	
	Range			
Age	17.80 (1.2)	19.6 (1.1)	18.16 (1.4)	16-21
VIQ	115.5 (11.3)	108 (8.7)	114 (11.1)	89-135
KADI SS	92.10 (12.4)	103.2(10.7)	94.3(12.7)	75-118
Age at diagnosis	10.33 (3.9)	13.75 (2.9)	10.9 (3.9)	8.5-18.3

The mean VIQ score for the group was 114 ( $SD = 11.10$ ), while the mean KADI score was 94.3 ( $SD = 12.70$ ). According to parent reports, the mean age of diagnosis for participants was 10.9 ( $SD = 3.9$ ). Participant's initial diagnoses were reported to be conferred by paediatricians (n=1), physicians (n=1), psychiatrists (n=15), and psychologists (n = 7). Fifteen of the participants had been diagnosed with AS by more than one clinician. As mentioned previously, participants with co-existing conditions were not excluded from the study unless the condition interfered with their ability to complete tasks (e.g. selective mutism). Eight individuals reported no co-morbid psychological conditions while others reported one or more conditions as shown in Table 1.2. Three individuals reported that they also had medical conditions. These were: Asthma (n=1); Cerebral Palsy (n=1); and, Strabismus (n=1). One individual reported that he had a medical condition, but did not specify the nature of this condition.

*Table 1.2. Co-morbid Psychological Diagnoses Reported by Participant's Parent*

Psychological condition	Number of participants
None	8
Attention deficit hyperactivity disorder (AD/HD)	10
Anxiety	4
Depression	2
Obsessive compulsive disorder	2
Tourette's syndrome	1
Tic disorder	1
Giftedness	1
Learning disability	1
Nonverbal learning disability	1
Bipolar disorder	1
Dyspraxia	1
Unidentified condition	1

Finally, it is of interest to note that while this group of participants was self and parent referred, and thus a selection bias may be present, the demographic information for this particular group is similar to that reported for the AS population in general. For example, the male: female ratio is for this study is 4:1, similar to reported ratios in the most commonly cited epidemiological study presenting this information (Ehlers and Gillberg, 1993). In addition, co-morbidities for this particular group were high and similar to the estimates provided by many researchers (Ehlers et al., 1997; Ghaziuddin et al., 1998; Kim, Szatmari, Bryson, Streiner, & Wilson, 2000; Tantam, 1991). Finally, the age of diagnosis is similar to that reported for this particular group (Howlin & Asgharian, 1999).

### *Procedures*

Potential participants were sent a mail-out package to complete prior to being invited to participate in the study. Parents of potential participants completed various forms: the KADI (Krug & Arick, 2003), participant information questionnaire, and the BASC-2 (Reynolds & Kamphaus, 2004) to assist the research team in deciding the appropriateness of including their child in the study. Informed consent from parents for their own participation in the study was indicated at this time. If individuals met the initial inclusion criteria gathered through these forms (i.e., no history of language delay and a score on the KADI of 70 or higher) they were invited to attend the university to complete the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999) to establish whether they met the final criterion of obtaining a VIQ  $\geq 85$ . If this final criterion was satisfied, the individual was invited to participate in the study. This study was part of a tri-university initiative and as such, there were a number of additional tasks in related studies not described in this paper. Each participant spent 4-7 hours on site at the university lab, where they completed various clinician or computer administrated tasks. Some individuals completed the entire battery in one session, while others requested two shorter sessions.

Clinicians at the University of Calgary and the University of Manitoba administered the researcher-created demographic questionnaire, the Mayer-Salovey Caruso Emotional Intelligence Test (MSCEIT; Mayer et al., 2002a), the Bar-On Emotional Intelligence Quotient Inventory, Short Version (Bar-On EQ-i:S; Bar-On,

2002), the BASC-2, the KADI, and the WASI to participants and their parents where relevant. In addition, participants or their parents were asked to nominate a teacher or instructor who would be likely to accurately report on the participant’s personality and behaviour (in most cases, the teacher nominated had known the individual well for at least six months according to parent report). Teachers who were nominated provided informed consent to participate in this study and completed the teacher form of the BASC-2. They were asked to mail their form directly to the researcher.

*Measures*

Participants completed a battery of tests as part of a larger study funded by the Alberta Centre for Child, Family, and Community Research (ACCFRCR). A summary of measures included in this study is provided in Table 1.3. Complete information about the psychometric properties of each measure in this study is found in Appendix L.

*Table 1.3. Summary of Measures Required for Participants in Study 1.*

Participants	Measures	Approx. Time needed
Primary Participants (Asperger Syndrome)	Bar-On EQ-i:S	2 hours
	MSCEIT	
	BASC-2 (SRP)	
	WASI	
Parent/or other close relative	BASC-2 PRS	1 hour
	KADI	
	Participant Information Questionnaire	
Teachers/Instructors	BASC-2 TRS	15 minutes

*BarOn Emotional Quotient Inventory, Short form (BarOn EQ-i:S).* The BarOn EQ-i:S (Bar-On & Parker, 2000) is a self-report measure of EI designed for individuals aged 16 and older. The BarOn EQ-i:S is the brief version of the BarOn EQ-i (Bar-On, 1997), which was developed through extensive reviews of the literature on emotions and the clinical expertise of the author (Bar-On, 2004). The measure consists of 51 items and takes approximately 10-15 minutes to complete. It generates a total EI composite score and several subscale scores. The EQ-i:S employs a five-point likert rating system on which individuals rate themselves. Descriptors range from “very seldom or not true of me” to “very often true of me”. The reliability and validity evidence provided for this instrument are acceptable (See Appendix L for more information).

*The Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT).* The Mayer-Salovey-Caruso Emotional Intelligence Test (Mayer, Salovey, & Caruso, 2002a) is the updated version of the Multi-factor Emotional Intelligence Scale (MEIS; (Mayer, Caruso, & Salovey, 1998), an ability-based assessment of EI that is based on the four-branch model of EI. The information provided for this measure indicates the psychometric properties are good (see Appendix L for more information). The MSCEIT is a 141 item self-report that takes 30-45 minutes to administer. Items are provided in multiple choice format and the test is intended for use with individuals aged 17 or older (use for 16 year olds is allowed for in the manual). This measure yields a single overall performance score in addition to the two area scores for Emotional Experience and Emotional Reasoning. Scores reflecting each branch of the four-branch model are also reported. These branches respectively measure the ability to: 1) perceive emotions; 2) use emotions to facilitate thought; 3) understand emotions; and 4) manage emotions to foster personal growth and healthy social relations. The information provide about the psychometric properties of this measure indicate that it meets the standards of acceptability. Table L1 (Appendix L) provides an overview of the structure of the MSCEIT. Detailed information on the psychometric properties of this measure are also provided in Appendix L.

*The Behavior Assessment System for Children, Second Edition (BASC-2).* The BASC-2 (Reynolds & Kamphaus, 2004) is a multi-dimensional inventory of behaviour and self-perceptions for individuals aged 2 to 25 years. Three types of rating forms are available to provide multi-source information about the behaviour and emotional functioning of children and youth in various contexts: Teacher Rating Scales (TRS), Parent Rating Scales (PRS), and Self-Report Scales (SRP). Three forms are available: Preschool (age 2 through 5), Child (6 through 11), and Adolescent (12 through 21). Scores for all forms are reported in terms of *t* scores ( $M = 50$ ,  $SD = 10$ ). The BASC-2 possesses excellent psychometric properties

*The Wechsler Abbreviated Scale of Intelligence (WASI).* The Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999) is an individually administered intelligence test. The abbreviated form is a quick measure of intelligence that is linked to the Wechsler Intelligence Scale for Children, Third Edition (WISC-III; Wechsler, 1991) and the Wechsler Adult Intelligence Scale, Third Edition (WAIS-III;

Wechsler, 1997). It is appropriate for assessing the general intellectual ability of adults or children (aged 8-89). It can be used to generate either a full scale IQ consisting of information gathered from four subtests (FSIQ-4) or a quicker two-subtest form (FSIQ-2). The individual's performance on these measures can be summarized by the conversion of scores into three composite scores: Full scale IQ's, Verbal IQ, and Performance IQ. This test takes 15 minutes to administer in the two-subtest form, and 30 minutes in the four-subtest form. For this study, only the verbal subtests were administered to generate a verbal IQ score. The psychometric properties of this instrument are considered to be excellent.

*Krug Asperger Disorder Index (KADI)*. The KADI (Krug & Arick, 2003) appears to be the most reliable and valid screen for identifying individuals with AS (Campbell, 2005). The KADI is a clinician-administered report designed to collect information on individuals aged 6 to 21 years, 11 months. The KADI is a norm-referenced, 32 item test which requires 5 to 10 minutes of administration time. Ratings of behaviours are to be completed by close friends, parents, or relatives of the individual in question.

#### *Analysis*

Data analysis was conducted using SPSS Version 15A (SPSS, 2004). Both descriptive and inferential information was generated. Descriptive statistics, such as means and standard deviations, were used to enable statistical interpretation and to examine distributions for this group. Single-sample t-tests were used to compare students to normative data for the Bar-On EQ-i:S, the MSCEIT, and the BASC-2. Further, Pearson's Product Moment correlations were conducted to identify significant relationships between age, IQ, EI composites, EI subscales and branches, and BASC-2 scales. This step was conducted to determine whether age and IQ should be entered as covariates in subsequent statistical procedures. A validity check was conducted by examining the values for reliability and validity in comparison to information provided in the test manuals for normal populations. Finally, theoretical and statistical information was used to establish a model to examine prediction of social outcomes. Given the relatively small sample size, analysis for this study is considered to be exploratory. In this case, any findings are considered preliminary and future studies should include larger sample sizes to address this issue.



### *Descriptive Analysis*

As mentioned previously, 5 females and 20 males participated in his study. In the AS literature, the ratio of boys: girls for autism spectrum disorders is commonly reported as 4:1 (Ehlers & Gillberg, 1993). However, in the Asperger group, the ratio is thought to be approximately 10:1 (Fombonne & Tidmarsh, 2003). This has led many to speculate that girls are actually under diagnosed in this population (see Attwood, 1999; Kopp & Gillberg, 1992). If this is indeed true, then the available population estimates may be underestimates of actual prevalence rates, as they likely do not include many girls who meet diagnostic criteria. The ratio of males to females in this study (4:1) is similar to previously cited estimates. However, it is important to be aware that two female participants did not meet inclusion criteria because their KADI scores were below the cut-off for this study.

An independent sample t-test was conducted to determine if females varied significantly from males in their performance on variables in this study. Only one variable, the MSCEIT Understanding Emotions Branch Score, was found to have unequal variances for males and females. For this particular branch, males scored higher than females (male  $m = 122.58$ ; female  $m = 112.67$ ). The mean difference for conditions was -9.90 and the 95% confidence interval for the corrected estimated population mean difference was between -39.55 and 19.75. The effect size was medium ( $d = .70$ ); however, an independent t-test showed that the difference between the conditions was not significant,  $t_{(24)} = 1.07, p = .50$ ). While results for this particular variable demonstrate that males performed better at understanding emotions than females with AS, performance in this area was significantly better than predicted (for both males and females) rather than being impaired as expected. Consequently, no steps were taken to prepare this variable for further analysis.

### *Results*

#### *Data Screening*

All data entry was checked by two researchers simultaneously to ensure all values were entered correctly. Any data that was missing at this point and was available was

subsequently entered by both researchers. All data was then rechecked by the two researchers.

### *Missing Data*

Some data were missing because they had not been completed by participants or parents. As part of the informed consent procedures, participants were free to decline completion of particular tasks if they chose. Consequently, this data was not provided, nor was it pursued in any way. This was relevant only for one parent report form and for several teacher reports. In the case of parent report forms, one parent chose not to complete the BASC-2 because of time constraints. In the case of teacher reports, 12 participants did not nominate a teacher to contact for this information or the teacher chose not to participate. Because of the age range of participants, (16-21.11 years) it is understandable that only a small number of teacher forms were completed, as many participants were not in a formal educational or training environment at the time of participation. This issue is not a concern for this study as teacher reports are used as additional and peripheral information and are not central to the study.

### *Distributions*

Distributions were examined for normality and the presence of outliers. Skewness and kurtosis values were examined to determine if the distributions were sufficiently normal. Skewness is a measure of the symmetry of the distribution, and kurtosis is a measure of the peakedness of the distribution (Tabachnik & Fidell, 2001). The skewness and kurtosis values for the relevant distributions are presented in Table 1.6.

*Table 1.6. Skewness and Kurtosis Values*

Measure	Skewness	Kurtosis
1) WASI VIQ score	-.116	-.129
2) Krug Asperger Disorder Index Composite	.344	-.823
3) BarOn EQ-i:S Total EQ score	.160	-.693
4) MSCEIT Total EI score	.076	-.923
5) BASC-2 SRP (Intrapersonal)	-1.446 (.544)	4.494 (-.305)
6) BASC-2 SRP (Social Stress)	1.473 (.178)	3.089(.019)
7) BASC-2 PRS (Social Skills)	1.010	.184
8) BASC-2 PRS (Adaptive Comp.)	.881	-.203
9) BASC-2 TRS (Social Skills)	.983	1.151
10) BASC-2 TRS (Adaptive Comp.)	.878	.958

If a distribution is perfectly normal, skewness and kurtosis values would be zero (George & Mallery, 2003; Tabachnick & Fidell, 2007). Skewness and kurtosis values falling between  $\pm 1$  are categorized as excellent. Values between  $\pm 2$  are considered acceptable (George & Mallery, 2003). As can be seen in Table 1.6, the majority of distributions had excellent skewness and kurtosis values, suggesting these distributions were sufficiently normal. However, the distributions of scores on the BASC-2 SRP Interpersonal and Social Stress subscales had moderate positive values, suggesting the distributions were slightly peaked. As suggested by Tabachnik and Fidell (2007), an examination of the distributions for outliers followed by replacing outliers with the mean group score will often produce a more normal distribution. This was indeed the case when the outliers (which were each more than 2 standard deviations from the group mean) were replaced. Only one outlier was replaced for each of the scales. The new values upon replacement of the outliers are provided in parenthesis beside the original

values and are considered excellent values. Consequently, all subsequent procedures were completed with this revised data set.

#### *Comparison of EI performance to Normative Data*

With the exception of the Inconsistency Index for the Baron-EQ-i:S, scales, subscales, and branch scores for the MSCEIT and the Bar-On EQ-i:S are based on a mean score of 100 and a standard deviation of 15. The Inconsistency Index for the Bar-On EQ-i:S provides only raw scores with a cut score. Values for this scale were examined and two individual met the cut score of 12, while one individual scored 13.

Consequently, it is important to consider this information when examining the results. To understand if removing these three cases significantly impacted results, results were examined with and without the cases meeting and exceeding the suggested cut-off. Means and standard deviations for the BarOn EQ-i:S changed only slightly when this procedure was conducted. Consequently, the three participants were retained to protect the sample size for the study.

To determine if the Asperger group differed significantly from the typical populations on which these measures were normed, a single subject t-test (two-tailed) was conducted. Two-tailed tests were chosen throughout this study as EI has not been investigated with this population to this point. Consequently, it is most appropriate to test for differences in both directions, as opposed to only testing for lower than expected values.

A comparison of means between the AS group in this study and the normative groups for the standardization sample for the MSCEIT and BarOn-EQ-i:S was conducted. It was predicted that results on EI measures would be lower than the norm group for individuals with AS, as this group is characterized by difficulties in various areas thought to contribute to EI. The mean scores, mean differences, and significance levels are shown in Table 1.7.

Table 1.7. Single Sample Comparisons of EI for AS Group and Normative Group

Measure	Asperger Group		
	Mean score	mean diff.	Sig.(two-tailed)
<b>MSCEIT Total EIQ</b>	103.43	3.43	.23
Perceiving	109.18	9.18	.04
Using	107.70	7.70	.02
Understanding	120.60	20.60	.001
Managing	98.03	-1.97	.45
<b>Positive-Negative Bias</b>	96.37	-3.63	.33
<b>BarOn EQ-i:S Total EQ</b>	87.12	-12.88	.001
<b>Positive Impression</b>	107.00	7.00	.02
Intrapersonal	89.60	-10.40	.006
Interpersonal	89.16	-10.84	.001
Stress Management	91.40	-8.60	.04
Adaptability	94.64	-5.36	.13
General Mood	86.28	-13.72	.001

### MSCEIT

The Positive Negative Bias subscale is a validity index used to establish the fake-good or fake-bad tendencies of individuals completing the measure. Comparable performance to the norm group for this particular scale provides some evidence that the MSCEIT is valid for use with this particular population and that the interpretation of group performance on the scales is appropriate. Surprisingly, performance for the AS group on the MSCEIT total EIQ was not significantly different from that of the norm group,  $t_{(24)} = 1.24$ ;  $p = .23$  (two-tailed). However, an examination of results on the subscales and branches generated interesting information. Significantly better performance was demonstrated on the branch measuring Perceiving Emotions  $t_{(24)} = 2.21$ ,  $p = .04$ , (two-tailed) and Using Emotions  $t_{(24)} = 2.53$ ,  $p = .02$  (two-tailed). A highly significant difference was observed on the Understanding Emotions branch, where the AS group scored approximately 20 points higher than normally developing individuals  $t_{(24)} = 3.63$ ,  $p = .001$  (two-tailed). Scores on the Managing Emotions branch were not significantly different from the norm group.

*BarOn EQ-i:S*

Examination of performance on the BarOn-EQ-i:S revealed the expected pattern of performance. That is, individuals with AS performed significantly worse on this measure than did the normative group (Total EQ,  $t_{(24)} = -4.17$ ;  $p = .001$ , two-tailed). A caution should be issued, however, as the validity index (Positive Impression) on this measure resulted in significantly different scores than the normative group  $t_{(24)} = 2.57$ ;  $p = .02$  (two-tailed). However, it should be noted that the mean score for the group was within the acceptable range ( $M = 107$ ; within one standard deviation from the mean) provided for this measure in the user's manual (Bar-On, 1997). Further, while results indicated that the AS group tended to report more positively than negatively about their own EI, scores for all other subscales and the composite EI score were all lower to than the mean score for the normative group, as shown in Table 5. Consequently, the values provided may actually underestimate the extent of difficulties. The analysis revealed that the AS group had significantly lower scores than the normative group on the Intrapersonal  $t_{(24)} = -3.03$ ;  $p = .006$  (two-tailed), Interpersonal  $t_{(24)} = -3.79$ ,  $p = .001$  (two-tailed), Stress Management  $t_{(24)} = -2.22$ ,  $p = .04$  (two-tailed), and General Mood scales  $t_{(24)} = -3.81$ ,  $p = .001$  (two-tailed).

Scales for the BASC-2 are reported as  $t$  scores with a mean of 50 and a standard deviation of 10. To examine performance of the AS group relative to the normative group for the BASC-2, single subject  $t$ -tests were conducted.

*Table 1.8. Single Sample Comparisons of Social Outcomes on the BASC-2 for AS Group and Normative Group*

Measure	Asperger Group		
	Mean score	mean diff.	Sig.(two-tailed)
<b>BASC-2 Subscales</b>			
Social Stress (SRP)	52.60	2.60	.15
Interpersonal relations (SRP)	47.72	-2.28	.12
Adaptive Composite (PRS)	43.17	-6.83	.002
Social Skills (PRS)	42.46	-7.54	.004
Adaptive Composite (TRS)	47.15	-2.85	.18
Social Skills (TRS)	46.69	-3.31	.15

As shown in Table 1.8, the comparison of AS scores to scores for the normative group revealed no significant difference for Social Stress (SRP) or Interpersonal Relations (SRP). However, an extreme outlier (which would have indicated more severe problems and would have further decreased the value if retained) was removed from each of these scales to create a normal distribution for this scale.

In contrast, on the parent scales of the BASC-2 both the Adaptive Composite and the Social Skills scale were significantly different from the normative group, supporting the hypothesis that individuals with AS have significantly poorer social outcomes than normative groups. Finally, teacher reports did not result in statistically significant scores for either the Social Skills scale or the Adaptive Composite. This result might have been impacted by the relatively small number of participants for whom a teacher report was completed. Additionally, subsequent analysis found that the older the participant, the higher teacher reported Social Skills (see correlation section). This may also have impacted the results for these forms.

#### *Correlations Among Variables*

Zero-order correlations among the variables are presented in Table 1.9. A Bonferonni correction was not applied to the correlations for this study as the study was exploratory in nature. Further, such an adjustment would have the effect of exacerbating the issue of small sample size. Moreover, a Bonferroni correction would only reduce the rate of Type I error (rejecting the null hypothesis when it is true), which in turn may increase Type II error (accepting the null hypotheses when it is false) for those associations which are not null. Thus, important findings may be overlooked (Perneger, 1998; Rothman, 1990). To address the issue of multiple comparisons, exact  $p$  values are reported and caution in interpreting results is urged. Inter-correlations for the respective subscales and branches for the EI measures were similar to those provided in the manuals for each measure, as summarized in Table 1.10.

Table 1.9. Zero Order Correlations Among Variables

	Age	VIQ	Total EQ	Intra	Inter	Stress	Adapt	Mood	Total EI	Perceive	Using	Underst	Manage	SRP SS	SRP Inter	PRSt Ada	PRSS	TRSS Adapt	TRSS
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	-	-.03	-.07	-.12	-.16	.05	.01	.00	-.13	-.48*	-.19	-.07	-.04	-.01	.03	.22	.24	0.44	.66*
2		-	.06	.02	.08	-.14	.34	.04	.30	.06	.18	.55**	.17	-.10	.08	.10	-.03	0.35	0.01
3			-	.75**	.49*	.76**	.46*	.91**	.34	-.04	.18	.35	.13	.51**	.63**	.18	.01	-.07	-.16
4				-	.10	.54**	.02	.67**	.03	.07	-.03	.03	-.11	-.29	.55**	.06	-.03	-.20	-.23
5					-	.02	.41*	.35	.47*	-.10	.29	.33	.56**	-.04	.25	.10	-.06	-.07	.13
6						-	.16	.72**	.07	-.06	.00	.24	-.24	.58**	.52**	.02	-.09	.05	-.21
7							-	.28	.45*	.06	.24	.32	.31	-.17	.14	.32	.41*	.02	-.34
8								-	.29	-.09	.20	.35	.11	.56**	.62**	.17	-.08	-.04	.12
9									-	.39	.84**	.69**	.53**	-.15	-.21	.28	.00	.08	-.28
10										-	.51**	-.03	-.19	.13	-.23	.25	.18	-.12	-.46
11											-	.52**	.34	-.10	-.22	.17	-.06	.25	-.07
12												-	.29	-.24	-.04	-.03	-.29	.15	-.19
13													-	.01	-.16	.13	-.05	.46	.35
14														-	-.67**	.03	.05	.08	-.13
15															-	-.04	-.01	-.15	.19
16																-	.72**	.61*	.32
17																	-	.16	-.11
18																		-	.67*

\* $p < .05$ ; \*\* $p < .01$ ; two-tailed



Age and VIQ were examined for their relationship with the variables on the scales and branches used in this study. Results for this analysis indicated that there was a strong association between age and 1) teacher reports of Social Skills and 2) Perceiving Emotions (MSCEIT). Findings revealed that the older the individual, the higher the teacher reported Social Skills and Perceiving Emotions scores. Additionally, there was a strong association between verbal IQ and the Understanding Emotions branch on the MSCEIT, a scale that requires individuals to identify emotions and demonstrate an understanding that “there are groups of related emotions” (Mayer, Salovey, Caruso, 2002, p. 19). Specifically, the higher one’s VIQ, the more likely he/she would be to correctly identify emotions, suggesting that verbal skills are highly linked with this particular ability. No other significant associations were found between either age or VIQ.

Within the BarOn EQ-i:S, inter-correlations were found to be similar to those reported in the technical manual for this measure. Similar to information presented in the manual, Total EQ was moderately to strongly associated with all subscales for this measure. Significant associations in the AS group are reported below along with information on correlations for the normative group, as shown in Table 1.10. In contrast to information provided in the manual, the Intra-personal scale demonstrated weak inter-correlation with the Adaptability scale ( $r = .02, p = .93$ , two-tailed) and there were weak inter-correlations between the Interpersonal and Stress Management scales ( $r = .02, p = .93$ , two-tailed). While only low to moderate correlations were reported for the normative group, this finding has implications for the factor structure of this measure for this particular group.

*Table 1.10. Significant Inter-correlations for BarOn EQ-i:S in AS and Normative Groups*

	<b>Intrapersonal</b>		<b>Interpersonal</b>		<b>Stress Mgmt.</b>		<b>Adaptability</b>		<b>Mood</b>	
	AS	Norm	AS	Norm	AS	Norm	AS	Norm	AS	Norm
Total EQ	.75	.67	.49	.51	.76	.45	.46	.51	.91	.84
Intrapers.					.54	.52			.67	.85
Interpers.							.41	.48		
Stress Mgmt.									.79	.69

Within the MSCEIT, moderate inter-correlations were found between Total EIQ and Using Emotions ( $r = .84, p < .05$ , two-tailed); Understanding Emotions ( $r = .69, p < .05$ , two-tailed); and Managing Emotions ( $r = .53, p < .05$ , two-tailed) branches. Additionally, the Using emotions branch was associated with the Perceiving Emotions branch ( $r = .51, p < .05$ , two-tailed) and Understanding Emotions was associated with Using Emotions ( $r = .52, p < .05$ , two-tailed). Unfortunately, the manual for the MSCEIT does not report inter-correlations for branches and the total EIQ score. However, the manual does provide information on inter-correlations amongst branch (subtest) scores (Mayer et al., 2002b). The inter-correlation between Perceiving and Understanding Emotions for the AS group was much lower than the moderate correlations reported in the manual ( $r = -.03, p = .87$ , two-tailed). As is the case for the BarOn EQ-i:S, this finding may have implications for the factor structure of this measure with the AS group. With the exception of the previously discussed outlier, inter-correlations for this group are relatively similar to those reported for the normative group, as shown in Table 1.11.

*Table 1.11. Significant Inter-correlations for MSCEIT in AS and Normative Groups*

Scale	Using		Understanding		Managing	
	AS	Norm	AS	Norm	AS	Norm
Total EIQ	.84	n/a	.69	n/a	.53	n/a
Perceiving	.51	.30				
Using			.52	.43		

Examination of correlations between the MSCEIT and BarOn EQ-i:S revealed moderate correlations for the MSCEIT total EIQ score and the BarOn EQ-i:S Adaptability scale ( $r = .45, p < .05$ , two-tailed) and the BarOn EQ-i:S Interpersonal scale ( $r = .47, p < .05$ , two-tailed). Additionally, moderate, but highly significant associations were revealed between the MSCEIT Managing Emotions branch and the BarOn EQ-i:S Interpersonal scale ( $r = .56, p < .01$ , two-tailed). These values were slightly higher than those reported for the normative group in the BarOn-EQ-i:S manual, as shown in see Table 1.12.

*Table 1.12. Significant correlations between EI measures in AS and Normative Group*

	MSCEIT total		MSCEIT Managing	
	AS	Norm	AS	Norm
BarOn EQ-i:S Interpersonal	.47	.23	.56	.26
BarOn EQ-i:S Adaptability	.45	.23	-	-

A strong and significant correlation was found between the Adaptive Composite for the BASC-2 Parent and Teacher Rating Scales ( $r = .60, p < .05$ , two-tailed). This association is similar and in the same direction as that for the normative group, as provided in the BASC-2 manual, where the correlation for the two scales was .44. This finding provides information about the consistency between parent and teacher reports of adaptive skills for this particular group. The two forms provide information on home and school contexts respectively. In addition, a strong association was reported for the Adaptive Composite and the Social Skills scale for the parent forms ( $r = .72, p < .01$ , two-tailed). This would be expected, as items from the Social Skills scale contribute to the Adaptive Composite. Further, the manual for the BASC-2 reports that these two scales correlate strongly ( $r = .83$ ). This was also true for reports completed in this study ( $r = .72, p < .01$ , two-tailed). For the self-report of the BASC-2, Social Stress was negatively correlated with Interpersonal Skills ( $r = -.67, p < .01$ , two-tailed). That is, as Social Stress decreased, interpersonal skills increased and visa versa. Again, this is remarkably similar to that reported for the normative group for these same scales in the BASC-2 manual where these scales yielded a correlation of  $-.68$ .

A similar, but slightly stronger negative relationship was found between self reports of Social Stress on the BASC-2 and self reports of Total EQ on the BarOn-EQ-i:S ( $r = -.51, p < .01$ , two-tailed). That is, as Social Stress decreased, the BarOn-EQ-I total EQ score increased. In addition, a highly significant positive correlation was found between EI as measured by the BarOn-EQ-i total EQ composite and participant's self-report of Interpersonal Skills on the BASC-2 ( $r = .63, p < .05$ , two-tailed). As these are all self-report formats, caution should be issued in interpreting the findings. Literature on measurement error warn that using common rater forms can result in measurement error due to 'common method variance' and forms of response bias (Campbell & Fiske, 1959;

Podsakoff, MacKenzie, Podsakoff, & Lee, 2003). Some safeguards to protect against this were initiated. For example, administration of procedures occurred in random order so that the order of administration did not influence reports, different response formats were required in measures, and measures were administered as separate units in the study battery. Further, participant anonymity was maintained and made explicit to reduce the chance of individuals producing socially desired responses. Additionally, the EI measure was computer administered, while the outcome measure was a pencil and paper task. Podsakoff and colleagues (2003) assert that these steps can be used to minimize, or even eliminate error due to common method. Finally, several self report branches on the EI measure demonstrated only weak correlations with the self-report outcome measure (BASC-2 scales). This provides information that suggests that the strong associations found were not entirely a result of common method variance; thus the association revealed is a potentially important finding for this study.

With the exception of the BASC-2 (PRS) Social Skills and BarOn EQ-i:S Adaptability ( $r = .41, p < .05$ , two-tailed) none of the correlations between parent or teacher forms and EI scales reached significance. However, for the SRP, several significant associations were noted. More specifically, significant correlations were observed for the BASC-2 Interpersonal Scale (SRP) and BarOn EQ-i:S total score ( $r = .63, p < .01$ , two-tailed); the BarOn EQ-i:S Intrapersonal scale ( $r = .55, p < .01$ , two-tailed); the BarOn EQ-i:S Stress Management scale ( $r = .52, p < .01$ , two-tailed); and the BarOn EQ-i:S General Mood scale ( $r = .62, p < .01$ , two-tailed). No significant associations were found for the Interpersonal scale and any of the composites or branches from the MSCEIT. Further, similar, yet inverse associations were noted for several scales from the Bar-On EQ-i:S and the BASC-2 Social Stress (SRP). Specifically, Social Stress correlated significantly with the BarOn EQ-i:S Total EQ score ( $r = -.51, p < .01$ , two-tailed); the BarOn EQ-i:S Stress Management scale ( $r = -.58, p < .01$ , two-tailed); and, the BarOn EQ-i:S General Mood ( $r = .56, p < .01$ , two-tailed).

#### *Prediction of Social Outcomes*

To explore the potential of the EI measures to predict social outcomes, a series of multiple regressions using three different dependant variables (Interpersonal Relations; Social Stress; and Social Skills) were conducted. In the interest of using conservative

procedures with a relatively small sample size, the standard method was employed for these analyses. In addition, the more conservative adjusted  $R^2$  was utilized because of the relatively high ratio of predictor to outcome variables (see Bellini, 2006). However, even with this conservative approach, the small sample size requires that the analyses should be considered exploratory at this stage.

Independent variables (IVs) for this procedure were chosen based on the results of aforementioned correlational analysis. As suggested by Tabachnik and Fidell (2007) and applied in similar studies (Bellini, 2006; Blackshaw, Kinderman, Hare, & Hatton, 2001; Parkenham, Samios, & Sofronoff, 2005), only IVs that were moderately to strongly correlated with the dependant variables (DVs), but not strongly correlated with each other were chosen for this procedure. Because approximately half of the participants did not submit teacher report forms for the BASC-2, variables from the TRS were not considered for regression analysis. Further, examination of the associations revealed no significant correlations (with only weak to moderate associations) for the parent report of Adaptive Skills. Thus, exploratory analysis for this composite is inappropriate. Consequently, only the BASC-2 Social Stress (SRP), Interpersonal Skills (SRP), and Social Skills (PRS) scales were considered for regression procedures in this study. Table 1.13 lists the IVs and DVs used in the regression series.

*Table 1.13. Variables for Multiple Regression Analysis*

<b>Model and Predictor Variables (IVs)</b>	<b>Dependant Variable</b>
Model 1 BarOn EQ-i:S Total EQ MSCEIT Total EIQ	Interpersonal Skills (SRP)
Model 2 BarOn EQ-i:S Total EQ MSCEIT Total EIQ	Social Stress (SRP)
Model 3 BarOn EQ-i:S Adaptability MSCEIT Understanding Emotions	Social Skills (PRS)

As mentioned previously, the standard method was chosen as the most appropriate multiple regression procedure for this study, as it is considered the most conservative and best to use when sample sizes are relatively small (Brace, Kemp, & Snelgar, 2006). Using the standard method, a significant model emerged:  $F_{(2,22)} = 16.65$ ,  $p < .005$ . The model explains 57 % of the variance (Adjusted  $R^2 = .566$ ). Both variables were significant predictors in this model. Table 1.14 provides information for the predictor variables entered into the model. Collinearity diagnostics for this procedure were within acceptable guidelines.

*Table 1.14. Standardised Regression Coefficients for Model Predicting Interpersonal Skills*

<b>Predictor Variable</b>	<b>Beta</b>	<b>p</b>
BarOn Total EQ	.79	.005
MSCEIT Total EIQ	-.48	.003

A second regression was conducted to explore the prediction of social outcomes via the self report of Social Stress on the BASC-2. Using the standard method, a significant model emerged:  $F_{(2,22)} = 3.82$ ,  $p < .038$ . The model explains 19 % of the variance (Adjusted  $R^2 = .19$ ). Table 1.15 provides information for the predictor variables entered into the model. Only the BarOn Total EQ was a significant predictor in this model. Again, collinearity diagnostics for this procedure were within acceptable guidelines.

*Table 1.15. Standardised Regression Coefficients for Model Predicting Social Stress*

<b>Predictor Variable</b>	<b>Beta</b>	<b>p</b>
BarOn Total EQ	-.52	.02
MSCEIT Total EIQ	.02	.90

A third regression was conducted to explore the prediction of social outcomes via parent ratings on the Social Skills scale for the BASC-2. Again, the standard method was used and a significant model emerged:  $F_{(2,22)} = 6.23$ ,  $p < .007$ . The model explains 31 % of the variance (Adjusted  $R^2 = .31$ ). Table 1.16 provides information for the predictor

variables entered into the model. Both predictors were significant in this model. Again, collinearity diagnostics for this procedure were within acceptable limits.

*Table 1.16 Standardised Regression Coefficients for Model Predicting Social Skills*

<b>Predictor Variable</b>	<b>Beta</b>	<b>p</b>
BarOn EQ-i:S Adaptability	.57	.005
MSCEIT Understanding Emotions	-.48	.02

### *Discussion*

The results for this study revealed that the AS group demonstrated impaired trait EI, but intact or better than expected ability EI. Subtest analysis revealed patterns of strength and weakness that provide useful information for intervention planning. Trait EI in particular was associated with self-reported social outcomes. Finally, regression procedures using EI to predict social outcomes revealed several significant models predicting 19-51% of the variance. Results are discussed in light of the literature and with reference to the implications for understanding individuals with AS.

#### *EI in Young Adults with AS*

In general, the findings from this study indicated that EI as measured by the trait approach, the *BarOn EQ-i:S*, was significantly impaired for the AS group when compared to the normative group. In contrast, individuals with AS performed the same as, or better than the normative group on the ability EI approach (the MSCEIT). Explanations and implications for these findings are explored below.

One goal for this study was to compare performance of individuals with AS to information provided about normative groups for ability and trait approaches to EI. To understand if EI differed significantly between the AS group and the normative sample, means were compared for both the ability (MSCEIT) and trait (BarOn EQ-i:S) EI tests using single sample t-tests. On the composite EIQ measure for the MSCEIT, individuals with AS performed similarly to the norm group for the Total EIQ composite. However, analyses of the branches contributing to this composite revealed variability and provided interesting information about the AS group in this study. A particularly surprising finding was that there was a significant difference on the Understanding Emotions branch for the MSCEIT. On this particular branch, individuals with AS performed significantly

better than the normative group. While on the surface this appears to be an unusual result, it is consistent with reports for this group on tasks of a similar construct, theory of mind (ToM). In studies examining ToM (the ability to perceive that other's have thoughts, feelings, perceptions different from our own), individuals with AS were able to pass laboratory tasks when ample time was provided. Many assert that individuals with AS can use their verbal skills to reason through the cognitive aspects of a scenario or problem to pass ToM tasks. However, these same individuals often fail to perform adequately in naturalistic situations (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997; Bowler, 1992; Dissanayake & Macintosh, 2003). The results for this study are consistent with those findings and suggest that individuals with AS have intact knowledge about how to reason through emotionally-based scenarios when provided with ample time to process information and evaluate options. In addition to performing better on the Understanding Emotions branch, individuals with AS also performed significantly better than the normative group on Perceiving Emotions and on Using Emotions. Again, this suggests that knowledge and performance on tasks requiring the un-timed processing of emotional information is not impaired for this particular group. Finally, on the remaining branch for the MSCEIT, Managing Emotions, the mean score for the AS group was slightly lower than the mean of the normative group but was not statistically significant.

In contrast to performance on the ability measure, individuals with AS scored significantly lower on the trait measure of EI than did the normative group. The mean Total EQ score for the BarOn-EQ-i:S was significantly lower than that of the normative group. Further, scores on the Intrapersonal, Interpersonal, Stress Management, and General Mood scales were also all significantly lower than the normative group. While the mean score for the AS group on the Adaptability scale was slightly lower than the mean for the normative group, it was not significantly different. Given that impairments in adaptability are often regarded as a key feature of AS, this appears to be a surprising result. However, an examination of items contributing to this index reveals that many items reflect a step by step, logical thinking approach to problem solving, which is often present in individuals with AS (Baron-Cohen, 2003). For the questionnaire, it appears that Adaptability is not defined as flexible and novel thinking approaches to complex



situations, but rather as a systematic and logical problem-solving style. Consequently, the results for this index are consistent with literature about the thinking styles of individuals with AS which describe logical and sequential approaches in this particular group (Klin & Volkmar, 2003; Klin et al., 1995; Tsatsanis, 2004).

*EI and Social Outcomes (Associations and Predictions)*

A series of correlations was conducted to explore associations within and between EI instruments and BASC-2 scales pertaining to social outcomes. First, it is important to note that validity indexes for measures in this study provided some evidence that the measures included appear appropriate for this particular clinical group. Second, similar inter-correlations to those provided in the respective manuals were demonstrated within and between instruments thereby providing additional evidence of the appropriateness of these measures for individuals with AS.

With reference to measuring social outcomes, both self and parent reports indicated that individuals with AS in this study did indeed demonstrate social deficits. Further, results for multiple regression analyses indicated that scores on EI measures accounted for 19 - 51% of the variance of the social outcomes used as dependant variables for this study. More specifically, the first model, which assessed ability and trait EI together, predicted 51% of the variance for self-reports of Interpersonal Skills. This further illustrates the utility of using these instruments to compliment each other in clinical assessment. For the second model, ability EI did not significantly contribute to prediction of self-reported Social Stress, however, trait EI predicted 19 % of the variance for this outcome. The implication is that self-reported trait EI, but not ability EI, predicts of Social Stress. This may be an important consideration when using trait EI measures in clinical batteries. Finally, the third model demonstrated that using a combination of the Adaptability scale from the trait measure and Understanding Emotions from the ability EI scale predicted 31% of the variance for parent reports of Social Skills. This may also be an important consideration in clinical assessment as parent reports of Social Skills demonstrated that the individuals in this study did have significantly poorer Social Skills than the norm group. These results are consistent with reports that EI predicts important social outcomes (social network size, quality of interactions, etc.) for normative populations (Austin et al., 2005; Brackett, Mayer, & Warner, 2004) and has implications

for investigations of EI interventions for the AS group. For example, if improving EI decreases social stress, then interventions designed to target this area may become important for individuals with AS. This will also have a practical implication as clinicians may find it useful to include the individually mentioned subscales and branches to provide converging evidence of social deficits in clinical assessments.

#### *Implications of Using EI measures with Individuals with AS*

In summary, the results for the AS group on measures of EI provides interesting insight into the characteristics of this particular group of individuals. In general, better than expected performance on the ability measure indicated that individuals with AS are able to accurately categorise, understand, perceive, and use emotional information when it is presented pictorially and/or in written form. While on the surface, this appears surprising, it provides important information about the potential of individuals with AS to navigate through social situations by using cognitive or perhaps verbally mediated approaches. This is consistent with previous research (Dissanayake & Macintosh, 2003; Klin, 2000) and has implications for EI interventions.

Future intervention studies might then investigate if, for example, practice and ‘overlearning’ of strategies in emotion-based (social) interactions might improve performance in naturalistic situations. Strategies to provide extra time for reasoning in natural social situations may also be useful to individuals with AS. For example, it may be helpful to explicitly teach a number of responses for emotionally charged situations that may make it socially acceptable to delay a response. Then, it would be important to provide many opportunities to practice these strategies in settings that are as natural as possible. While it was not the purpose of this study to test this particular hypothesis, these findings could provide the basis for further investigation in this area.

In contrast to average or better than expected performance on the ability measure of EI, results for the self-report trait measure revealed that those with AS: 1) perceive that their ability to navigate through such situations is impaired; and, 2) report significant stress as a result of poor interactions. In other words, even though actual knowledge and skills in emotional situations is intact, performance in naturalistic situations seems to remain problematic. This information has implications for the type of interventions we provide for individuals with AS. As an analogy, in the field of social skills training,

Gresham (1981, 2002) noted that it is important to differentiate between individuals who do not possess the prerequisite social knowledge to successfully interact with others on a social level and those who possess the knowledge but fail to perform the skill associated with that knowledge. While the latter is referred to as an acquisition deficit, the former can be referred to as a performance deficit (Gresham, 1981, 2002). For an acquisition deficit, individuals are provided with explicit training in the knowledge required for successful social situations, while performance deficits require instruction in skill sequences and repeated practice in naturalistic settings to promote generalization. The performance of individuals in this study on EI measures highlights a similar phenomenon. While it appears that results for this group on the MSCEIT indicate that knowledge acquisition and the ability to process emotional information is intact, the results for the BarOn-EQ-i:S appear to indicate that individuals feel that their performance in naturalistic social situations is impaired.

On a practical level, it is helpful to use ability EI measures to assess knowledge and cognitive processing aspects for emotion based situations to target interventions efficiently. If, as is the case in this study, ability EI is intact, yet social difficulties are present, then interventions will need to focus more on practice, generalization, and social strategy instruction rather than explicit instruction on the prerequisite knowledge required for successful social interactions. In this way, the insights provided by using both instruments together is invaluable in providing information to assist in the design and instruction of interventions for individuals with low EI. Moreover, while the data generated from this study provides further evidence that the two models of EI are distinct, it also illustrates the potential for the approaches to be used together to provide complimentary perspectives to inform intervention.

#### *Limitations*

It is important to note that while the results of this study points to directions for intervention research, the purpose of this study was not to test the impact of interventions. Future research should directly assess this preliminary evidence with the appropriate experimental designs. Further, the information gathered from this study should be considered as preliminary evidence that is limited by a number of factors, and as such, caution is warranted. The relative rarity of AS, and therefore the small sample population

from which to draw participants, resulted in a small sample size for this study. For these reasons, random selection was not possible. The use of a non-random sample restricts the generalizability of the results. In addition to limitations associated with a small sample size, this study incorporated several self-report measures. While some authors report that individuals in the AS population can, and do accurately self report on perceptions and behaviours (Aydemir, 2000; Berthoz & Hill, 2005), the use of several self-report measures makes it difficult to determine the precise amount of variance accounted for by the specific constructs. Finally, this study utilized correlational and multiple regression procedures. Consequently, causation was not directly examined. To demonstrate causation, randomized or quasi-randomized experimental designs to test the proposed model are necessary. Future research projects may be designed with a target and control group to test the findings from this study. Further, while this study proposes an alternative model for understanding social deficits in individuals with AS, it did not compare leading approaches to understanding social deficits for this group. As previously mentioned in the introduction to this study, deficits in ToM and/or EF are widely attributed as impacting social difficulties for AS individuals. Consequently, an exploration of EI, ToM, and EF measures used singularly or in conjunction with EI measures to predict social outcomes may provide additional information to enhance understanding of this particular concern in individuals with AS.

### **Rationale for Study 2**

In Study 1, 25 individuals with AS (aged 16-22) completed trait and ability EI and social outcome measures to ascertain how EI relates to and predicts social outcomes. The results for this study indicated that total ability EI and trait EI combined accounted for 51% of the variance for self reports for Interpersonal Relations and 19% of the variance for self reports of Social Stress. A third model demonstrated that a subscale/branch from each respective measure (Adaptability on the BarOn EQ-i:S and Understanding Emotions on the MSCEIT) accounted for 31% of the variance for parent reports of Social Skills. While this information provides insight using EI measures for individuals with AS, performance on EI measures were not compared to leading theoretical approaches conceptualizing social difficulties in AS. More specifically, it would be helpful to understand if deficits in ToM and EF individually, or in combination with EI predict important social outcomes in this particular clinical group. Study 2 was conceptualized to extend the findings from Study 1 to ToM and EF, conceptual approaches for explaining social difficulties in the AS population. The purpose of Study 2 was to investigate if including ToM and EF variables improves models (outlined in Study1) predicting social outcomes for AS.

## CHAPTER 3

### *Study 2: Emotional Intelligence, Theory of Mind, and Executive Functions as Predictors of Social Outcomes in Young Adults with Asperger Syndrome*

Individuals with Asperger syndrome (AS) are often described as having a core deficit in social interaction. This deficit is particularly evident when processing of emotional information is required in social situations (Grossman, et al., 2000). Deficits in theory of mind (ToM) and executive functions (EF) are the two hypotheses for social deficits in AS that predominate in the literature. However, each of these explanations for social deficits in those with AS has limitations. Emotional intelligence (EI) has emerged as a relatively new explanation for social difficulties in typically developing individuals. Study 1 demonstrated that EI predicted important social outcomes for a group of individuals (aged 16-21) with AS. The purpose of this study was to explore EI as an alternative or additive explanation for the social deficits of individuals with AS in light of the predominant theories accounting for social difficulties. Tests of ToM, EF, and EI were administered to young adults with AS to understand whether EI singularly, or in combination with other approaches, best predicts social and adaptive outcomes (as measured by the Behaviour Assessment System for Children, Second Edition; Reynolds & Kamphaus, 2004) for individuals with AS.

#### *Asperger Syndrome*

Asperger syndrome (AS) or Asperger disorder is categorized as one of the pervasive developmental disorders (PDD) or autism spectrum disorders (Wing, 1979). It is characterised by “marked and enduring impairments” (Klin, McPartland, & Volkmar, 2005, p. 88) in social interaction, communication, behaviour, and language. While AS is believed to be one of several autism spectrum disorders, it is commonly distinguished from ‘classical’ or Kanner’s Autism (U Frith, 1991) by the degree of cognitive impairment and the presence of intact and typically developing early speech (Wing, 1981a; Szatmari, 2005). Individuals with AS usually demonstrate intelligence in the average to superior range and many with AS are reported to have verbal intelligence in the high average to superior range (Ghaziuddin & Mountain-Kimchi, 2004; Wing, 1981). A variety of strengths and impairments are often attributed to those with AS (Klin et al., 1995; Ehlers et al., 1997). Highly specialized skills and circumscribed interests (Wing,

1981a) are considered by many to be a hallmark feature of AS. However, the severe and pervasive social impairments are often considered to be the primary feature of autism spectrum disorders, including AS (U. Frith, 1991; Gutstein & Whitney, 2002; Howlin & Goode, 2000; Klin, 2000; Smith Myles et al., 2001; Sperry, 2005; Wing, 1981b). Further, individual difficulties with social interaction are central to the various clinical diagnostic criteria for AS (Asperger, 1944, 1979; Wing, 1991, Gillberg & Gillberg (1989); Tantam, 1988; Szatmari et al., 1989).

Various researchers have examined potential explanations for these social deficits in AS. The most commonly referenced theories in the literature are that deficits in ToM and/or EF are responsible for the social difficulties reported for those with AS. These approaches provide some valuable information about the characteristics of those with AS. However, limitations of existing approaches may be remedied by an exploration of an emerging construct, such as EI, and measuring actual social outcomes in relation to each construct.

### *Theory of Mind*

The ToM hypothesis for social deficits in autism and AS suggests that a “specific, and primarily cognitive, incapacity to attribute mental states such as beliefs, intentions, and desires to the other and self” (Klin, 2000, p. 831) is directly responsible for social deficits. ToM dysfunction is further proposed to account for a variety of autistic-like symptoms including deficits in: pragmatic language, imaginative play, and empathy (Baron-Cohen, 1995). While this theory is intuitively sensible and appears to be accurate for low-functioning individuals on the autism spectrum, some have questioned the ability of this approach to account for individuals with AS or HFA, as they have been shown to pass first-level ToM tasks (Bowler, 1992; Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997; Dahlgren & Trillingsgaard, 1996a) and demonstrated intact ToM skills in naturalistic contexts (Eisenmajer & Prior, 1996). Others assert that strong verbal skills regulate performance on verbally-based ToM tasks (Bowler, 1992; Eisenmajer & Prior, 1991; Fombonne, Siddons, Archard, Frith, & Happe, 1994; Happe, 1994; Yirmiya & Shulman, 1996); consequently, individuals with higher verbal skills could be expected to pass ToM tasks when they are verbal in nature (Klin, 2000). Moreover, with regard to individuals who pass ToM tasks in experimental situations, Klin (2000) posits that when

social stress is reduced and less spontaneous and/or rapid integration of social information is required, individuals with AS are more likely to be successful.

Measuring ToM remains a complex endeavour. A number of problems plague traditional and newer tests of the construct. Traditional lab tasks tend to be artificial in format. For example, dichotomous responses are often part of the available responses in many ToM tasks, however, in real life contexts appropriate responses are rarely provided in this format. For example, in a natural situation, individuals must generate responses by integrating information from 1) the individual with whom they are interacting, 2) contextual variables, and 3) their own memory for similar situations. These processes should then be followed with the selection of an appropriate response (Klin, 2000). Clearly, this list of steps involved in formulating a social response is not exhaustive, and many other cognitive and affective processes may precede appropriate ToM responses (see Klin, 2000). However, the aforementioned list provides some indication of how complex the processes associated with ToM are. Consequently, it may be inappropriate to measure ToM without ensuring that probable prerequisite tasks and subskills are also accounted for by some sort of baseline assessment. This is not commonly available for ToM tasks.

The specificity of ToM for autism and/or AS has also been questioned as ToM deficits have been demonstrated in clinical groups other than autism (i.e., schizophrenia, mental retardation, and deaf children) (Corcoran, Mercer, & Frith, 1995; Peterson & Seigal, 1995; Yirmiya et al., 1992). Additionally, some ToM tests have been documented to possess poor test-retest reliability (Charman & Campbell, 1997; L. Mayes, Klin, Tercyak, Cicchetti, & Cohen, 1996), making studies using these measures to document this explanation for poor social skills in AS and autism difficult to support. Finally, some have reported that intact lower-order ToM skills do not correlate with social outcomes (see Klin, 2000), nor does demonstrated improvement in ToM skills after targeted interventions correspond with increased social capabilities (Hadwin, Baron-Cohen, Howlin, & Hill, 1996; Ozonoff & Miller, 1995). Indeed, when verbal ability was entered as a covariate, ToM did not predict severity of social impairments (Capps, Kehres, & Sigman, 1998; Fombonne et al., 1994). Thus, while somewhat helpful to articulate the



difficulties individuals with AS may have understanding others, the evidence does not support ToM deficits as the primary cause of social difficulties in individuals with AS.

### *Executive Dysfunction*

In contrast to the assertion that ToM deficits cause social difficulties in AS, some propose that deficits in executive functions (EF) explain the social impairments in autism and particularly AS (Ozonoff, 1997). EFs are the neuropsychological processes involved in overlapping and complex cognitive functions which include: planning, cognitive and behavioural flexibility, inhibition control, selective attention, and working memory (Joseph & Tager-Flusburg, 2004). From this neuropsychological perspective, effective social interaction requires ongoing updating, evaluation, and selection of appropriate responses to both verbal and nonverbal social information (Joseph & Tager-Flusberg, 2004). Some posit that it is difficulties in these areas that lead to poor social interaction for those with AS (Ozonoff, 1997). Anecdotal evidence and results on self-report measures indicate that EF deficits are characteristic of those with AS (Channon, Charman, Heap, Crawford, & Rios, 2001; Wilson, Alderman, Burgess, Emslie, & Evans, 1996). However, limited research has specifically examined EF in clearly defined AS groups, and even fewer studies have explored EF in young adults with AS (Ambery, Russell, Perry, Morris, & Murphy, 2006).

While research documenting the performance of individuals with AS on traditional EF tasks is limited, many researchers have examined neuropsychological profiles via the various Wechsler Scales of Intelligence (Wechsler, 1991, 1997, 1999). Attempts to discriminate between AS and high functioning autism (HFA) on the basis of IQ profiles have revealed mixed, yet promising preliminary information for differentiation of subtypes. Some researchers have found that those with HFA demonstrate less developed verbal skills and better nonverbal skills than those with AS (Ehlers et al., 1997; Ghaziuddin & Mountain-Kimchi, 2004; Klin et al., 1995; A.J. Lincoln, Allen, & Kilman, 1995; A. J. Lincoln et al., 1998). More specifically, Ehlers and colleagues (1997b) found better developed verbal skills, yet weaker visual spatial organization and graphomotor skills for individuals with AS when compared to those with HFA.

The notion that stronger verbal than nonverbal skills are present in AS is commonly reported (Klin, Volkmar, Schultz, Pauls, & Cohen, 1997; Tsatsanis, 2004). Indeed, some claim that those with AS and HFA almost always present with opposite neuropsychological patterns (Klin et al., 1995) and recent meta-analysis of neuropsychological patterns support this assertion (A.J. Lincoln, Courchesne, Kilman, Elmasian, & Allen, 1988). In contrast, a comparison of intellectual, motor, visuospatial, and executive function conducted by Miller and Ozonoff (2000) found that when compared to those with HFA, the AS group had a higher full scale IQ and the magnitude of the difference between verbal and nonverbal skills was greater. However, when IQ was controlled, statistically significant differences were found only for fine motor skills with the AS group having a deficit in this area. Further, a clinically, but not statistically significant VIQ-PIQ discrepancy was found, with the AS group demonstrating greater discrepancy. Miller and Ozonoff concluded that IQ is the major differentiating feature for these two subgroups, and as such, Asperger's can be considered a "high IQ autism" (p.235). Further, a review of the literature indicates that while some researchers have reported a qualitative difference between the groups (Klin et al., 2005b; Klin et al., 1995; A. J. Lincoln et al., 1998; Miller & Ozonoff, 2000), others have found that there is no difference (Ozonoff, Pennington et al., 1991a; Szatmari, Tuff, Finlayson, & Bartolucci, 1990). Moreover, some researchers have found higher PIQ than VIQ for the AS group (see Lincoln et al., 1998). Clearly, there is no clear consensus as to the neuropsychological profiles in AS and differing approaches to grouping participants or controlling for variables (e.g. IQ) likely impact the consistency of results. Indeed, in their meta-analysis, Klin and colleagues (2005b) noted that studies applying inclusion criteria adhering strictly to DSM-IV were most likely to find the previously described VIQ-PIQ difference for individuals with AS. Finally, while the Wechsler scales provide some information about EFs, they also assess many other constructs, and as such, information gathered using these instruments should not be viewed as pure indicators of EF. Thus, studies attempting to document EF and related processes should include measures specifically designed to assess EF.

As is the case with ToM tasks, EF tests often have problematic properties. One issue is the difficulty defining and measuring specific functions, constructs, and

operations for EF. For example, the construct of cognitive flexibility is a broad one that includes various operations and functions, which are inferred but not directly observable. A function, however, is the product of several connected operations that are observable. Various tests purport to measure EF, including traditional tasks such as the Stroop test, the Tower Tasks, and the Wisconsin Card Sort (Burgess, Alderman, Evans, Emslie, & Wilson, 1998). While these tasks claim to measure EFs, it is not entirely clear where they converge and diverge as tests of executive processes. Even when the specific process is defined, it is often difficult to entirely distinguish between EFs that may overlap or to delineate the prerequisite or sub-skills that may be implicated. It is this overlapping nature of EF tasks makes them difficult to measure discretely (Hill & Bird, 2006). However, recent EF tests have emerged that attempt to partial out the sub-skills and overlapping EFs to generate a more accurate characterization of specific areas of impairment (see the D-Kefs; Delis, Kaplan & Kramer, 2001).

While there appears to be promising research on EF in AS, it is clear that much is still uncertain. Proponents of executive dysfunction as the “main psychological cause of autism” (see Bonli, p. 38) consider ToM as a prerequisite and lower-order aspect of EF that is subsumed by dysfunction in processes of the executive system. While deficits in EFs are well documented in individuals with autism, the normal developmental course for EFs has not been well documented, and as a result, it is difficult to examine these processes reliably in children with autism (Bonli, 2005; Tager-Flusberg et al., 2001). Further, as mentioned previously, executive deficits are not specific to autism; they have been implicated in various disorders (Diamond et al., 1991; Ozonoff, 1994, 1997; Ozonoff & Jensen, 1999; B. F. Pennington, 1996; B. F. Pennington & Ozonoff, 1996). Moreover, on EF tasks, it appears that individuals with autism and AS differ only on planning, cognitive flexibility, and generativity (the ability to fluently produce novel ideas) when compared to normal controls but not necessarily in other EFs (Lopez et al., 2005; B. F. Pennington & Ozonoff, 1996). The EDF hypothesis for social impairments in autism spectrum disorders has been further questioned by studies revealing that young children with autism do not have impairments in EF when compared to developmentally delayed and typically developing children (Dawson et al., 2002; Griffith et al., 1999; McEvoy, Rogers, & Pennington, 1993). Finally, while EF provides promising insight into

the cognitive difficulties of individuals with AS, neither deficits in ToM or EF have been demonstrated to explain variances in social outcomes (Joseph & Tager-Flusberg, 2004; Klin, 2000). Clearly, the primacy of EDF as explanatory hypotheses for social deficits in AS has not been established (Bonli, 2005; Klin, 2000; Tager-Flusberg et al., 2001).

#### *Additional Limitations of Research on Social-emotional Deficits in AS*

While various theories have been proposed to explain the social difficulties of individuals with classical (lower than average IQ) autism, a common practice in research exploring this assertion is to group individuals with autism, HFA, AS, and pervasive developmental disorder-not otherwise specified (PDD-nos) into one broad group. Given the diversity between PDD subtypes, adopting this approach is problematic as the resulting information does not necessarily apply to higher functioning individuals with autism. Moreover, the research literature emphasizes the heterogeneous nature of the PDD group (Klin, 2003; Szatmari, 2005) and highlights the influence of language and cognitive abilities in both developmental and social outcomes (Kasari & Rotheram-Fuller, 2005; Ozonoff et al., 1991b; Szatmari, 2005; Szatmari et al., 2003). Indeed, even within subgroups (PDD-NOS, AS, autism, and HFA), there is heterogeneity. Because subtypes are often not clearly defined, existing studies do not necessarily provide information that is relevant for those with average or above average intellect, as is the case in AS, HFA, and sometimes PDD-NOS. Those studies that have clearly discriminated between subtypes have found that individuals with AS are likely to perform significantly better than those with autism or HFA (Bowler, 1992; Dahlgren & Trillingsgaard, 1996b; Ziatas et al., 1998) and often perform similarly to those with nonverbal learning disabilities (NLD) (Klin et al., 1995; Rourke, 1989; Tsatsanis & Rourke, 2001), particularly on tasks of a cognitive nature.

#### *EI: A Promising Approach*

The social deficits in AS can not be adequately explained by existing hypotheses such as ToM and EF (Tager-Flusberg & Joseph, 2004). Consequently, it will be helpful to explore alternate constructs that hold promise to enhance understanding of the social interaction problems of individuals with AS. Emotional intelligence (EI) is an emerging construct which has recently been demonstrated to predict successful social interactions (Lopes et al., 2004; Lopes et al., 2005), social network size (Austin et al., 2005), and life

satisfaction (Ganon & Ranzijn, 2005b). All of these outcomes are of interest for individuals with AS. While EI has long been in the public eye (Goleman, 1995), two models prevail in the research literature and have been demonstrated to be distinct in conceptualization (Brackett & Mayer, 2003) and form. The ability EI approach conceptualizes EI as the cognitive response to emotional information (Mayer et al., 2000). In this approach, EI is measured using performance tests. In contrast, the trait EI approach characterizes EI as a series of related competencies in emotion-related areas that may include characteristics such as optimism, self-awareness, self-esteem, and self-actualizations (Bar-On, 1997; Goleman, 1995, 1998). This conceptualization of EI typically uses self-report in the measurement of the construct.

Ability EI is conceptualized as an inter-related set of cognitive abilities, skills, or capacities that include: recognizing the meanings of emotion; recognizing the complex relationships between emotions; and, reasoning and problem solving on the basis of this information (Mayer et al., 1999, 2000). Ability EI has been shown to be distinct from personality (Brackett & Mayer, 2003; Lopes, 2003) and IQ and is predictive of social deviance (Brackett & Mayer, 2003). Self-report ability EI predicted life satisfaction and demonstrated incremental validity over personality (Law et al., 2004). This preliminary evidence suggests that ability EI predicts important outcomes, above and beyond that which is predicted by personality measures. Further, Ability EI positively correlates with self-reported empathy (Ciarrochi et al., 2000; Rubin, 1999; Sullivan, 1999), life satisfaction, and self-reported relationship quality (Ciarrochi et al., 2000). Again, it appears there is sufficient evidence to indicate that this form of EI provides information above and beyond traditional personality or IQ (Mayer, 1999) and that it can account for many important outcomes that likely relate to successful social interactions.

Trait EI is considered to be “a dispositional tendency like personality which can be assessed by self-report questionnaire” (Austin, et al., 2005, p.548). While a common criticism of the trait EI approach is that it is too closely related to personality to provide any novel information, recent studies have shown that trait EI demonstrates incremental validity over personality in the prediction of life satisfaction, social network quality, loneliness, and depression-proneness (Dawda & Hart, 2000; B. Palmer et al., 2002; Saklofske et al., 2003). Further, associations between trait EI and alexithymia (Parker et

al., 2001; Schutte et al., 1998a), psychological distress (Slaski & Cartwright, 2002), and depression (Dawda & Hart, 2000; Schutte et al., 1998a) have been demonstrated. Finally, factor analysis of trait EI has revealed that the Eysenck Personality Scales and the Five Factor Model of Personality reveal a distinct EI factor (Petrides & Furnham, 2001). Thus, it appears there is sufficient evidence to indicate that trait EI tests measure some aspect of psychological well-being beyond that of personality measures.

### *EI and Asperger Syndrome*

While Asperger himself noted a “dissonance of cognition and affect” (pg. 79, Frith, 1991) for the individuals he studied, and many others have noted problems in emotional processing for this group, little effort has been made to document a link between affective processing and difficulties in social interaction for those with AS. Study 1 demonstrated that trait EI was significantly impaired (see Study 1) while ability EI was intact in the AS group. Examination of branch results for ability EI revealed information about areas of strength that have implications for intervention design. Specifically, the AS group demonstrated intact cognitive skills in relation to emotional information. However, the same group also reported impaired performance in emotional interactions in real-life settings. Finally, the results of the aforementioned study revealed that EI predicted important social outcomes for the AS group. Thus, using ability and trait EI approaches together provides a multidimensional approach to assessment, which in turn has implications for intervention. While the examination of EI revealed important information for interventions, an exploration of ToM and EF together with EI may improve the prediction of social outcomes and inform assessment practices for those with AS.

### *The Study*

This study builds on Study 1 by investigating associations between EI, ToM, EF, and social outcomes and by exploring ToM and EF singularly and in combination with EI as predictors of social difficulties.

### *Research Questions*

1. Does performance on EI, EF, ToM measures relate to social outcomes in young adults with AS?

2. Does EI in combination with ToM and EF predict social outcomes in young adults with AS?

### *Method*

#### *Participants*

As described in Study 1, 25 young adults (20 male, 5 female) diagnosed with AS, aged 16-21.11 years ( $M = 16.3$ ;  $SD = 1.4$ ) were recruited from school and mental health settings in Manitoba and Alberta. Detailed inclusion criteria are provided in Study 1.

#### *Procedures*

Participants who met the inclusion criteria outlined in Study 1 were invited to complete a battery of tests which is provided in the aforementioned study. In addition to the tests completed for Study 1, the Reading the Mind in the Eyes Test-Revised (Eyes Test-Revised; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) and selected subtests from the Delis-Kaplin Executive Function System (D-Kefs; Delis, Kaplan, & Kramer, 2001) were administered. Results on the EI, ToM, and EF measures were compared to each other and to performance on an outcome measure (BASC-2) to provide information on the extent of social and adaptive deficiencies. Further, exploration of the predictive ability of EI, ToM, and EF for social outcomes was conducted by examinations of correlations and multiple regression procedures.

#### *Measures*

Participants completed a battery of instruments as part of a wider study. Complete information about the psychometric properties of each measure in this study is found in Appendix L. Further, measures used in the previous study are described in the appropriate section in the aforementioned study.

*The Reading the Mind in the Eyes Test, Revised Version (Eyes Test-Revised).* The Reading the Mind in the Eyes test (or Eyes Test-Revised; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) is a measure of advanced theory of mind. The test consists of 25 items that require the individuals to look at pictures of the eye region and to choose the word that best describes the emotion or thinking conveyed. This instrument purports to measure attribution of mental state, which is considered to be one aspect of theory of mind skills. The Eyes Test-Revised has been found to be sensitive to subtle differences in social sensitivity or 'mind-reading' (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb,

2001). The available information on the psychometric properties of this instrument appears to indicate that this is acceptable measure of ToM to use in the AS population (see Appendix L for further information).

*The Delis-Kaplin Executive Function System (D-Kefs).* The Delis-Kaplin Executive Function System (D-Kefs; Delis, Kaplan, & Kramer, 2001) is a measure of cognitive functions related to various executive processes including: planning, reasoning, cognitive flexibility, fluency, and inhibition. Because the D-Kefs is intended to provide assessment of broad, yet primarily independent executive functions, each test in this battery may be administered alone or in combination with others. No composite scores are generated, and consequently excluding subtests does not impede interpretation.

The subtests included in the D-Kefs are modifications of well-known traditional tests of EF (Lopez et al., 2005). However, the D-Kefs subtests differ from traditional measures in that several baseline conditions are provided for each EF. As such, this test facilitates isolation of basic cognitive processes (e.g., motor speed and visual scanning skills) that might affect performance on each EF to determine “whether poor performance is due to deficits in more fundamental cognitive skills or deficits in higher-level executive functions” (Delis, Kalpan, & Kramer, 2001, p. 3). Available information on the psychometric properties of the D-Kefs indicates that this is an appropriate measure to use in clinical and non-clinical populations. Table 2.1 provides a summary of the subtests and conditions of interest for the study.

*Table 2.1. D-Kefs Tests and Conditions Included in Study 1*

D-Kefs Test	Purpose	Conditions
Trail Making	To assess flexibility of thinking on a visual motor task	1. visual scanning 2. number sequencing 3. letter sequencing 4. number-letter switching * 5. motor speed
Verbal Fluency	To assess fluent productivity in the verbal domain	1. letter fluency 2. category fluency 3. category switching *
Colour-Word Interference	To assess inhibition of over learned verbal response in order to generate a dissent response	1. colour naming 2. word reading 3. inhibition* 4. inhibition/switching

\* marked conditions are those purported to most accurately reflect traditional EF tasks



### *Analysis*

SPSS Version 15A (SPSS, 2004) was utilized for data analysis. Descriptive statistics, such as means and standard deviations, enabled statistical interpretation and assisted in the examination of distributions for this group. A preliminary validity check was conducted by examining reliability and validity coefficients in comparison to performance for normative groups. Finally, information generated from the computation of Pearson Product Moment correlations was considered in the creation of models for multiple regression procedures. Because the sample size in this study is relatively small, analysis is considered to be exploratory. As such, the findings are to be viewed cautiously.

### *Results*

#### *Data Screening*

All data entry was checked by two researchers simultaneously to ensure all values were entered correctly. Some data was missing at this point, but it was available and entered by both researchers. All data was then rechecked independently by both researchers.

#### *Missing Data*

As required in the informed consent procedures of the appropriate ethical boards, participants were free to decline completion of particular tasks at any time without penalty. As mentioned in the previous study, some participants chose not to/or could not nominate a teacher to complete the BASC-2 forms. Consequently, only 13 of the 25 BASC-2 TRS forms were returned. Further, one parent chose not to complete the BASC-2 PRS. Study 1 provides details on the relationships between the BASC-2 TRS and other variables of interest.

#### *Distributions*

The data were examined for normality and outliers. Further, skewness and kurtosis was examined for each variable to determine if the resulting distributions were sufficiently normal. Skewness reflects the symmetry of the distribution while kurtosis reflects the peakedness of the distribution (Tabachnik & Fidell, 2001). Skewness and kurtosis values for the primary variables in Study 2 are presented in Table 2.2. Values for variables included in both studies are presented in Study 1.

*Table 2.2. Skewness and Kurtosis Values*

Measure	Skewness	Kurtosis
1) Eyes Test-Revised	.23	-.05
2) D-Kefs TM-1(Vis. Scanning)	-.18	-1.24
3) D-Kefs TM-2 (Number Seq.)	-.09	-.79
4) D-Kefs TM-3 (Letter Seq.)	-.13	-1.25
5) D-Kefs TM-4 (Numb-letter Seq.)	-.76	-.05
6) D-Kefs TM-5 (Motor Speed)	-.80	-.78
7) D-Kefs VF-1 (Letter Fluency)	.14	.46
8) D-Kefs VF-2 (Category Fluency)	-.04	.34
9) D-Kefs VF-3 (Correct Response)	-.20	-.80
10) D-Kefs VF-4 (Accuracy)	-.01	-.92
11) D-Kefs CWI-1 (Colour Naming)	-.81	-.17
12) D-Kefs CWI-2 (Word Reading)	-.77	-.12
13) D-Kefs CWI-3 (Inhibition)	-.28	-1.09
14) D-Kefs CWI-4 (Inhibition/Switch)	-.21	-.85

TM - Trail Making  
VF - Verbal Fluency  
CWI - Colour Word Interference

As can be seen in Table 2.2, most of the distributions had skewness and kurtosis values in the excellent range, suggesting that the distributions for this group were sufficiently normal.

*Comparison of ToM and EF Performance to Normative Data*

Raw scores are reported for the Eyes Test-Revised, while the D-Kefs provides age-corrected scaled scores based on a mean of 10 and a standard deviation of 3. Single

sample *t*-tests were conducted to examine whether the AS group differed significantly from the normative group on EF and ToM measures. Two-tailed tests were used as there was not a sufficient literature base to confidently predict the direction of the group results. Results are presented in table 2.3. Results for the EI measures are summarized in detail in the previous study.

*Table 2.3. Single Sample Comparisons of, ToM, and EF Measures for AS Group*

Measure	Asperger Group		
	Mean score	mean diff.	Sig.(two-tailed)
Eyes Test Revised	24.2	-1.80	.015
D-Kefs TM-1 (Visual Scan)	7.2	-2.80	.001
D-Kefs TM-2 (Number Sequence)	7.40	-2.60	.002
D-Kefs TM-3 (Letter Sequence)	7.00	-3.00	.002
D-Kefs TM-4 (N-L Sequence)	8.92	-1.08	.19
D-Kefs TM-5 (Motor Speed)	7.60	-2.40	.005
D-Kefs VF-1 (Letter Fluency)	10.24	.24	.74
D-Kefs VF-2 (Cat. Fluency)	10.84	.84	.34
D- Kefs VF-3 (Cat. switch-correct)	10.84	.84	.17
D-Kefs VF-4 (Cat. Switch accuracy)	10.92	.92	.12
D-Kefs CWI-1 (Color Naming)	8.20	-1.80	.03
D-Kefs CWI-2 (Word reading)	9.00	-1.00	.19
D-kefs CWI-3 (Inhibition)	8.28	-1.72	.09
D-Kefs CWI-4 (Inhibition/Switch)	7.84	-2.16	.02

As discussed in the previous study, comparison of EI results for the AS group revealed that in general, performance on the trait EI measure was impaired for this group. In contrast, an examination of ability EI in the AS group revealed intact or better than expected skills. While the initial results for the ability measure may seem surprising, it was noted that these ability-based tasks required un-timed cognitive reasoning about emotional situations. It appears that when provided with time to process information about emotional interactions, these individuals perform similarly or better than the normative group.

Performance on the BASC-2 PRS and SRP was reported in the previous study. However, it is important to summarize this information as some of the same variables are included in this study. Comparison of scores for the AS group to the normative group revealed a significant weakness on a parent-reported measure of Social Skills  $t_{(24)} = -3.22$ ,  $p = .004$  (two-tailed) and on the Adaptive Composite,  $t_{(24)} = -3.60$ ,  $p = .002$  (two-tailed), supporting the hypothesis that individuals with AS have significantly impaired social outcomes when compared to normative groups. For Social Stress (SRP) and Interpersonal Relations (SRP), the values were lower than the normative group, but not statistically significant.

For the ToM measure, the Eyes Test-revised, results revealed that the AS group scored significantly lower than the normative group,  $t_{(24)} = -2.616$ ,  $p = .015$  (two-tailed). In addition, results for the AS group in this study were compared to the AS group in the test publisher's study, as presented in Table 2.4. The AS group in the this study performed significantly better than the AS group in the standardization study,  $t_{(24)} = 3.634$ ,  $p = .001$  (two-tailed). However, it is important to note that the group in the standardization of this measure was a combined HFA and AS group.

*Table 2.4. Single Sample Comparison of ToM for AS group in Study 2 to AS Group in Standardization Sample*

Measure	Asperger Group		
	Mean score	mean diff.	Sig.(two-tailed)
<b>Eyes Test-Revised</b>	24.2	2.50	.001

Within the EF scale, findings revealed that relative to the normative group, AS subjects performed significantly poorer on the following tasks from the Trail Making Test: Condition 1: Visual Scanning,  $t_{(24)} = -3.75$ ,  $p = .001$  (two-tailed); Condition 2: Number Sequencing,  $t_{(24)} = -3.5$ ,  $p = .002$  (two-tailed); Condition 3: Letter Sequencing,  $t_{(24)} = -3.58$ ,  $p = .002$  (two-tailed); and for Condition 5: Motor Speed,  $t_{(24)} = -3.13$ ,  $p = .005$  (two-tailed). Scores for the group on Condition 4: Number-Letter Switching, the task most similar to the traditional Trail-Making B task were not significant.

No significant differences were noted on any of the conditions of the Verbal Fluency subtest. For all conditions on this subtest, AS participants scored slightly, but not significantly higher than the normative group.

Significant differences between the normative and AS groups were evident on two subtests comprising the Color-Word Interference test. The AS group performed significantly worse than the normative controls on Color-Word Interference 1: Colour Naming,  $t_{(24)} = -2.40$ ,  $p = .03$  (two-tailed) and Colour Word Interference 4: Inhibition/switching,  $t_{(24)} = -2.55$ ,  $p = .02$  (two-tailed). Colour Word Interference 3: Inhibition was approaching significance,  $t_{(24)} = -1.77$ ,  $p = .09$  (two-tailed) and performance on Word Reading was not significant.

#### *Correlations Amongst Variables*

The correlations for the variables in this study are presented in Table 2.5. As mentioned in the previous study, a Bonferroni correction was not applied, given that the study is considered exploratory. Age and VIQ were included in the analysis to examine the extent to which these variables might impact performance. Results indicated that age was negatively correlated with the D-Kefs Color Word Interference subtest: Condition 1: Color Naming. That is, as age increased, participant performance on this particular subtest decreased ( $r = -.40$ ,  $p = .05$ , two-tailed). VIQ was not significantly correlated with any of the variables in this study.

As stated in the previous study, the BASC-2 self-report of Social Stress was negatively correlated with Total EQ as reported on the BarOn EQ-i:S ( $r = -.51$ ,  $p < .01$ , two-tailed). That is, as Social Stress increased, total scores on this measure of trait EI decreased. In addition, a highly significant and positive correlation was found for the BarOn-EQ-i:S total EQ composite and participant's self-report of Interpersonal Skills on the BASC-2 ( $r = .63$ ,  $p < .05$ , two-tailed). However, neither the EF nor ToM variables were significantly correlated with trait EI.

In contrast, three subtests from the D-Kefs demonstrated significant associations with the Total EI score on the MSCEIT. Highly significant associations were noted between the EI score and Trail Making 2: Number Sequencing ( $r = .54$ ,  $p = .005$ , two-tailed) and with Trail Making 4: Number-Letter Switching ( $r = .42$ ,  $p = .04$ , two-tailed). EI

was also significantly associated with Verbal Fluency 3: Category Switching Total Correct ( $r = .46, p = .02$ , two-tailed).

For the ToM measure, the Eyes Test-Revised, strong associations were demonstrated with three conditions from the Trail Making test: Trail Making 1: Visual Scanning ( $r = .59, p = .002$ , two-tailed); Trail Making 2: Number Sequence ( $r = .45, p = .02$ , two-tailed); and Trail Making 3: Letter Sequence ( $r = .60, p = .001$ , two-tailed). Low to moderate and non-significant correlations were noted for the Condition 4: Number-Letter Switching, which is most similar to classic Trail Making B test ( $r = .26, p = .22$ , two-tailed).

Inter-correlations for the BASC-2 SRP Interpersonal Relations and Social Stress scale were demonstrated to be inverse and significant ( $r = -.67, p < .001$ , two-tailed) and for the BASC-2 PRS Adaptive Composite and Social Skills scales ( $r = .72, p < .001$ , two-tailed). These values are similar to those provided for inter-correlations in the BASC-2 manual (Reynolds & Kamphaus, 2004).

The D-Kefs technical manual provides information about inter-correlations for conditions within subtests (Delis, Kaplan, & Kramer, 2001). As mentioned previously, each D-Kefs subtest contains several ‘conditions’ provided to enable an examination of the effect of impairments in basic cognitive processes on the EF. As such, it is important to note that only one condition in each subtest truly reflects an EF. However, examination of the EF task without attending to performance on the basic cognitive processes is inappropriate. Further, the associations between conditions within each subtest reveals information about how the processes occur within a particular population. Thus, both the baseline and traditional EF ‘conditions’ from the D-Kefs were included in correlational analysis. Table 2.6 details the correlations found for variables in this study. To illustrate how performance for the AS group differed from the normative group, values provided for the normative group (aged 8-19) in the D-Kefs technical manual are noted in parentheses.

Table 2.5. Zero Order Correlations Amongst Variables

1. Age	2. VIQ	3. BarOn Total EQ	4. MSCEIT Total EI	5. Eyes	6. BASC-2 SRP SS	7. BASC-2 SRP IR	8. BASC-2 PRS AC	9. BASC-2 PRS SS	10. DKEFS TM 1	11. DKEFS TM 2	12. DKEFS TM3	13. DKEFS TM 4	14. DKEFS TM 5	15. DKEFS VF 1	16. DKEFS VF 2	17. DKEFS VF3 Correct	18. DKEFS VF 4 Acc.	19. DKEFS CWI 1	20. DKEFS CWI 2	21. DKEFS CWI 3	22. DKEFS CWI 4										
1	-	-.03	-.07	.13	-.01	.03	.22	.24	-.01	-.10	.08	-.02	.34	-.13	-.05	-.08	-.14	-.40*	-.23	-.22	-.35										
2			.06	.30	.04	-.10	.08	.10	-.03	.10	.11	.08	.04	-.02	.12	.20	.33	.39	.23	.02	.37	.15									
3					-.05	.51**	.63**	.18	.01	-.02	-.11	-.18	-.13	-.09	.01	.12	.23	-.01	-.20	.04	-.08	-.15									
4					-.17	-.15	-.21	.28	.01	.36	.54**	.36	.42*	.22	.04	-.01	.46*	.26	.34	.22	.36	.32									
5						.38	-.30	.21	.19	.59**	.45*	.60**	.26	.17	.30	.21	.08	.04	.31	.16	.34	.31									
6							-.67**	.03	.05	.16	-.01	.15	.08	.05	-.02	.10	.06	.13	-.01	-.23	-.08	.10									
7								-.04	-.01	-.24	-.33	-.35	-.21	-.10	.09	.11	-.01	-.14	-.24	.01	-.14	-.30									
8									.72**	.32	.26	.36	.36	.22	-.18	.26	.28	.07	.02	.03	.18	.15									
9											.22	-.05	.15	.11	.10	-.31	-.07	-.19	-.34	-.22	-.26	-.06	-.07								
10													.71**	.73**	.55**	.42*	.46*	.34	.20	.16	.65**	.35	.58**	.64**							
11																		.75**	.59**	.71**	.69**										
12																				.57**	.40*	.61**	.59**								
13																					.56**	.54**	.62**								
14																						.56**	.54**	.60**							
15																							.56**	.54**	.60**						
16																								.56**	.54**	.60**					
17																									.56**	.54**	.60**				
18																										.56**	.54**	.60**			
19																											.56**	.54**	.60**		
20																												.56**	.54**	.60**	
21																													.56**	.54**	.60**

\* $p < .05$ ; \*\* $p < .01$ ; two-tailed

For the Trail Making test, many inter-correlations found for the AS group were higher than expected. For example, Trail Making 1 and Trail Making 2 were highly correlated ( $r = .71, p < .001$ , two-tailed), while for the normative group, a moderate correlation ( $r = .38$ ) was found. As is shown in Table 2.6, similar differences were evident for most of the conditions of the Trail Making test, where values found for the AS group were significantly higher than those listed for the normative group. This may have implications for the factor structure of these tasks for the AS group. Likewise, for the conditions of the Colour-Word Interference test, some unusual values were exhibited by the AS group. Of particular note, Color-Word 1 and Color-Word 4 were highly related for this group ( $r = .84, p < .001$ , two-tailed), while the manual lists a very low correlation for these conditions ( $r = .06$ ). For the AS group, inter-correlations between conditions was much higher than for the normative group for most of the variables. These results seem to indicate that baseline skills are more related to EF performance for the Trail Making and Color-Word Interference tests in the AS group than is the case in the normative group. Finally, for the conditions of the Verbal Fluency test, the inter-correlations for the most part were slightly higher, yet similar to those presented in the manual for the normative group.



Table 2.6. Inter-correlations for D-Kefs Subtest Conditions for the AS Group

	1. TM1	2. TM2	3. TM3	4. TM4	5. TM5	6. VF1	7. VF2	8. VF3 (correct)	9. VF3 (Acc.)	10. CWI1	11. CWI2	12. CWI3	13. CWI4
1		.71** (.38)	.73** (.36)	.55** (.24)	.42* (.28)	.46* (.33)	.34	.20	.16	.65**	.35	.58**	.64**
2		-	.84** (.54)	.66** (.43)	.39 (.33)	.46*	.39	.42*	.27	.75**	.59**	.71**	.69**
3			-	.56** (.45)	.54** (.36)	.41*	.33	.33	.25	.57**	.40*	.61**	.59**
4				-	.56** (.23)	.38	.35	.42*	.31	.65**	.54**	.60**	.62**
5					-	.35	.20	.37	.29	.14	-.02	.08	.12
6						-	.68** (.55)	.34 (.40)	.37 (.29)	.50*	.33	.55**	.52**
7							-	.63** (.47)	.53** (.34)	.41*	.28	.45*	.35
8								-	.82** (.72)	.27	.09	.22	.19
9									-	.33	.06	.19	.24
10										-	.77** (.57)	.84** (.49)	.84** (.06)
11											-	.72** (.45)	.71** (.42)
12												-	.89** (.57)

\* $p < .05$ ; \*\* $p < .01$ ; two-tailed

### *Prediction of Social Outcomes*

To examine prediction of social outcomes, a series of multiple regression equations was planned. However, as per guidelines for multiple regression (Tabachnick & Fidell, 2007), only those variables that were at least moderately correlated ( $>.30$ ) with the outcome variables were retained for inclusion in the procedures. Only one EF variable (Verbal Fluency-Accuracy) met the standards suggested by Tabachnick & Fidell (2001). However, the outcome variable to which this particular variable was moderately related was not one of the variables of interest for this study. As such, the verbal fluency variable was not entered into regression procedures. Thus, no EF variables were maintained for regression procedures in this study. However, given the low correlations exhibited between EF and outcome variables, the prediction rate would likely have been minimal if they were retained and included.

Likewise, outcome variables retained for regression procedures included only those that demonstrated correlations of at least  $.30$  with predictor variables. Using this standard, only two outcome variables were included in the regression procedures for this study: BASC-2 Social Stress and BASC-2 Interpersonal Relations. Table 2.7 presents the variables that were include in the multiple regression procedures.

*Table 2.7. Variables for Multiple Regression Analysis*

<b>Model and Predictor Variables (IVs)</b>	<b>Dependant Variable</b>
Model 1 BarOn EQ-i:S Total EQ MSCEIT Total EIQ Eyes Test-Revised	Interpersonal Skills (SRP)
Model 2 BarOn EQ-i:S Total EQ Eyes Test-Revised	Social Stress (SRP)

The standard method was chosen for regression procedures as it is the most conservative and recommended approach for small samples sizes (Brace et al., 2006). Using the standard method, a significant model emerged:  $F_{(2,22)} = 12.24$ ,  $p = .0005$ . The model explains 58 % of the variance (Adjusted  $R^2 = .58$ ). Only the EI variables were

significant predictors in this model. Table 2.8 provides information for the predictor variables entered into the model. Collinearity diagnostics for this procedure were within acceptable guidelines.

*Table 2.8. Standardised Regression Coefficients for Model Predicting Interpersonal Skills*

<b>Predictor Variable</b>	<b>Beta</b>	<b>P</b>
BarOn Total EQ	.77	.0005
MSCEIT Total EIQ	-.44	.005
Eyes Test-Revised	-.189	.176

Multiple regression was conducted to explore the prediction of social outcomes via the Self-report of Social Stress from the BASC-2. Based on information gathered from a previous study, the MSCEIT EIQ was not entered into the regression formula for this particular outcome variable, as it was not found to be a significant predictor of Social Stress. Again, using the standard method, a significant model emerged:  $F_{(2,22)} = 6.81, p = .005$ . Employing the more conservative  $R^2$  value, the model explained 33 % of the variance. Table 2.9 provides information for the predictor variables entered into the model. Both the BarOn EQ-i:S Total EQ and the Eyes Test-Revised were significant predictors in this model. Again, collinearity diagnostics were within acceptable guidelines.

*Table 2.9. Standardised Regression Coefficients for Model Predicting Social Stress*

<b>Predictor Variable</b>	<b>Beta</b>	<b>P</b>
Baron Total EQ	-.49	.008
Eyes Test-Revised	.36	.05

### *Discussion*

The results of this study revealed that trait and ability EI, but not ToM predicted self-reported interpersonal skills for individuals with AS. However, Trait EI together with ToM predicted self-reported Social Stress for this same group of individuals. While it

was anticipated that EF variables would be entered into regression equations, the subtests fractured when used in this particular group of individuals. Thus, it was inappropriate to enter these variables into regression analysis. Moreover, the correlations between the EF variables and outcome variables were low, which also precluded their use in multiple regression procedures. These low correlations were consistent with a recent study that showed that for individuals with autism spectrum disorders, EFs predict communication symptoms, but not social interaction difficulties (Joseph & Tager-Flusberg, 2004). While the phenomenon of low correlations between EF and outcome variables confounded analyses for this study, it is widely acknowledged that the complexity of neuropsychological functions may produce diverse and distinct patterns for clinical groups (Franzen, 2000). As such, findings in clinical groups can be confounded by the nature of the brain damage typically present (Delis et al., 2001). For example, Delis and colleagues (2001) suggest that cognitive functions which correlate in individuals with typically developing brains may load on one factor, while for individuals with brain-based pathologies; vital processes can be disrupted and dissociated. It appears that this is precisely what occurred in this study.

For the AS group, only one of the traditional EF tasks, Condition 4: Color-Word Interference (Inhibition/Switching), was impaired. However, the AS group demonstrated impairments in many of the baseline skills considered to be sub-skills required for effective executive processes. Results are discussed in the context of the literature and suggestions for future research.

#### *EI, ToM, and EF in AS*

As mentioned in Study 1, individuals with AS were impaired in trait EI but performed similarly or better than the normative group on ability EI. Analysis of patterns of performance revealed interesting information that has implications for interventions for individuals with these characteristics. More specifically, in un-timed situations, individuals with AS performed significantly better than normative controls on a task measuring the ability to identify emotions and recognize related emotional concepts (MSCEIT: Understanding Emotions). Further, the AS group performed significantly better than the normative group on Perceiving Emotions, a branch that measures the ability to recognise ones own and others' emotions. Finally, the AS group performed

significantly better than the normative group on Using Emotions, a branch purporting to measure how an individual's thoughts and thought processes are informed by their own emotional experiences. Together, results on the ability EI measures indicated that when provided with the time to reason through information, individuals with AS were not impaired in the cognitive processes involved in decoding and responding to emotional situations. In contrast, the same group reported impairments in their actual social interactions involving emotional exchanges, as measured by the trait EI measure. As mentioned in study 1, these findings suggest that for this particular group, there is a gap between knowledge and performance in real-life social situations. That is, while individuals with AS have the knowledge and cognitive ability to reason with emotional information, their application in real-life settings is impaired.

In this study, ToM performance was compared to the normative and combined AS/HFA group described in the standardization study for the Eyes Test-Revised (Baron-Cohen et al., 1997). The results for the AS group in this study revealed significantly lower scores than the normative group, yet significantly higher scores than the combined AS/HFA group. Consequently, it appears that our group of prototypical AS individuals performed better than those with HFA and AS combined, but were still impaired in ToM when compared to normative controls. Thus, the AS group demonstrated more subtle impairments than a combined group, but showed significant impairments nonetheless.

Comparisons of the AS group to the normative group were conducted to identify areas of difficulty on EF tasks. For the Trail Making subtest, which is thought to measure cognitive flexibility with novel nonverbal information, impaired performance was shown on the baseline tasks (Visual Scanning, Number Sequencing, Letter Sequencing, and Motor Speed) but not on the classic EF task (Condition 4: Number-Letter Switching). This finding illustrates that while this group of individual with AS was impaired in the basic cognitive functions which contribute to the traditional EF task, the actual EF was not impaired. This finding supports Kleinhans et al. (2005) argument that poor performance of individuals with autism spectrum disorders on EF tasks similar to trail Making B in previous research (Minshew, Golstein, & Seigel, 1997; Rumsey & Hanburger, 1988) indicates impairment in “multiple fundamental and higher order cognitive skills” (p. 380), rather than impairment in EFs. Further, these results are

consistent with Kleinmans, Akshoomoff, and Delis's (2005) findings, where a slight, but not statistically significant, impairment was noted for this same condition for a combined group of individuals with AS and HFA. The finding of impairment on baseline measures, but not on the higher order EF, is potentially important information generated from this study, as it indicates that basic cognitive skills which may contribute to EF are impaired for this group.

In contrast to the impairment in basic cognitive functions noted for the Trail Making subtest, intact skills were found for the AS group on all conditions on the Verbal Fluency subtest. The Verbal Fluency subtest purports to measure an individual's ability to "generate words fluently in an effortful phonemic format (Letter Fluency), from over-learned concepts (Category Fluency), while simultaneously shifting between over-learned concepts (Category Switching) (Delis, Kaplan, & Kramer, 2001, p. 55). The results from this study are consistent with previous research suggesting that this particular type of task is not problematic for those with AS or HFA (Boucher et al., 2005; Dunn, Gomes, & Sebastian, 1996; Manjiviona & Prior, 1999). However, results for this study differ from the findings of Kleinmans and colleagues (2005) where the combined HFA and AS group had impaired performance on the baseline Letter Fluency task (Condition 1) and on Category Switching Correct (Condition 3). For the baseline task, examination of individual results in this AS group revealed considerable variability (standard scores range from 3 to 17;  $M = 10.24$ ;  $SD = 3.56$ ). Examination of scatter plots provided for Kleinmans et al. (2005) revealed a similar situation. However, less variability was present for the AS group in this study on Condition 3: Category Switching Correct (standard scores ranged from 5-15,  $M = 10.84$ ;  $SD = 2.95$ ), suggesting that while some of the baseline skills may be problematic for some individuals, the EF ability for the group as a whole remains intact.

Finally, the AS group was compared to the normative group on the Color-Word Interference subtest. This subtest is similar to the traditional Stroop task (Stroop, 1935) which is thought to measure verbal inhibition. However, the authors of the D-Kefs argue that lower-order tasks, such as word reading and colour identification, affect performance on this EF (Delis et al., 2001). As such, baseline conditions are provided to enable examination of specific cognitive functions in relation to the traditional EF task. Further,

as well as the classic Stroop task, a set-switching condition is provided to measure cognitive flexibility. Comparison of the AS group to the normative group revealed significant impairments for Colour Naming and for Inhibition/Switching (verbal inhibition and cognitive flexibility), but not for Colour Reading or for Inhibition alone. As such, it appears that it is the switching aspect which is most problematic for those with AS. This indicates that while verbal inhibition is not a significant problem for this group, switching from an over-learned task (word reading) to a novel task (saying the colour instead of reading the word) was problematic. A tendency towards perseveration (sticking to an over-learned response regardless of explicit instruction) may exacerbate difficulties with this particular EF (Ozonoff & Jensen, 1999; Ozonoff, Pennington et al., 1991a).

For the Color Naming condition of the Color-Word Inhibition subtest, the findings for this study were similar to those found by Kleinhans and colleagues (2005) where below average performance was reported ( $M = 8.2$ ;  $SD = 2.8$ ). While significance levels were not reported for the individual conditions in the Kleinhans et al. (2005) study, the group in this study revealed similar results which were statistically significant ( $M = 8.2$ ;  $SD = 3.8$ ,  $p = .03$ ). In contrast, the AS group in this study revealed significant cognitive set-switching difficulties, while Kleinhans et al.'s combined AS/HFA group performed similarly to the normative group. For this study, individuals were not excluded if they identified co-existing psychological conditions, such as AD/HD. This inclusion criterion was designed to preserve sample size and reflect actual characteristics experienced in the general AS population. As detailed in the demographic information provided in Study 1, 10 of 25 participants identified this particular co-existing diagnosis. When compared to estimates for this particular combination, where some researchers report that 4 out of 5 individuals with AS also have AD/HD (Ehlers & Gillberg, 1993; Ghaziuddin et al., 1998), our group actually reported fewer cases of AD/HD than would be predicted. Given the difficulties demonstrated for individuals with AD/HD on tasks of cognitive flexibility (Barkley, 1997a; Geurts, Verter, Oosterlaan, Roeyers, & Sergeant, 2004; Ozonoff & Jensen, 1999; Willcutt et al., 2001), it is important to examine results of similar studies with this information in mind. Thus, it is not clear if the findings of

difficulty with the Inhibition/Switching condition reflects EF difficulties because of AS or AD/HD.

Although Kleinhans et al. (2005) did not indicate whether or not individuals with co-morbid conditions were excluded for their study, participants were described as taking medications commonly prescribed to treat anxiety, depression, and AD/HD. In contrast, while Ambery and colleagues (2006) ensured that individuals with language delays were not included in their study, they excluded individuals with co-morbid conditions, such as AD/HD and did not find deficits in inhibition. This illustrates the diversity of practice in the literature and the difficulty of comparing results of the few existing studies that purport to measure EF in individuals with AS. While the inclusion of individuals with co-existing AD/HD confounds the results of this study, it also provides insight into what the daily experience of the typical individual with AS might be, given the high reported rate of co-morbid AS and AD/HD (Ehlers & Gillberg, 1993; Ghaziuddin et al., 1998).

While a large body of research examines EF in individuals with autism, there has been limited research focussing specifically on AS, particularly with reference to young adults (Ambery et al., 2006). Examination of the literature reveals considerable variability in research findings. For example, some researchers have found deficits in verbal fluency (Ambery et al., 2006; Rumsey & Hanburger, 1988), while others have found intact verbal fluency (Manjiviona & Prior, 1999; Rumsey & Hanburger, 1988). Others have found difficulties with inhibition (Kleinhans et al., 2005), while others have found the opposite (Ambery et al., 2006; Kleinhans et al., 2005). Close examination of the literature reveals inconsistent and differing operational definitions for AS (e.g. sometime AS and HFA are combined) and differing approaches to exclusion criteria, which again makes comparison across studies difficult. Consequently, the results from this study should be considered in light of similar groups only.

In summary, it appears that the AS group in this study had intact verbal fluency (as per Verbal Fluency) and nonverbal cognitive flexibility (Trail Making), but demonstrated impaired set-switching (as per the Stroop-like Colour-Word Interference). As mentioned, it is important to note that many individuals in this AS group reported also having a diagnosis of AD/HD. Moreover, individuals with AD/HD are thought to have a core deficit in inhibition (Barkley, 1997a, 1997b; B. F. Pennington & Ozonoff, 1996) and



perform poorly on tests of cognitive flexibility, such as the Stroop task (Barkley, Grodzinsky, & Dupaul, 1992; Ozonoff & Jensen, 1999; Willcutt et al., 2001). While this particular group did not demonstrate significant impairment in inhibition, they did demonstrate statistically significant impairment with a cognitive flexibility (Inhibition/Switching) task. Some researchers have found that individuals with AD/HD have more severe impairments in cognitive flexibility than do those with autism spectrum disorders (Geurts et al., 2004). In contrast, in a study where age and IQ were controlled and AD/HD individuals were compared to autism spectrum and typically developing controls, individuals with AD/HD had less profound EF impairments than those with autism spectrum disorders (Happé, Booth, Charlton, & Hughes, 2006). In light of this conflicting information and the high rate of co-morbid AD/HD diagnoses for the participants in this study, the results of this study should be considered to reveal potentially important and practical information about many, but not all individuals with AS. In particular, this information is most applicable for individuals with both AS and AD/HD, but perhaps not for those with only AS.

Finally, in relation to examination of EFs in AS, it is important to note that many have questioned the primacy of EF deficits for the social difficulties of those with AS (Ozonoff & Schetter, 2007). The results for this study demonstrated that only one EF (cognitive flexibility with verbal information) was impaired. These results were likely impacted by the inclusion of individuals with AD/HD in the AS group.

#### *EI, ToM, EF and Social Outcomes (Associations and Predictions)*

As mentioned in Study 1, both self- and parent-reports of social outcomes revealed that individuals with AS demonstrated social impairments. Further, results indicated that together, total EI scores for ability and trait measures predicted 51% of the variance for self-reports of Interpersonal Skills. Trait EI alone predicted 19% of the variance for self-reported Social Stress. Finally, the Adaptability scale from the trait measure and Understanding Emotions branch from the ability EI scale predicted 31% of the variance for parent reports of Social Skills.

In Study 2, correlations were computed for EF and ToM variables. However, an unusual pattern of correlations for the EF scales (distinctly different from those reported for the subtests in the technical manual) meant that they were not appropriate to include

in regression analyses. Further, because EF did not demonstrate at least a moderate correlations with outcome variables, further exploration using EF variables as predictors was not conducted. Consequently, only ToM was retained to explore potential improvements to prediction for the self-report outcome variables.

Results of refinements to the regressions conducted in Study 1 revealed that ToM and trait EI together predicted 33% of the variance for self-reported social stress. This was an improvement on the model provided in Study 1, where trait EI alone predicted 19% of the variance. In contrast, ToM did not significantly contribute to the prediction of self-reported interpersonal skills. These results indicate that ToM is a useful addition to understanding perceived social stress in this AS group, however, it does not account for poor social interactions in individuals with AS. The findings support the assertion that EI predicts important social outcomes (Austin et al., 2005; Brackett et al., 2004) and have implications for investigations of EI interventions for the AS group. For example, if improving both EI and ToM decreases social stress, then targeting both may be helpful for adults with AS. Further, clinicians may find it helpful to include both EI and ToM measures in their assessment batteries when the referral question is concerned with levels of social stress.

#### *Limitations*

While the results of this study impact intervention research, the primary purpose of this study was to examine EI, EF, and ToM as a predictors of social outcome in AS. This study highlights some preliminary information that may be helpful in designing subsequent studies. Appropriate experimental designs should be considered to test whether improving EI and ToM decreases social stress. Further, several limitations mean that the results of this study should be interpreted with caution. The relatively small sample size and the use of an accessible, rather than randomly selected sample limits the generalizability of the findings. In addition, this study incorporated several self-report measures as predictor and outcome variables. Thus, future studies should to incorporate additional types of measures, such as observational information to confirm these findings. Further, participants in this study reported a high rate of co-existing AD/HD diagnosis. While this appears to be very common in the AS population (Ehlers & Gillberg, 1993; Ghaziuddin et al., 1998), the findings for this study are limited by this phenomenon. In

addition, this study did not examine causation of poor social outcomes in AS. Randomized or quasi-randomized experimental designs would be required to test the proposed model and its implications for causation.

Finally, because of the unusual results with EF measures, it would be helpful for future research to examine expected patterns of performance in clinical groups including AS. Moreover, the inclusion of additional EF measures, such as the Wisconsin Card Sort and Iowa Gambling task, would be helpful to fully understand EFs in individuals with AS.

## CHAPTER 4

### *General Discussion and Integration of Studies*

Individuals with AS suffer from severe and sustained impairments in social interaction. These impairments have been thought to contribute to poor outcomes including affective problems, anxiety issues, and conduct disorders (Ghaziuddin et al., 1998; Szatmari et al., 1989; Tantam, 1988, 2000). Although both studies are considered exploratory because of methodological limitations (limited by sample size and the use of an accessible sample), a number of interesting trends are revealed.

Study 1 demonstrated that ability and trait EI together provided useful information to assist in understanding social outcomes for individuals with AS. While the AS group demonstrated impaired trait EI, they performed as well as or significantly better than normative controls on ability EI. The results indicated that cognitive aspects of processing emotional information were intact, while actual performance in real life settings was problematic. A potential implication of Study 1 is that interventions should not focus on teaching knowledge level information about social interactions (i.e., what facial expressions mean, how emotions relate, etc.) to individuals with AS. Rather, interventions for this particular group should focus on automatizing responses in emotional situations, teaching coping tools that can extend processing time, and providing guided and repeated practice in various social settings to increase generalization.

In addition to providing useful information on which to build interventions, Study 1 explored EI measures for the prediction of various social outcomes in individuals with AS. The results indicated that trait and ability EI combined, predicted 57% of the variance for interpersonal skills, while trait EI alone predicted 19 % of the variance for social stress. Finally, the BarOn-EQ-i:S Adaptability scale (Bar-On, 2002) combined with the MSCEIT Understanding Emotions scale (Mayer et al., 2002a) predicted 31 % of the variance for parent reports of social skills. This finding suggests that EI measures can be used to predict the level of social impairment in individuals with AS, particularly with reference to parent-reported social difficulties. As such, it may be helpful for clinicians to include EI measures, rather than relying solely on self- and parent-reports, when conducting assessments designed to measure social outcomes in those with AS.

The finding that trait EI is impaired, while ability EI is intact may lead to research that examines whether strengths in ability EI can be used to compensate for poor trait EI. For example, future projects may be designed to teach individuals with AS to use their strong reasoning skills for emotional information to assist in advance planning and practice for potential responses in social situations. Further, such investigations may examine whether awareness of strengths and weakness and/or teaching skills to extend the time to process information in natural situations improves social competence. Randomized control designs, combined with third party ratings, would be most appropriate for these types of investigations.

While Study 1 examined EI as it relates to social outcomes in AS, Study 2 was designed to extend Study 1 and determine whether incorporating EF and ToM, two leading explanations for the social difficulties in AS, can improve the prediction of social outcomes. As such, EF and ToM were examined for their correlations with the variables included in Study 1 and as additional predictors of social outcomes. While interesting descriptive information was generated about the AS group on EF measures, low correlations with the outcome variables specific to this study precluded their inclusion in regression models. This was not surprising, given that research indicates that EF predicts variance in communication symptoms, but not social interaction in the AS group (Joseph & Tager-Flusberg, 2004). In contrast to the results for EF, using ToM in combination with trait EI improved the prediction of the variance for social stress from 19% (when using trait EI alone) to 33%. The implication for clinical practice is that using EI and ToM measures together is likely to yield better information regarding social stress levels of those with AS. Further, interventions incorporating both EI and ToM may be considered appropriate when social stress is an area of concern.

The findings from these two studies are important for several reasons. First, these studies, in conjunction with a broader project (see Chapter One for details), are some of the first explorations of EI in the AS group. In addition, results indicate that EI is a useful construct to enhance understanding of the emotional and social characteristics of young adults with AS. Further, EI predicted important social outcomes for youth with AS, and thus interventions focussing on EI hold promise to improve these areas. Finally, using ToM and EI together provided important information about social stress in individuals

with AS. As such, randomized control studies that systematically vary instruction in aspects of EI and ToM (singly and together) could determine if this intervention decreases social stress.

While the exploration of EF in individuals with AS (Study 2) revealed that only cognitive flexibility (set-switching) was impaired, various directions for future research were revealed. The limited and conflicting findings in existing research on EF in individuals with AS warrants further examination. Some suggest that EFs are the core deficit in ADHD (Barkley, 1997a), while others suggest the EFs are more impaired in autism spectrum disorders (Geurts et al., 2004). Thus, studies designed to characterise the experiences of ‘typical’ individuals with AS should continue to include those with co-morbidities such as AD/HD in participant groupings, as this reflects the high rates of co-morbidity in the AS population. However, studies aimed at investigating, for example, the primary neuropsychological impairments for this particular disorder should exclude individuals with AD/HD and perhaps other co-morbidities reflecting neuropsychological impairment (e.g., Tourette’s syndrome, learning disability, etc.). Further, the inclusion of a broader battery of EF tests would assist in comparison across studies and would be helpful in understanding specific areas of strength and impairment for individuals with AS. Moreover, comprehensive examinations of patterns of EF on various measures would be useful to address the difficulty identified in Study 2 that individuals with AS exhibited unusual relationships between their basic cognitive skills and EFs when compared to the standardization sample for the D-Kefs. Research of this nature is vitally important to understanding AS and designing interventions which have the potential to improve outcome and overall quality of life.

As mentioned previously, much of the existing research on AS has examined heterogeneous groups of individuals with various conditions similar to AS (HFA and PDD-NOS). Because the AS group itself is heterogonous, future studies should contain exclusion and inclusion criteria that restricts groups to only those individuals with prototypical AS characteristics to most accurately reflect those in this group. The use of rigid and replicable criteria will enable better description of core characteristics and allow researchers to compare results across studies. Furthermore, studies including individuals from similar diagnostic groups should explicitly differentiate between groups to enable

examinations of differences between subtypes on the spectrum. Alternatively, studies employing a posteriori design (e.g. cluster analysis) may be useful to determine differences between those with AS and similar groups. This type of approach will be particularly helpful if diagnostic procedures are applied after the data analysis to confirm and validate the findings.

One of the limitations of these studies was that social outcomes were measured only by self and parent report on a broad measure of behaviour and personality (BASC-2). For future studies, it would be helpful to incorporate both standardized tests specifically designed to assess a range of social skills in young adults and naturalistic measures of social behaviours (e.g. observational information). In this way, researchers could be more confident that the range of competencies and problems those with AS encounter in social interactions are fully characterised. In addition, since only one measure of ToM was included in Study 2, future studies may want to confirm and expand upon the findings by incorporating additional ToM measures. This will ensure that the findings are not a result of an idiosyncrasy particular to the test that was selected (the Eye Test-Revised).

In addition to including more measures of ToM and EF in future studies, it may be helpful to collect more concrete information from participants that may relate to adaptive outcomes in AS. For example, collecting information about important life outcomes, like relationship status, educational attainment, employment status, and the amount of support required from health and community services, would enhance the characterization of this particular group of individuals and allow researchers to explore whether interventions that include EI components enhance quality of life for those with AS. Further, the broader research project described earlier includes an extension of these studies that examines the constructs of resiliency (having adaptive outcomes, in spite of exposure to high levels of risk) and life satisfaction. Inclusion of measures of real life outcomes (such as relationship status, educational attainment, etc) would elucidate how these theoretical concepts relate to real life outcomes. Moreover, understanding which particular aspects of social skills, EI, ToM, and EF improve outcomes and predict resiliency is important for clinicians designing interventions for those with AS. While these studies did not examine additional clinical outcomes (such as depression and

anxiety), in future studies, the data generated from the outcome measures in these studies can be further examined to explore predication of these maladaptive outcomes. This may further clarify the experience of those with AS. For example, it appears that on the Depression Index of the BASC-2, the AS group in this study demonstrated significant levels of depression when compared to the normative group. Examination of this particular outcome was not planned in the design of the original studies; however, future research should examine these important outcomes with reference to how EI can be used to understand mental health.

In addition to enhancing general understanding of the characteristics of individuals with AS, these studies generated information that may be of interest to those researching the EI construct. Specifically, the implication of the finding that those with AS performed poorer on trait than ability EI provides some evidence for the construct validation of EI. That is, the evidence that those who struggle with social situations are indeed impaired in trait EI provides support for that particular construct and provides practical examples of the import of EI for daily functioning. With reference to ability EI, the intact skills demonstrated by the AS group provides support that the two models are measuring distinct aspects of the construct. Moreover, the finding that individuals can have intact ability EI, while demonstrating impaired trait EI confirms the hypotheses that using measures of both forms of EI can provide complimentary information that may be important for individualized assessment and intervention. Thus, clinicians examining social difficulties in individuals with AS should be encouraged to use measures from both models to generate the most appropriate intervention information.

This examination of EI in individuals with AS may lead to similar examinations of impaired social functioning in other clinical groups. For example, individuals with AD/HD, learning disabilities, and fetal alcohol spectrum disorder demonstrate significant social deficits. Further evidence to support the EI construct may be generated from explorations of the performance of these clinical groups on EI measures. Moreover, it may be useful to compare these clinical groups to each other to fully understand how differing levels of EI impact daily functioning. The studies described in this manuscript may provide a framework to extend this investigation to other groups.



In summary, the findings from Study 1 and 2 indicate that using EI in assessment batteries provides useful information about the characteristics of those with AS that impacts intervention planning. Further, ToM and EI together predict important social outcomes, and thus examinations of interventions incorporating training and practice with skills considered to be part of these constructs will be an important next step for this program of research. Current efforts are underway to establish networks to facilitate larger scale studies. As such, future research will aim to enhance generalization of the concepts explored in these studies by expanding the geographical region from which participants are recruited. In this way, random selection will be more possible, and thus findings will be generalizable to the AS population.

The studies described in this manuscript provide a framework for future investigations of EI and social outcomes in clinical groups. Moreover, extensions of this project may provide information about resiliency and life satisfaction to impart a better understanding of outcomes for those with AS. Finally, this exploration of EI in young adults with AS generated interesting and useful information about the characteristics of this group, which revealed promising approaches to intervention planning and a range of potential lines of research to pursue for future studies. It is anticipated that continued exploration of the characteristics of young adults with AS will have a positive impact on life outcomes and quality of life for those who live with this condition.

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## Appendices

### *APPENDIX A: Parent/Guardian Consent Form*

You and your child are invited to participate in a study entitled, “**Emotional Intelligence and Resiliency in Individuals with Asperger Syndrome**”. Please read this form carefully and feel free to ask any question you may have. Also, feel free to discuss this information with your son/daughter.

#### **Purpose and Procedure**

The main objective of this study is to obtain information towards answering the questions:

What assessment tools are most appropriate to use in understanding social and emotional abilities in youth diagnosed with Asperger syndrome?

Can emotional skills provide an alternate or complimentary explanation for the social challenges faced by individuals with Asperger syndrome?

This study will investigate the emotional and social abilities of youth (aged 17-21) with Asperger syndrome (or Asperger syndrome) by analysing performance on various tests of emotional, social, and cognitive abilities. These tests are intended to measure attentional, memory, social and emotional abilities, as well as organizational and planning skills. Finally, we are interested in abilities that best promote social and emotional resiliency in youth with Asperger syndrome. In order to obtain multiple perspectives about the emotional and social abilities of the youth participants, additional information will be gathered from parents/guardians and teachers/instructors of individuals with Asperger syndrome who have also agreed to participate in this study.

The amount of time needed for participation in this study will vary. Some participants will complete only one **15-20 minute task**, while others will complete multiple tasks and questionnaires that will take **approximately 4-5 hours to complete**. Parents/guardians of participants who are minors will be asked to remain at the research site for the initial 15-20 minutes. Upon completion of the initial measure, youth and their parents/guardians will be informed as to whether or not the full 4-5 hour session will occur. It is preferable if your son/daughter is available for the entire time on the day of the testing.

In order to understand your child from multiple perspectives, a parent/guardian and a teacher/instructor will also be asked to complete questionnaires regarding the social and emotional abilities of the youth with Asperger syndrome. Guardians will be required to commit 45-60 minutes of their time, and it is anticipated that teachers will need approximately 15 minutes to complete the required questionnaire.

#### **Potential Risks**

There are no known discomforts or risks associated with this study. The study involves simple tasks and questionnaires.

### **Potential Benefits**

It is expected that the information collected in this study will provide us with a better understanding of the social and emotional characteristics of individuals with Asperger syndrome. There is surprisingly little research examining the social and emotional abilities that best promote success and resiliency in youth in Asperger syndrome. The researchers involved in this study believe that it is important to understand these characteristics because youth with Asperger syndrome are likely to encounter many social and emotional challenges, particularly in the transition to adulthood.

We expect that the results of this study will be helpful for scientists and professionals around the world interested in social and emotional abilities of youth with Asperger syndrome. We want to thank you very much in advance for your help in furthering this research.

### **Confidentiality**

Data generated from this study are primarily intended to be used in doctoral and master's level student research. All materials will be stored in a locked facility by the researcher or one of the committee members, Dr. Vicki Schwean, Dr. Don Saklofske, Dr. Brian Noonan, or Dr. Laurie Hellsten. While the information generated from this study may be published and/or presented at academic conferences, the data will be reported in aggregate form, which ensures individual participants are not identifiable. **Please understand that all information collected during the course of this study will remain strictly confidential and the participant's name will not be identified at any time or associated with any published results.**

### **Right to Withdraw**

It is important to acknowledge that a significant time commitment is likely necessary for participation in this study. As such, fatigue may occur and participants are encouraged to take breaks as they desire. **Participants may withdraw from the study for any reason, at any time, without penalty of any sort.** If participants do withdraw from the study, the data contributed will be destroyed. Further, participants will be informed if any new information arises that may affect the decision to remain in the study.

### **Questions**

If participants or parents have any questions about the study at any point in time, please feel free to ask. You may also contact any of the researchers at the contact information provided on the final page of this form, should you have any questions at any time. This research has been approved by the University of Saskatchewan's Behavioural Sciences Research Ethics Board (file #06-106) on May 29<sup>th</sup>, 2006, the University of Manitoba on June 26, 2006 (#P2006:052), and the University of Calgary on June 23, 2006. Any questions regarding your rights as a participant may be addressed to that committee via the Office of Research Services at (306) 966-2084. Out of town participants are encouraged to call collect.

## **APPENDIX A Continued**

### **Study Results**

The research questions we are interested in examining involve understanding youth with Asperger syndrome as a group. Consequently, we will not have study results for individual participants. However, when the study is completed and the data have been analyzed, participants should feel free to contact any of the researchers if they would like a summary of the group results.

**Please return this form to the researcher.** If you are interested in allowing your son/daughter to participate in this study, please complete this form (see following page) and return it in the stamped and addressed envelope provided. Your prompt response will enable the researcher to mail out materials and schedule your son/daughter's participation in this study. Again, participation is purely voluntary.

## Parental/Guardian Consent

I give my son/daughter consent to participate in the research study being conducted by the researchers listed below from the Universities of Saskatchewan, Manitoba, and Calgary. My signature at the end of this consent form will indicate that the researchers have answered all of my questions and that I voluntarily consent to my son/daughter's participation in this investigation. I understand that no individual assessment results will be shared from my son/daughter's participation in this study. However, I understand that I may contact the researchers at the numbers provided to enquire about the results of this project. **I realize that I am free to withdraw my son/daughter from participation at any time, for any reason without penalty.**

I have read, understood and been provided with a copy of this consent form. I realize that I may ask questions in the future about the study, and I indicate my free consent to research participation by signing this research consent form.

I give my consent to be contacted after participation in this study should the researchers have further questions regarding this study **(check one)** Yes \_\_\_\_\_ No \_\_\_\_\_

I give my consent to contact the following individuals for the purposes of this study outline previously. **(check one)** Yes \_\_\_\_\_ No \_\_\_\_\_

Teacher/instructor \_\_\_\_\_  
(name) (phone number)

Parent/guardian \_\_\_\_\_  
(name) (phone number)

Close Relative \_\_\_\_\_  
(if parent/guardian is not available) (name) (phone number)

Finally, I give consent for future contact for a follow-up study should there be one **(check one)** Yes \_\_\_\_\_ No \_\_\_\_\_

\_\_\_\_\_  
(Name of Participant)

\_\_\_\_\_  
(Signature of Participant)

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
Contact Number

\_\_\_\_\_  
Alternate Contact (cell or email)

\_\_\_\_\_  
(Mailing Address)

\_\_\_\_\_  
(Signature of Researcher)

**Research Team**

**Please remove this page and keep for your records**

**Research Supervisor**

Dr. Vicki Schwean, Ph.D  
Associate Dean,  
Division of Applied Psychology  
Faculty of Education  
University of Calgary  
Phone: (403) 220-5651  
[vlschwea@ucalgary.ca](mailto:vlschwea@ucalgary.ca)

**Researcher**

Janine M. Montgomery  
Doctoral Student  
University of Saskatchewan  
Department of Educational  
Psychology & Special Education  
Phone: (306) 966-2874  
[jmn120@mail.usask.ca](mailto:jmn120@mail.usask.ca)

**OR**

Janine M. Montgomery  
Lecturer  
Department of Psychology  
University of Manitoba  
Phone (204) 269-2877  
Email: [montgom0@cc.umanitoba.ca](mailto:montgom0@cc.umanitoba.ca)

**Researcher**

Danielle Dyke  
Master's Student  
University of Calgary  
Department of Applied Psychology  
Phone: (403) 220-3585  
[didyke@ucalgary.ca](mailto:didyke@ucalgary.ca)

**Researcher**

Jo-Anne Burt  
Master's Student  
University of Calgary  
Department of Psychology  
Phone: (403) 220-3585  
[jburt@ucalgary.ca](mailto:jburt@ucalgary.ca)

**Researcher**

Candace Kohut  
Master's Student  
University of Calgary  
Department of Applied Psychology  
Phone: (403) 220-3585  
[CSKohut@ucalgary.ca](mailto:CSKohut@ucalgary.ca)

**Researcher**

Yvonne Hindes  
Master's Student  
University of Calgary  
Department of Applied Psychology  
Phone: (403) 220-3585  
[ylhindes@ucalgary.ca](mailto:ylhindes@ucalgary.ca)

## *APPENDIX B: Student Assent to Participate in Research*

You are invited to participate in a study entitled “Emotional Intelligence and Resiliency in Individuals with Asperger Syndrome”. The Purpose of this research project is to collect information about the emotional and social skills of youth with Asperger Syndrome (or Asperger Syndrome). Additionally, information about your strengths will be collected in order to understand how to build success for youth with Asperger syndrome. The hope is that the collection of such information will assist teachers and others who work with youth with Asperger Syndrome to better understand the youth with whom they work. In addition, it is hoped that this study will provide information to researchers that will help to develop appropriate ways to teach social and emotional skills to individuals with Asperger syndrome.

### **Procedures:**

If you chose to participate in this study, you will first be asked to complete a 10-15 minute test that will help researchers to confirm that you fit the definition of Asperger syndrome we wish to use for this study. Additionally, one of your parents and one of your teachers will be asked to complete brief questionnaires about your social skills. If after completing these tasks, you still meet the requirements for this study, you will be asked to complete a series of tests that will help to understand your social and emotional skills, thinking processes, strengths, and overall ability. **The testing battery will take 4-5 hours to complete.** However, you will be free to take breaks whenever you feel you need to.

The purpose of this study is to collect information from many youth with Asperger syndrome. Consequently, **it will not be possible to share your individual results** on the various tests. However, the information we collect about how you think and interact will help the researchers to understand youth with Asperger syndrome so that appropriate information can be shared with many professionals that work with individuals with Asperger syndrome.

### **Potential Risks:**

There are no foreseeable risks associated with participation in this study.

### **Potential benefits:**

The information collected in this study will help researchers and professionals to understand the emotional and social skills of youth with Asperger syndrome. It is hoped that this information will lead to further research to develop appropriate plans to help youth with Asperger syndrome achieve successful social interactions.

### **Confidentiality:**

The information collected in this study may be published and presented at academic conferences. However, the data will be reported in aggregate form, which ensures individual participants are not identifiable. All forms will be coded and stored separately so that your personal information or responses cannot be identified.

All materials will be stored in a locked facility by the researcher or one of the committee members, Dr. Vicki Schwean, Dr. Don Saklofske, Dr. Brian Noonan, or Dr. Laurie Hellsten.

### **Right to Withdraw**

**You may withdraw from the study for any reason, at any time, without penalty of any sort.** If you withdraw from the study, the information that you have contributed will be destroyed. Since **participation in the study is purely voluntary**, participants may choose to answer some or all of the questions on the questionnaires, while leaving out any questions you may be uncomfortable at answering. Further, you will be informed if any new information arises that may affect your decision to remain in the study.

### **Questions**

If you have any questions about the study at any point in time, please feel free to ask. You may contact the researchers at the number or email address provided if you have any questions now or at any other time. If participants or parents have any questions about the study at any point in time, please feel free to ask. You may also contact any of the researchers at the contact information provided on the final page of this form, should you have any questions at any time. This research has been approved by the University of Saskatchewan's Behavioural Sciences Research Ethics Board (file #06-106) on May 29<sup>th</sup>, 2006, the University of Manitoba on June 26, 2006 (#P2006:052), and the University of Calgary on June 23, 2006. Any questions regarding your rights as a participant may be addressed to that committee via the Office of Research Services at (306) 966-2084. Out of town participants are encouraged to call collect.

When the study is completed, participants should feel free to contact the researcher if they would like a summary of the results.

**Please return this form to the researcher.** If you are interested in participating in this study, please complete this form and return it in the stamped and addressed envelope provided. Your prompt response will enable the researcher to mail out materials and schedule your participation in this study. Again, **participation is purely voluntary and you should feel free to withdraw from the study at anytime and for any reason.**

In order to participate in this study, the researchers ask that both you and one of your parents agree to your involvement. In addition, we ask that you agree to let the research team contact a teacher identified on the contact information page.

**Student Assent to Participate** (participants under the age of 18 are required to complete the form below)

I \_\_\_\_\_ (first and last name) also understand the reason for this study, the contents of the consent form, and my expectations as a participant in this study. I agree to participate in this study. **I understand that I am free to withdraw from this study and any time and for any reason. There will be no penalty if I choose to**

**withdraw.** I understand that this study has been designed to collect information about my social and emotional skills from several perspectives. I agree that the researchers can contact the individual named on the contact page for the purposes of this study.

\_\_\_\_\_  
(Signature of Student)

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Signature of Parent/Guardian)

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Signature of Researcher)



## Research Team

Please remove this page and keep for your records

### **Research Supervisor**

Dr. Vicki Schwean, Ph.D  
Associate Dean,  
Division of Applied Psychology  
Faculty of Education  
University of Calgary  
Phone: (403) 220-5651  
[vlschwea@ucalgary.ca](mailto:vlschwea@ucalgary.ca)

### **Researcher**

Janine M. Montgomery  
Doctoral Student  
University of Saskatchewan  
Department of Educational  
Psychology & Special Education  
Phone: (306) 966-2874  
[jmn120@mail.usask.ca](mailto:jmn120@mail.usask.ca)

### **OR**

Janine M. Montgomery  
Lecturer  
Department of Psychology  
University of Manitoba  
Phone (204) 269-2877  
Email: [montgom0@cc.umanitoba.ca](mailto:montgom0@cc.umanitoba.ca)

### **Researcher**

Danielle Dyke  
Master's Student  
University of Calgary  
Department of Applied Psychology  
Phone: (403) 220-3585  
[didyke@ucalgary.ca](mailto:didyke@ucalgary.ca)

### **Researcher**

Jo-Anne Burt  
Master's Student  
University of Calgary  
Department of Psychology  
Phone: (403) 220-3585  
[jburt@ucalgary.ca](mailto:jburt@ucalgary.ca)

### **Researcher**

Candace Kohut  
Master's Student  
University of Calgary  
Department of Applied Psychology  
Phone: (403) 220-3585  
[CSKohut@ucalgary.ca](mailto:CSKohut@ucalgary.ca)

### **Researcher**

Yvonne Hindes  
Master's Student  
University of Calgary  
Department of Applied Psychology  
Phone: (403) 220-3585  
[ylhindes@ucalgary.ca](mailto:ylhindes@ucalgary.ca)

## *APPENDIX C: Participant Consent Form*

You are invited to participate in a study entitled, “**Emotional Intelligence and Resiliency in Individuals with Asperger Syndrome**”. Please read this form carefully and feel free to ask any question you may have.

### **Purpose and Procedure**

The main objective of this study is to obtain information towards answering the questions:

- 1) What assessment tools are most appropriate to use in understanding social and emotional abilities in youth diagnosed with Asperger syndrome?
- 2) Can emotional capabilities provide an alternate or complimentary explanation for the social challenges faced by individuals with Asperger syndrome?

This study will investigate the emotional and social abilities of individuals with Asperger syndrome (or Asperger syndrome) by analyzing their performance on various measures of emotional, social, and cognitive abilities. The tests included in this study will measure attentional, memory, social and emotional abilities, as well as organizational and planning skills. Finally, we will measure abilities thought to best promote positive social outcomes in individuals with Asperger syndrome. In order to obtain multiple perspectives about the emotional and social abilities of the participants, additional information will be gathered from parents/guardians and teachers/instructors of individuals with Asperger syndrome who have also agreed to participate in this study. If a parent is unavailable to participate, you may chose to nominate another close family member who has known you well to participate in this study.

The amount of time needed for participation in this study will vary. Some participants will complete only one **15-20 minute task**, while others will complete multiple tasks and questionnaires that will take **approximately 4-5 hours to complete**. Upon completion of the initial measure, you will be informed as to whether or not the full 4-5 hour session will occur. It is preferable if you are available for the entire time on the day of the testing.

A parent/guardian or another close relative and a teacher/instructor will also be asked to complete questionnaires regarding your social and emotional abilities for the purposes of this study. Parents/guardians will be required to commit 45-60 minutes of their time, and it is anticipated that teachers will need approximately 15 minutes to complete the required questionnaire.

### **Potential Risks**

There are no known discomforts or risks associated with this study. The study involves simple tasks and questionnaires.

### **Potential Benefits**

It is expected that the information collected in this study will provide us with a better understanding of the social and emotional characteristics of individuals with Asperger

syndrome. There is surprisingly little research examining the social and emotional abilities that best promote success and resiliency in youth in Asperger syndrome. The researchers involved in this study believe that it is important to understand these characteristics because youth with Asperger syndrome are likely to encounter many social and emotional challenges, particularly in the transition to adulthood.

We expect that the results of this study will be helpful for scientists and professionals around the world interested in social and emotional abilities of individuals with Asperger syndrome. We want to thank you very much in advance for your help in furthering this research.

### **Confidentiality**

Data generated from this study are primarily intended to be used in doctoral and master's level student research. All materials will be stored in a locked facility by the researcher or one of the committee members, Dr. Vicki Schwean, Dr. Don Saklofske, Dr. Brian Noonan, or Dr. Laurie Hellsten. While the information generated from this study may be published and presented at academic conferences, the data will be reported in aggregate form, which ensures individual participants are not identifiable. **Please understand that all information collected during the course of this study will remain strictly confidential and your name will not be identified at any time or associated with any published results.**

### **Right to Withdraw**

It is important to acknowledge that a significant time commitment is likely necessary for participation in this study. As such, fatigue may occur and participants are encouraged to take breaks as they desire. **Participants may withdraw from the study for any reason, at any time, without penalty of any sort.** If participants do withdraw from the study, the data contributed will be destroyed. Further, participants will be informed if any new information arises that may affect the decision to remain in the study.

### **Questions**

If participants or parents have any questions about the study at any point in time, please feel free to ask. You may also contact any of the researchers at the contact information provided on the final page of this form, should you have any questions at any time. This research has been approved by the University of Saskatchewan's Behavioural Sciences Research Ethics Board (file #06-106) on May 29<sup>th</sup>, 2006, the University of Manitoba on June 26, 2006 (#P2006:052), and the University of Calgary on June 23, 2006. Any questions regarding your rights as a participant may be addressed to that committee via the Office of Research Services at (306) 966-2084. Out of town participants are encouraged to call collect.

### **Study Results**

The research questions we are interested in examining involve understanding youth with Asperger syndrome as a group. Consequently, we will not have study results for individual participants. However, when the study is completed and the data have been

analyzed, you should feel free to contact any of the researchers if you would like a summary of the group results.

**Please return this form to the researcher.** If you are interested in participating in this study, please complete this form (see following page) and return it in the stamped and addressed envelope provided. Your prompt response will enable the researcher to mail out materials and schedule your participation in this study. Again, participation is purely voluntary.

In order to participate in this study, the researchers ask that both you and one of your parents agree to your involvement. In addition, we ask that you agree to let the research team contact a teacher identified by your parent or guardian on *Parental/Guardian Consent* page.

## Consent to Participate in Research Study

I consent to participate in the research study being conducted by the researchers listed below from the Universities of Saskatchewan and Calgary. My signature at the end of this consent form will indicate that the researchers have answered all of my questions and that I voluntarily consent to participate in this investigation. I understand that no individual assessment results will be shared from my participation in this study. However, I understand that I may contact the researchers at the numbers provided to enquire about the results of this project. **I realize that I am free to withdraw from participation at any time, for any reason without penalty.**

I have read, understood and been provided with a copy of this consent form. I realize that I may ask questions in the future about the study, and I indicate my free consent to research participation by signing this research consent form.

I give my consent to be contacted after participation in this study should the researchers have further questions regarding this study **(check one)** Yes \_\_\_\_\_ No \_\_\_\_\_

I give my consent to contact the following individuals for the purposes of this study outline previously. **(check one)** Yes \_\_\_\_\_ No \_\_\_\_\_

Teacher/instructor \_\_\_\_\_ (name) \_\_\_\_\_ (phone number)

Parent/guardian \_\_\_\_\_ (name) \_\_\_\_\_ (phone number)

Close Relative \_\_\_\_\_ (name) \_\_\_\_\_ (phone number)  
(if parent/guardian is not available)

Finally, I give consent for future contact for a follow-up study should there be one **(check one)** Yes \_\_\_\_\_ No \_\_\_\_\_

\_\_\_\_\_  
(Name of Participant)

\_\_\_\_\_  
(Signature of Participant)

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
Contact Number

\_\_\_\_\_  
Alternate Contact (cell or email)

\_\_\_\_\_  
(Mailing Address)

\_\_\_\_\_  
(Signature of Researcher)

**Research Team**

**Please remove this page and keep for your records**

**Research Supervisor**

Dr. Vicki Schwean, Ph.D  
Associate Dean,  
Division of Applied Psychology  
Faculty of Education  
University of Calgary  
Phone: (403) 220-5651  
[vlschwea@ucalgary.ca](mailto:vlschwea@ucalgary.ca)

**Researcher**

Janine M. Montgomery  
Doctoral Student  
University of Saskatchewan  
Department of Educational  
Psychology & Special Education  
Phone: (306) 966-2874  
[jmn120@mail.usask.ca](mailto:jmn120@mail.usask.ca)

**OR**

Janine M. Montgomery  
Lecturer  
Department of Psychology  
University of Manitoba  
Phone (204) 269-2877  
Email: [montgom0@cc.umanitoba.ca](mailto:montgom0@cc.umanitoba.ca)

**Researcher**

Danielle Dyke  
Master's Student  
University of Calgary  
Department of Applied Psychology  
Phone: (403) 220-3585  
[didyke@ucalgary.ca](mailto:didyke@ucalgary.ca)

**Researcher**

Jo-Anne Burt  
Master's Student  
University of Calgary  
Department of Psychology  
Phone: (403) 220-3585  
[jburt@ucalgary.ca](mailto:jburt@ucalgary.ca)

**Researcher**

Candace Kohut  
Master's Student  
University of Calgary  
Department of Applied Psychology  
Phone: (403) 220-3585  
[CSKohut@ucalgary.ca](mailto:CSKohut@ucalgary.ca)

**Researcher**

Yvonne Hindes  
Master's Student  
University of Calgary  
Department of Applied Psychology  
Phone: (403) 220-3585  
[ylhindes@ucalgary.ca](mailto:ylhindes@ucalgary.ca)

*APPENDIX D: Letter to Directors of School Divisions*

March 22, 2006

Director of Education,  
**Address here**

Dear Director,

I am a graduate student at the University of Saskatchewan currently working on my Ph.D. in educational psychology and special education. I am part of a team conducting a research study entitled *Emotional Intelligence and Resiliency in Individuals with Asperger Syndrome*. The purpose of the study is to examine the emotional intelligence of individuals between the ages of 17 and 21. Additionally, concepts potentially linked to emotional intelligence (social skills, theory of mind, executive dysfunction, and resiliency) will be examined in order to enhance understanding of individuals with Asperger syndrome and provide insight that may impact interventions.

I would like permission to post ads in your school newsletters to recruit participants for this study. While the individuals with Asperger syndrome are the primary participants for this study, teachers and parents of these participants will also be recruited through the primary participant to provide information about the individual with Asperger syndrome (with consent). The ad for this project is attached.

Data collection will be conducted by six graduate students trained in psycho-educational assessment and psychometric theory and will take place at three university sites. This research has been approved by the University of Saskatchewan's Behavioural Sciences Research Ethics Board (file #06-106) on May 29<sup>th</sup>, 2006, the University of Manitoba on June 26, 2006 (#P2006:052), and the University of Calgary on June 23, 2006. Any questions regarding your rights as a participant may be addressed to that committee via the Office of Research Services at (306) 966-2084. Out of town participants are encouraged to call collect. To find out the results of the study, you may contact the primary researcher (Janine Montgomery), at (204) 474-8306 or e-mail at [montgom0@c.umanitoba.ca](mailto:montgom0@c.umanitoba.ca), or the research supervisor, Dr. Vicki Schwean (403) 220-5651.

Respectfully,

---

Janine Montgomery, B. Ed., PhD Student  
Department of Educational Psychology and Special Education  
University of Saskatchewan  
(306) 270-4125 or (204) 474-8306

*APPENDIX E: Recruitment Poster*

Have you been diagnosed with Asperger Syndrome or Asperger Syndrome?

Are you 17 to 21 years old?

Would you like to participate in a research study examining emotions in individuals with Asperger Syndrome/Syndrome?

The purpose of the study is to examine the performance of individuals with Asperger syndrome on two tests of emotional skills and related concepts. Individual participants will be asked to complete 4-5 hours of tasks and activities measuring emotional intelligence, mental processes, social perception, and social skills.

The potential benefit is to contribute to research that may lead to enhanced understanding of Asperger syndrome and may provide important information about appropriate interventions. In order to understand the needs of individuals in Western Canada, participants from Alberta, Saskatchewan, and Manitoba are being recruited for this study. If you are interested in participating in this research project, please contact:

Janine Montgomery, B.Ed., PhD student  
Department of Educational Psychology and Special Education,  
University of Saskatchewan,  
Saskatoon, Sk.  
Phone: (306) 270-4125  
OR (204) 474-8306  
Email: montgom0@cc.umanitoba.ca



*APPENDIX F: Participant Information Questionnaire*

This questionnaire should be completed by a parent of the participant, as it asks about early developmental history. If a parent is unavailable, a close relative who has knowledge of the individual's early history is acceptable.

In order to establish the appropriateness of your child's participation in the study "**Emotional Intelligence and Resiliency in Individuals with Asperger Syndrome**", the researchers require background information about your child. Please complete the follow questionnaire

Child's Name:

Sex:

Child's date of birth:

Age:

School/Educational Institution:

Grade/ Year of Program:

If your child is enrolled in a college/ university program, please name the program:

Name and school phone number of a teacher you would be willing to allow the researchers to contact:

Name and phone number of a peer you would be willing to allow the researchers to contact:

**Official Diagnosis**

Who originally diagnosed your child (name and title)?

How old was your child at the time of the original diagnosis?

Has anyone else given a diagnosis to your child?

If so, who gave the diagnosis and what is their title?

What was the diagnosis?

Has your child been diagnosed with any other psychological disorders?

Has your child been diagnosed with any medical disorders? If so, please provide a general description.

Has your child ever experienced a head injury? (Circle) Yes No

If yes, were they unconscious? Yes No

If yes, for how long was your child unconscious? \_\_\_\_\_

Was your child adult hospitalized for the head injury? (Circle) Yes No

If yes, how long was the hospitalization? \_\_\_\_\_

### Language Development

Did your child receive speech therapy before the age of 5?

As far as you recall, how old was your child when he/she begin speaking single words?

How old was your child when he/she began speaking in short, but meaningful phrases?

Do you consent to the researcher contacting the individuals you have listed in order to participate in this study?

- Yes
- No

Signature \_\_\_\_\_  
(parent)

Date \_\_\_\_\_

Signature \_\_\_\_\_  
(researcher)

## APPENDIX G: Clinician Script and Procedure Summary

The Following script is to be read to primary participants at initiation of testing.

**Clinician:** Thank you for agreeing to help us with this study. Today we are going to do a number of tasks designed to measure how you behave, think, and act in social situations and in daily life. The tasks may take from a half hour\* to 4 hours to complete. In addition, you will complete some tasks designed to assess the strengths and weaknesses in your thinking processes.

If at any time you want to take a break, or need to go to the washroom, please ask. I may also initiate a break if I think we need one. Please remember that your participation in this study is purely voluntary and that you may chose to stop at any time. Also, if you have any questions at any time, please feel free to ask me.

Are you ready to begin?

### Procedures:

1. Administer WASI according to instructions in the test manual (while student completes one of the self-report measures listed below, score the WASI). If a VIQ of 85 or higher is not achieved, then testing should be discontinued. In order to maintain rapport, allow the participant complete the self-report. Then thank them for their time and willingness to co-operate.
2. Administer the following tests, alternating between test 1 for one participant, then test 2 for the next.
  - Test 1: Bar-On EQ-i: S (self report)
  - Test 2: BASC-2 (self-report)
3. Administer the following tests in random order (as determined by computer assignment)
  - Test 3: MSCEIT
  - Test 4: EYES
  - Test 5: D-KEFS
  - Test 6: CANTAB
  - Test 7: WCST
  - Test 8: Iowa Gambling Task
  - Test 9: Resiliency Scales for Adolescents
  - Test 10: Satisfaction with Life Scales

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\* If a VIQ of 85 or higher is not achieved, then testing should be discontinued. Then thank them for their time and willingness to co-operate.

*APPENDIX H: Parent Instructions I*

Parents will be mailed the following letter after consenting to participate in the study. They will be provided with the following instructions to clarify their initial tasks. The following materials will be mailed with this letter.

- Participant Information Questionnaire (designed by researcher- see attached)
- KADI
- BASC-2
- GARS 2

Dear Parent,

Thank you for agreeing to participate in our study examining the emotional intelligence of young adults with Asperger disorder. The information you provide will help us to determine if your youth's participation is appropriate and provide us with a rich understanding of the individual characteristics of your child. If your youth is selected to participate in this study based on the information collected in this form, then the researchers will contact you to arrange a mutually convenient time. At this visit, you will be asked to complete two additional questionnaires. Please complete the following forms as best as you can. Follow the instructions at the top of each form and feel free to contact the researcher (at the number below) at any time if you have questions.

Thank you again for agreeing to participate in this study.

Regards,

Janine Montgomery

PhD student

Department of Educational Psychology and Special Education

University of Saskatchewan

306(966-2874)

## APPENDIX I: Teacher/Instructor Consent Form

Dear Teacher/Instructor,

You have been suggested as a teacher/instructor who could complete a rating scale about the social and emotional skills of \_\_\_\_\_.  
(name of student)

Both the previously mentioned student and their parent/guardian have consented to our contact with you in order to facilitate research for a study entitled “**Emotional Intelligence and Resiliency in Individuals with Asperger Syndrome**”. Please read this form carefully and feel free to ask any questions you may have.

### **Purpose and Procedure**

The main objective of this study is to obtain information towards answering the questions:

- 1) What tests are most appropriate to use in understanding social and emotional abilities in youth diagnosed with Asperger syndrome?
- 2) Can emotional capabilities provide an alternate or complimentary explanation for the social challenges faced by individuals with Asperger syndrome?

This study will investigate the emotional and social abilities of individuals with Asperger syndrome. For those individuals with Asperger syndrome who have consented to participate, a battery of tests will be administered that examine a number of abilities thought to relate to social and emotional skills and that promote social and emotional resiliency in youth. There are three sources of information for this study: 1) the youth with Asperger who has agreed to participate 2) a parent of the youth who has chosen to participate, and 3) a teacher or instructor of the youth participant. The individual named above has suggested you as an appropriate contact for our purposes in this study.

Teachers who agree to participate in this study will be asked to complete on rating scale about the social and emotional skills of the student listed above that will take **approximately 15 minutes** to finish. Your participation in this study will provide the researchers with a valuable perspective on the social and emotional interactions of students within the school setting. It is anticipated that this information will provide better understanding of individuals with Asperger syndrome and may indirectly lead to research on appropriate interventions for youth with Asperger syndrome.

### **Potential Risks**

There are no known discomforts or risks associated with this study. The study involves completion of a simple questionnaire.

### **Potential Benefits**

It is expected that the information collected in this study will provide us with a better understanding of the social and emotional characteristics of individuals with Asperger syndrome. There is surprisingly little research examining the social and emotional

abilities that best promote success and resiliency in youth with Asperger syndrome. The researchers involved in this study believe that it is important to understand these characteristics, because youth with Asperger syndrome, in particular, are likely to encounter many social and emotional challenges, particularly in the transition to adulthood.

We expect that the results of this study will be helpful for scientists and professional around the world interested in social and emotional abilities of youth with Asperger syndrome. We want to thank you very much in advance for your help in furthering this research.

### **Confidentiality**

Data generated from this study are primarily intended to be used in doctoral and master's level student research. All materials will be stored in a locked facility by the researcher or one of the committee members, Dr. Vicki Schwean, Dr. Don Saklofske, Dr. Brian Noonan, or Dr. Laurie Hellsten. The results may also be published in scholarly journals and/or presented at academic conferences. While the information generated from this study may be published and presented at academic conferences, the data will be reported in aggregate form, which ensures individual participants are not identifiable. **Please understand that all information collected during the course of this study will remain strictly confidential and your name will not be identified at any time or associated with any published results.**

### **Right to Withdraw**

It is important to acknowledge that participation is completely voluntary so **participants may withdraw from the study for any reason, at any time, without penalty of any sort.**

### **Questions**

If teachers have any questions about the study at any point in time, please feel free to ask. You may also contact any of the researchers at the contact information provided on the final page of this form, should you have any questions at any time. This research has been approved by the University of Saskatchewan's Behavioural Sciences Research Ethics Board (file #06-106) on May 29<sup>th</sup>, 2006, the University of Manitoba on June 26, 2006 (#P2006:052), and the University of Calgary on June 23, 2006. Any questions regarding your rights as a participant may be addressed to that committee via the Office of Research Services at (306) 966-2084. Out of town participants are encouraged to call collect.

### **Study Results**

The research questions we are interested in examining involve understanding youth with Asperger syndrome as a group. Consequently, we will not have study results for individual participants. However, when the study is completed and the data have been analyzed, participants should feel free to contact any of the researchers if they would like a summary of the group results.

**Please return this form to the researcher.** If you are interested in participating in this study, please complete this form and return it in the stamped and addressed envelope provided. Your prompt response will enable the researcher to mail out materials required for your participation in this study. Again, participation is purely voluntary.

**Teacher Consent**

I give my consent for participation in the research study being conducted by the researchers listed below from the Universities of Saskatchewan and Calgary. My signature at the end of this consent form will indicate that the researchers have answered all of my questions and that I voluntarily consent to participate in this investigation. **I realize that I am free to withdraw from participation at any time, for any reason without penalty.**

I have read, understood and been provided with a copy of this consent form. I realize that I may ask questions in the future about the study, and I indicate my free consent to research participation by signing this research consent form.

I give my consent to be contacted after participation in this study should the researchers have further questions regarding this study **(check one)** Yes \_\_\_\_\_ No \_\_\_\_\_

Finally, I give consent for future contact for a follow-up study should there be one **(check one)** Yes \_\_\_\_\_ No \_\_\_\_\_

\_\_\_\_\_  
(Name of Teacher)

\_\_\_\_\_  
(Signature of Teacher)

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
Contact Number

\_\_\_\_\_  
Alternate Contact (cell or email)

\_\_\_\_\_  
(Mailing Address)

\_\_\_\_\_  
(Signature of Researcher)

*APPENDIX J: Teacher Instructions*

This instruction sheet is to be provided to the teacher/ instructor if their student meets inclusion criteria. It may be mailed out and returned by mail.

Dear Teacher/Instructor,

Thank you again for agreeing to participate in the study entitled “**Emotional Intelligence in Individuals with Asperger Syndrome**”. The following questionnaire will provide the researchers with information about how your student functions in school situations. Please complete the **BASC-2 (TRS)** as per the instructions at the top of the form. If you have any questions, please feel free to contact the researcher or ask for clarification at the end of your session.

Regards,  
Janine Montgomery  
PhD student  
Department of Educational Psychology and Special Education  
University of Saskatchewan  
306(966-2874)

Researcher : \_\_\_\_\_  
(Signature)



*APPENDIX K: Time Requirements for Individual Measures*

Table 1.1 Breakdown of measures for respective participants

Participants	Measures	Approx. Time needed
Primary Participants (Asperger Syndrome)	Bar-On EQ-i:S MSCEIT BASC-2 (SRP) WASI D-Kefs Eyes Resiliency Scale for Adolescents Satisfaction with Life Scale	4-5 hours
Parent/or other close relative	BASC-2 PRS KADI Participant Information Questionnaire	1 hour
Teachers/Instructors	BASC-2 TRS	15 minutes

Tale 1.2 Time Requirements and Subtests for individual measures in this study

Measure	Subtests	Approx. Time required
Bar-On EQ-i:S	none	10-15 minutes
MSCEIT	none	30-40 minutes
BASC-2 (SRP)	none	20-30 minutes
BASC-2 (PRS)	none	20 minutes
BASC-2 (TRS)	none	15 minutes
WASI	Vocabulary Similarities	15 minutes
D-Kefs	Trail Making Verbal Fluency Design Fluency Tower Colour-word Interference	45 minutes
CANTAB	Intra/Extradimensional Shift Task	10 minutes
Wisconsin Card Sorting	none	15 minutes
Iowa Gambling Task	none	15 minutes
Satisfaction with Life Scale	none	1 minute
Resiliency Scale for Adolescents	Sense of mastery Sense of Relatedness Emotional Reactivity Scale	15 minutes
'Eyes' test	none	Maximum 10 minutes

## APPENDIX L: Psychometric Properties of Instruments

### BarOn Emotional Quotient Inventory, Short form (BarOn EQ-i:S)

The *BarOn EQ-i:S* (Bar-On & Parker, 2000) is a self-report measure of EI designed for individuals aged 16 and older. The *BarOn EQ-i:S* is the brief version of the *BarOn EQ-i:S* (Bar-On, 1997), which was developed through extensive reviews of the literature on emotions and the clinical expertise of the author (Bar-On, 2004). The measure consists of 51 items and takes approximately 10-15 minutes to complete. The *EQ-i:S* employs a five-point likert rating system on which individuals rate themselves. Descriptors range from “very seldom or not true of me” to “very often true of me”.

The *BarOn EQ-i:S* consists of 8 EI subscales (Intrapersonal, Interpersonal, Stress Management, Adaptability, General Mood, Positive Impression, Inconsistency Index, and Total EQ). The inconsistency index is included to detect random responding, and a positive impression scale is included to detect individuals who tend to portray themselves more positively than is true. A general mood scale provides additional information on the respondent’s general level of happiness and tendency to remain optimistic (Widdefield-Konkin, 2005), as general mood is seen as linked to EQ (Bar-On & Parker, 2000).

The *BarOn EQ-i:S* was developed through an exploratory and confirmatory factor analysis of its predecessor, the *BarOn Emotional Quotient Inventory (BarOn EQ-i)*. Results of these analyses formed the basis for item selection for the short form, and it appears to support a five factor structure. The *BarOn EQ-i:S* was normed on 3,174 adults in the United States and Canada.

Acceptable internal consistency is reported for this measure, with most values ranging from .70 to .80 (BarOn, 2002). Test-retest values for a 6 month retest period ranged from .46-.80 for each scale by gender. Some information is available for factorial validity, construct validity, and predictive validity and is outlined in the technical manual (Dogget & Sheperis, 2005). Correlations between the *BarOn EQ-i* and *BarOn EQ-i:S* are reported to range from .73 to .97 and are provided as evidence for the construct validity of the short form (BarOn, 2002). No additional convergence studies are presented.

### The Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT)

The Mayer-Salovey-Caruso Emotional Intelligence Test (Mayer et al.) is the updated version of the Multi-factor Emotional Intelligence Scale (MEIS) (Mayer et al.,

1998), an ability-based assessment of EI that is based on the four-branch model of EI. The MSCEIT is a 141 item self-report that takes 30-45 minutes to administer. It is intended for use with individuals aged 17 or older (use for 16 year olds is allowed for in the manual). This measure yields a single overall performance score in addition to the two area scores for Emotional Experience and Emotional Reasoning. Scores reflecting each branch of the four-branch model are also reported. These branches respectively measure the ability to: 1) perceive emotions; 2) use emotions to facilitate thought; 3) understand emotions; and 4) manage emotions to foster personal growth and healthy social relations. Table 1.4 provides an overview of the structure of the MSCEIT.

*Branch 1: Perception of Emotion* involves the discernment and identification of emotional content in pictorial information. In *Branch 2: Use of Emotion (aka Facilitating Thought)*, the construct measured is the integration of emotion to facilitate thought. *Branch 3: Understanding of Emotion* assesses the ability to identify complex combinations of emotion and how emotions change and/or progress. Finally, *Branch 4: Regulation of Emotion* concerns the management of emotions and interactions based on emotion.

The MSCEIT produces two types of scores for each area assessed and for the total composite. A consensus score evaluates the individual's score in relation to the answer provided by most individuals in the norming sample, while the correctness score judges the response in relation to the answers established by an expert panel. General consensus scores are considered "suitable for most applications" (Mayer, Salovey, & Caruso, 2002, p.12), and were used for this study. Recent research has provided evidence of reliability for the branch and total scores (split-half values fell between .79 to .93 for general scoring) and test-retest reliability for general consensus scoring over a three-week period was demonstrated to be .86 (Brackett & Mayer, 2003; Mayer, Salovey, Caruso, & Sitarenios, 2003). Internal consistency values for the eight task scores ranged from .64 to .87 for general scoring.

Table L1. A Hierarchal View of Emotional Intelligence Abilities as Measured by the MSCIET

Area	Branch	Task	Task Description
1: Experiential EI	Branch 1: Perception of emotion	Task 1: Faces	Participants view photographs of faces and identify the emotions in them.
		Task 2: Pictures	Participants view photographs of faces and artistic representations and identify the emotions in them.
	Branch 2: Use of Emotion	Task 3: Sensation	Which tactile, taste, and colour sensations are reminiscent of specific emotion?
		Task 4: Facilitation	How moods enhance thinking, reasoning, and other cognitive processes.
2: Strategic EI	Branch 3: Understanding Of emotion	Task 5: Blends	Which emotions might blend together to form a more complex feeling?
		Task 6: Changes	How emotions progress and change from one state to another.
	Branch 4: Regulation of emotion	Task 7: Emotion Management	How effective alternative actions would be in achieving a certain outcome, in emotion-laden situations where individuals must regulate their feelings.
		Task 8: Relationship Management	Test-takers evaluate how effective different actions would be in achieving an emotion-laden outcome involving other people.

Source: Brackett, Lopes, Ivcevic, Mayer, & Salovey, 2005, p. 179.

Validity studies have demonstrated moderate correlations for: total MSCEIT scores and verbal SAT scores (values range from .23 to .39) (Brackett et al., 2004); WAIS-III vocabulary scores with the understanding emotions branch (Lopes, 2003); and, MSCEIT total score and *Understanding Emotions* with the Wonderlic Personal Test (.30 & .44 respectively). In the personality domain, the MSCEIT correlated moderately with Agreeableness and Intellect ( $r_s < .28$ ) but was not significantly related to Neuroticism, Extraversion, or Conscientiousness (Bracket & Mayer, 2003) or to social desirability, mood, or public and private self-consciousness and self-esteem (Lopes et al, 2003). Further, limited studies of predictive validity have demonstrated positive correlations between high EI (using the MSCEIT) and cognitive efficiency (Jausovec, Jausovec, &

Gerli, 2001), psychological well-being (Bracket and Mayer, 2003), positive social relations (Lopes, et al., 2003), and positive interpersonal relationships (Brackett et al., 2004). In contrast, negative correlations were demonstrated with depression and anxiety (Brackett & Salovey, 2004; Head, 2002), substance abuse (Trinidad & Johnson, 2002), deviant behaviour, violence, and negative interpersonal relationships (Brackett & Salovey, 2004). Based on the information provided, it appears that the MSCEIT has demonstrated acceptable psychometric properties.

### The Behavior Assessment System for Children, Second Edition (BASC-2)

The BASC-2 is a multi-dimensional inventory of behaviour and self-perceptions for individuals aged 2 to 25 years. Three types of rating forms are available to provide multi-source information about the behaviour and emotional functioning of children and youth in various contexts: Teacher Rating Scales (TRS), Parent Rating Scales (PRS), and Self-Report Scales (SRP). Three forms are available: Preschool (age 2 through 5), child (6 through 11), and adolescent (12 through 21). Scores for all forms are reported in terms of t scores ( $M = 50$ ,  $SD = 10$ ).

Evidence for the validity of the BASC-2 is provided in the forms of scale inter-correlations and factor analysis, correlations with other behaviour measures, and comparisons of score profiles to clinical groups. Further, evidence for validity is documented in the test manual and is well supported. Reliability reports indicate acceptable levels for the BASC-2.

#### Teacher and Parent Rating Scales

The TRS are designed to measure adaptive and problem behaviours in the school context (Reynolds & Kamphaus, 2004). Parent Rating Scales (PRS) provide the opportunity for a parent or guardian to rate the child's behaviours and skills in the home and community context. Both parent and teacher forms use a four-choice likert rating scale with the following choices: never, sometimes, often, almost always. The TRS and PRS provide information about the broad categories of Externalizing Problems, Internalizing Problems, School Problems, and Adaptive Skills. Additionally, the Behavioural Symptoms Index (BSI) is provided to measure the overall level of problem behaviours. Optional content scales are available to examine: Anger Control, Bullying, Developmental Social Disorders, Emotional Self-Control, Executive Functioning,

Negative Emotionality, and Resiliency. The PRS takes 10-20 minutes to complete while the TRS takes 10-15 minutes. Internal consistency for the BASC-2 TRS and PRS is reported as very high (mid .90s for the Behavioural Symptoms Index and Externalizing Problems Composite and low to mid 90's for the School Problems and Adaptive Skills, and high .80s -.90s for the Internalizing Problems Composite). Additionally, values for the Adaptive Skills composite are higher at the adolescent levels (.96 to .97) than at preschool levels (.91 to .92). Other composites demonstrate consistent reliabilities across age ranges.

Reliabilities of individual scales are also high. At the preschool level, the median value is .84 while values range from .85 to .89 at the adolescent levels. Scale reliabilities for Hyperactivity, Aggression, Conduct Problems, Attention Problems, and Learning Problems range from high .80s to low .90s. For the Adaptive Scale Composites, with the exception of the Adaptability Composite, values range from .76 to .82. The Internalizing Problems Composite ranges from the mid .70's to upper .80s. Reliabilities for clinical groups are similar to the normal population for Behavioural Symptoms Index, Externalizing Problems, Internalizing Problems, and Adaptive Composites.

For this study, the following PRS and TRS subscales were chosen as variables related to social outcomes. A brief description of each is provided.

*Adaptive Skills Composite (PRS and TRS).* The Adaptive Skills Composite is composed of the Adaptability, Activities of Daily Living (For the PRS only), Functional Communication, Social Skills, and Leadership Subscales. This scale summarizes skills and behaviours including: appropriate emotional expression; daily living skills in the home and other contexts; communication; and pro-social, organizational, study, and other adaptive skills. These skills relate to the quality of individual's interactions with peers and in the community. The BASC-2 manual states that poor skills in this area are particularly relevant for individuals with autism spectrum disorders (Reynolds & Kamphaus, 2004).

*Social Skills (PRS and TRS).* The Social Skills scale emphasizes interpersonal aspects of social behaviour and adaptation. Specific and concrete examples are included. Items tend to measure polite verbal behaviours such as saying thank you, congratulating

others, and verbally volunteering suggestions and assistance. Additionally, items pertaining to conventional manners are included in this scale.

### Self-Report Forms

The Self-Report of Personality (SRP) is an inventory of self-perceptions of behaviour and emotions that includes two types of items. Item formats include *True* or *False* items and items requiring a rating on a four-point scale that requires the respondent to answer: Never, sometimes, often, or always. The SRP takes 20-30 minutes to complete and has forms at three grade levels: child (8 through 11), adolescent (12-21), and young adults attending postsecondary school (18 through 25).

Internal consistency estimates for the SRP are reported to range from the mid to upper .80's for the School Problems, Inattention/Hyperactivity, and Personal Adjustment Composites and in the mid .90s for the Internalizing Problem Composite and the Emotional Symptoms Index. Reliabilities for individual scales range from a low of .69 (Self-reliance) to .83 (Anxiety; Depression). Further, test-retest values are reported to range from .63 (Relations with Parents; Social Stress) to .83 (School Problems).

For this study, the following SRP scales are considered to provide valuable information on self-perceptions of social outcomes.

*Interpersonal Relations (SRP)*. This scale measures self-perceptions of the quality of social relationships an individual has with peers. Items relate to the individual's perceptions of how others perceive them and feelings of satisfaction around social interactions.

*Social Stress (SRP)*. This scale measures feelings of stress or tension in personal relationships. Items pertain to one's perceptions of being excluded from activities and feelings about how they are treated by peers.

### The Wechsler Abbreviated Scale of Intelligence (WASI)

The Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999) is an individually administered intelligence test. The abbreviated form is a quick measure of intelligence that is linked to the Wechsler Intelligence Scale for Children (WISC-III) and the Wechsler Adult Intelligence Scale (WAIS-III). It is appropriate for assessing the general intellectual ability of adults or children (aged 8-89). It can be used to generate either a full scale IQ consisting of information gathered from four subtests (FSIQ-4) or a

quicker two-subtest form (FSIQ-2). The individual's performance on these measures can be summarized by the conversion of scores into three composite scores: Full scale IQ's, Verbal IQ, and Performance IQ. This test takes 15 minutes to administer in the two-subtest form, and 30 minutes in the four-subtest form. For this study, only the verbal subtests were administered to generate a verbal IQ score.

The WASI was standardized on a sample of 2,245 American children, stratified according to 1997 US census data. Internal consistency estimates are high and range from .92 to .98 for the IQ scores. Stability coefficients for the VIQ range from .92 to .97, indicative of high reliability. For the verbal subtests that were used in the present study, reliability coefficients for ages 17- 89 ranged from .90 to .98 for Vocabulary and .84 -.96 for Similarities, indicating high reliability. High (corrected) stability coefficients are provided for ages 17-54 as being .87 for the Vocabulary subtest, .85 for the Similarities subtest, and .88 for the VIQ.

With reference to evidence for validity, scores on the WASI were highly correlated with scores on the WISC-III (ranged from .69 to .74 for subtests; .76 to .87 for IQ scores) and the WAIS-III (.66 to .88 for subtest scores; .84 to .92 for IQ scores). Additionally, factor analysis and inter-correlations of subtest scores provide evidence for the construct validity of the WASI (Lindskog & Smith, 2001). The factor structures for this measure were examined by combining the WASI scales with subtests from the WISC-III and the WAIS-III for exploratory factor analysis. Results support a two-factor structure, reflecting the verbal and performance IQ indexes. Confirmatory factor analysis revealed that a two-factor model was the best fit for data provided from the total sample, the adult sample, the children's sample, and for all age bands (Wechsler, 1999).

Information about the performance of clinical groups (mental retardation, giftedness, attention deficit hyperactivity disorder, learning disabilities, and traumatic brain injury) is provided as further evidence for the construct validity of the WASI. While the information provided suggests that the test should not be used diagnostically, performance by individuals with clinical conditions in the standardization study revealed patterns similar to those of clinical groups on the WISC-III and the WAIS-III. Finally, some researchers have argued that for participants on the autism spectrum, it is most appropriate to use general measures of intelligence as opposed to measures that may



inflate IQ estimates. The Wechsler scales are deemed an appropriate source of general IQ information (Motttron, 2004). In summary, the available information reveals that the WASI has acceptable psychometric properties, and is thus deemed appropriate for this study.

#### Krug Asperger Disorder Index (KADI)

The *Krug Asperger Disorder Index (KADI; Krug & Arick, 2003)* appears to be the most reliable and valid screen for identifying individuals with AS (Campbell, 2005). The KADI is a clinician-administered report designed to collect information on individuals aged 6 to 21 years, 11 months. The KADI is a norm-referenced, 32 item test which requires 5 to 10 minutes of administration time. Ratings are to be completed by close friends, parents, or relatives of the individual in question. The KADI has two subgroups of items. Items 1-11 are used as an initial screen. If an individual's raw score does not add up to 18 on the first 11 items, then testing is discontinued. However, if the score for the individual being rated exceeds 18, then the remaining items are completed.

The final version of the KADI was standardized on 486 individuals, 130 of these had a diagnosis of AS and 162 had a diagnosis of Autistic disorder. One-hundred and ninety four 'normal' controls were included in the standardization sample. The KADI demonstrates internal reliability of .89 and excellent stability over a two week period (.98). Further, 90% agreement was demonstrated for inter-rater reliability (Nellis, 2005). This scale is based on a distribution with a mean of 100 and a standard deviation of 15. However, it is important to note that rather than reflecting numbers of individual in the general population who manifest the characteristics, this scale reflects the number of participants with AS who achieved a score in the various ranges. For example, if an individual receives a score of 100 or higher, interpretation standards indicate that 50% of individuals with AS scored the same as or higher than the participant. The classification ranges for this measure are provided in Table 1.5. For this study, individuals with a score of 70 or higher were included.

Table L2. Interpretive Guidelines for the KADI, Based on AS Sample

Probability of AS	SS	%ile
Very High	>114	14
High	90-114	67
Somewhat Likely	80-89	7
Low	70-79	7
Very Low	60-69	7
Extremely Low	<60	7

With reference to evidence for validity, the KADI demonstrated specificity of .94, sensitivity of .78, and positive predictive power of .83. Mean scores differed significantly for the various groups in the standardization sample, demonstrating the evidence of clinical validity of the instrument. While many screens for AS do not have acceptable psychometric properties, the authors of the KADI have gone to great lengths to provide information on the psychometric properties of this measure. Further, the KADI meets standards for psychometric adequacy (see Bracken, 1987; Campbell, 2005) and provides a good source of information on the individuals recruited for this study.

The Reading the Mind in the Eyes Test, Revised Version (Eyes Test-Revised)

The Reading the Mind in the Eyes test (or Eyes Test-Revised; Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997b) is a measure of advanced theory of mind. The test consists of 25 items that require the individuals to look at pictures of the eye region and to choose the word that best describes the emotion or thinking conveyed. This instrument purports to measure attribution of mental state, which is considered to be one aspect of theory of mind skills. The *Eyes Test-Revised* has been found to be sensitive to subtle differences in social sensitivity or ‘mind-reading’ (Baron-Cohen et al., 2001).

Standardization of this revised version of the instrument took place in the United Kingdom and consisted of four groups: 1) adults with AS or HFA (N=15); 2) normally developing adults (N= 122); normally developing adult students (N=103); and randomly selected individuals in the general population (N=14), who were matched on age and IQ with group 1.

With reference to validity, a study with the original version of this test demonstrated that individuals with autism and AS were significantly impaired on this

task when compared to individuals with Tourette's Syndrome and normal controls. Further, another test of theory of mind revealed comparable performance, while on two control tasks, no impairment was noted (Baron-Cohen et al., 1997b).

Evidence for the validity of the newest version of the measure has been provided by comparing results to those on measures that would be theoretically similar (Autism Quotient and the Empathy Quotient). Findings indicate that the Autism Quotient correlated inversely with the Eyes Test-Revised, while the Empathy Quotient and the Eyes Test-Revised shared a positive correlation. IQ was found to be unrelated to performance on the Eyes Test-Revised (Baron-Cohen, Wheelwright, Hill, Raste, and Plumb, 2001). Further, adults with AS were significantly impaired on the Eyes Test-Revised, whereas performance on a control task (recognizing gender from pictures) was comparable to normal controls (Baron-Cohen, Jolliffe, et al., 1997; Baron-Cohen, Wheelwright, et al., 1997), providing further evidence for the clinical validity of this test. Finally, in a series of individual case studies, the Eyes Test-Revised was found to discriminate between individuals with HFA or AS and normal controls (Baron-Cohen, Wheelwright, Stone, & Rutherford, 1999). While information for item performance is available, information for the reliability of this measure as a whole is not available.

#### The Delis-Kaplin Executive Function System (D-Kefs)

The Delis-Kaplin Executive Function System (D-Kefs) is a measure of cognitive functions related to various executive processes including: planning, reasoning, cognitive flexibility, fluency, and inhibition. Because the D-Kefs is intended to provide assessment of broad, yet primarily independent executive functions, each test in this battery may be administered alone or in combination with others. No composite scores are generated, and consequently excluding subtests does not impede interpretation. The subtests included in the D-Kefs are modifications of well-known traditional tests of executive function (Lopez et al., 2005).

The D-Kefs was standardized on a stratified sample of 1750 non-clinical individuals in the United States based on 2000 US census data. Reliabilities of the D-Kefs tests were demonstrated to be comparable to other commonly available tests of executive function (Delis, Kramer, Kaplan, & Holdnack, 2004). The authors of the D-kefs explain that since the D-Kefs consists of various distinct subtests, comparison to

single measures of executive function has not been conducted. Rather, correlational analyses of conditions for each D-Kefs subtests in relation to each other in normal functioning individuals are provided. Results indicate that 1) the relative contribution of each executive function differs between age groups (as would be expected in developmental neuropsychological theory) and, 2) overall low correlations between tests indicate that each measures distinct, relatively independent executive functions (Delis et al., 2001).

Evidence for the validity of D-Kefs has been provided in various publications. To summarize, various studies provide evidence of the construct validity by using the test in clinical populations. For example, investigations with individuals from the following groups have been conducted to understand the utility for clinical populations: Alzheimer's; frontal lobe lesions; frontal-temporal dementia; epilepsy; mild cognitive impairment; psychopathy; fetal alcohol exposure; autism; and Asperger syndrome (Baldo, Shimamura, Delis, Kramer, & Kaplan, 2001; Delis et al., 2001; Kalinian & Wisniewski, 2007; Kramer et al., 2007; McDonald et al., 2005; Yochim, Baldo, Nelson, & Delis, 2007). Results of these studies demonstrate that individuals in clinical groups perform as would be theoretically expected on the tasks of executive function administered and that the D-Kefs is reasonably sensitive to clinical groups (Homack, Lee, & Riccio, 2005). Evidence for discriminant validity is provided by comparison of the D-Kefs subtest and the California Verbal Learning Test- Second edition, where, as expected, no significant correlation was found. Further, the D-Kefs tests were found to correlate with subtests from the Woodcock Johnson Tests of Cognitive Abilities, which is a measure purporting to tap cognitive and executive skills (Floyd et al., 2006), providing further evidence for the validity of tests within the D-Kefs.

In a study of EF using the D-Kefs with individuals with HFA and AS, Kleinmans, Akshoomoff, & Delis's (2005) found that only tasks pertaining to cognitive switching were impaired. In particular, deficits were found on some conditions of the Trail Making, Verbal Fluency, and Colour-Word Interference subtests. These tasks were chosen for inclusion in this study in light of the aforementioned study and because they reflect several traditional and widely used EF tasks commonly referred to in the literature. Table 2.3 provides more detailed information on these tasks and what they purport to

measure. As mentioned, for this study, conditions reflecting the traditional EF tasks and those pertaining to cognitive switching are the particular variables of interest. However, for each subtest it is important to evaluate baseline measures prior to analyzing results in the target conditions, as poor baseline scores indicate a subskill deficit, rather than a deficit in the EF process. A summary of the structure of the tests (including conditions) to be used in this study is provided in the Table 2.1.

The D-Kefs Trail Making test is an adaptation of the Trail Making test from the Halstead Reitan Battery. It consists of five conditions: visual scanning, number sequencing, number-letter switching, visual-motor sequencing, and motor speed. Condition 4, number letter switching, is the particular condition of interest in this subtest as it is similar to the Traditional Trail Making A test, which is commonly used in examinations of EF. The internal consistency for the D-Kefs Trail Making test for ages 16 to 29 range between .69 to .64 and test-retest coefficients are reported to range between .5 to .82 over a 25-day period (+/- 12.8 days). Evidence for the validity of the D-Kefs Trail making test was demonstrated through an examination of fetal alcohol syndrome and normal controls (Mattson, Goodman, Caine, Delis, & Riley, 1999), where results indicated that FAS participants demonstrated impulsivity, difficulties with inhibition control, and impairment in higher-level cognitive functions. These patterns reflect theoretical predictions of performance for this group.

The Verbal Fluency test is a measure of individual ability to fluently generate verbal labels to fit a specific category and simultaneously shifting from an automatic response. Verbal Fluency consists of three conditions: Letter Fluency, Category Fluency, and Category Switching. Category Fluency is the condition that is of primary interest for this subtest, as it incorporates a switching condition. Internal consistency is reported to range from .48 to .85 while test-retest values range from .24 to .81. Validity studies for the Verbal Fluency test revealed a pattern of relationships between conditions that was consistent with expected patterns (Delis, et al., 2001). For example, an examination of the performance of adults with frontal lesions also revealed impaired performance compared to normal controls (Baldo et al., 2001), as would be expected on a task theoretically linked with frontal lobe functions.

The Colour-Word Interference test is an adaptation of the Stroop (1935) procedure that is intended to measure the ability to inhibit a prepotent response in light of dissonant task demands. The test includes two baseline conditions (colour naming and word reading) intended to measure the prerequisite skills needed for this task. Two higher level tasks (inhibition and inhibition/switching) are intended to assess the ability to inhibit an over-learned response in order to produce a non-intuitive, yet required dissonant response. Condition 3, Inhibition, is the condition of interest for this study as it is similar to the classic Stroop task used in many EF investigations. Internal consistency for this test is reported to range from .62 for 13-19 year olds to .86 for 50-59 year olds, indicating moderate to high values. Test-retest data for this test indicates moderate scores for the colour word variables ranging from .62 to .76 for all conditions in the full age range. Performance on the colour naming condition peaks at ages 16-19 and remains relatively stable through ages 30-39 years. However, performance on the word reading condition does not peak until age 20. Consequently, some differences in performance across conditions may be evident (Delis et al., 2001).

Clinical validity for the colour word interference test was demonstrated in studies of individuals with fetal alcohol syndrome, where elevated rates of impulsivity were demonstrated by individuals with fetal alcohol syndrome when compared to IQ matched normal controls (Delis et al., 2001).



University of Saskatchewan  
Behavioural Research Ethics Board (Beh-REB)

9-Jun-2006

*APPENDIX M: Ethical*

# Certificate of Approval

## Approval Certificates

PRINCIPAL INVESTIGATOR  
Vicki Schwean

DEPARTMENT  
Educational Psychology and Special Education

BEH#  
06-106

STUDENT RESEARCHERS  
Janine Montgomery, Danielle Dyke, Jo-Anne Burt, Candace Kohut, Yvonne Hindes

SPONSOR  
UNFUNDED

TITLE  
Emotional Intelligence and Resiliency in Individuals with Asperger Disorder

CURRENT APPROVAL DATE  
29-May-2006

CURRENT RENEWAL DATE  
01-May-2007

The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

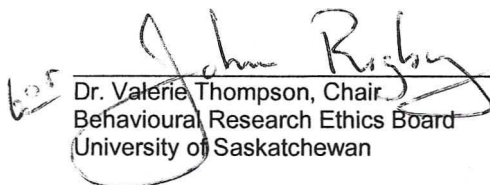
Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

### ONGOING REVIEW REQUIREMENTS

The term of this approval is five years. However, the approval must be renewed on an annual basis. In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions:

<http://www.usask.ca/research/ethical.shtml>

APPROVED

  
Dr. Valerie Thompson, Chair  
Behavioural Research Ethics Board  
University of Saskatchewan

Please send all correspondence to:

Ethics Office  
University of Saskatchewan  
Room 306 Kirk Hall, 117 Science Place  
Saskatoon SK S7N 5C4  
Telephone: (306) 966-2084



## APPROVAL CERTIFICATE

26 June 2006

**TO: Janine Montgomery**  
Principal Investigator

**FROM: Bruce Tefft, Chair**  
Psychology/Sociology Research Ethics Board (PSREB)

**Re: Protocol #P2006:052**  
**“Emotional Intelligence and Resiliency in Individuals with Asperger Disorder”**

Please be advised that your above-referenced protocol has received human ethics approval by the **Psychology/Sociology Research Ethics Board**, which is organized and operates according to the Tri-Council Policy Statement. This approval is valid for one year only.

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.



**Please note:**

- if you have funds pending human ethics approval, the auditor requires that you submit a copy of this Approval Certificate to Kathryn Bartmanovich, Research Grants & Contract Services (fax 261-0325), including the Sponsor name, before your account can be opened.
- if you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.



UNIVERSITY OF  
CALGARY

MEMO

**Conjoint Faculties Research Ethics Board (CFREB)**  
Research Services Office  
Main Floor, Energy Resources Research Building  
Research Park  
Telephone: (403) 220-3782  
Fax: (403) 289-0693  
Email: bonnie.scherrer@ucalgary.ca

**To:** Dr. Vicki Schwean  
Division of Applied Psychology,  
Faculty of Education

**Date:** June 23, 2006

**From:** Dr. J. Kent Donlevy, Acting Chair  
Conjoint Faculties Research Ethics Board

**Re:** Certification of Institutional Ethics Review – "Emotional Intelligence and Resiliency in Individuals With Asperger Disorder"

On behalf of the Conjoint Faculties Research Ethics Board (CFREB), this is to acknowledge receipt of the proposal, consent forms, and recruitment materials submitted to the University of Saskatchewan Behavioural Research Ethics Board for the above-named project, and copy of the ethical clearance from the University of Saskatchewan dated 29 May 2006. The University of Calgary accepts your application in this format and herewith confirms ethical clearance. Accordingly, a copy of this letter should be attached to your original clearance granted by the University of Saskatchewan.

In accordance with the approval issued by the University of Saskatchewan REB, you have been named as principal investigator for this project on the University of Calgary ethics clearance. Referral for individuals with questions regarding their rights as participants, however, will be to the University of Saskatchewan REB (as outlined in the study consent forms), since there is a student researcher, Ms. Janine Montgomery, at the University of Saskatchewan, and the original approval was issued by that institution's REB; we have advised the University of Saskatchewan Behavioural REB that we attorn to their jurisdiction with respect to the action of the student researcher in this instance.

The CFREB should be kept apprised of any modifications to the protocol that are authorized by the principal investigator's institution. A progress report must be submitted 12 months from the date of this letter, and you should provide the expected completion date for the project. A form for this purpose is available at the following website: [http://www.ucalgary.ca/UofC/research/html/ethics/info\\_facres.html](http://www.ucalgary.ca/UofC/research/html/ethics/info_facres.html)

Written notification must be sent to the CFREB when the project is complete or terminated.

In closing, let me take this opportunity to wish you well in your research endeavors.

Sincerely,

J. Kent Donlevy, M.Ed., LLB, Ph.D., Assistant Professor  
Faculty of Education and  
Acting Chair, Conjoint Faculties Research Ethics Board