Abstract

Autism spectrum disorders (ASD) are more prevalent in males than in females, at an estimated rate of 5:1. Consequently, women and girls were neglected from much of the early ASD research. Recently, there has been an increased focus on how ASD affects females in symptom presentation and in social and emotional functioning. Some recent studies suggest that while females with high functioning autism spectrum disorders (HFASD) may present with better observable social skills than males with HFASD, they may experience more problems in developing appropriate peer relationships.

Understanding gender differences in the typically developing (TD) population is an important aspect of understanding this relationship among individuals with HFASD. In general, females place more emphasis on emotional intimacy, while males place more emphasis on interest-based relationships, which could impact the ability of women with HFASD to maintain relationships with TD peers. The current study examined gender differences in ASD symptoms, social relationships, loneliness and emotions in 56 adults diagnosed with HFASD and 56 TD adults. Participants with HFASD included 28 women and 28 men with a previous diagnosis of an ASD, who did not differ on age, ethnicity, education level, or cognitive ability. The TD participants included 28 women and 28 men who did not differ from participants with HFASD on age, ethnicity, or education.
level. Individuals with HFASD participated in two researcher administered assessments, the *Autism Diagnostic Observation Schedule (ADOS)* and the *Wechsler Abbreviated Scale of Intelligence – Second Edition (WASI-II)*. Both HFASD and TD participants completed the following self-report questionnaires: a *Demographic Questionnaire*, the *Autism Spectrum Quotient*, the *Cambridge Friendship Questionnaire*, the *UCLA Loneliness Scale: Version 3*, the *Positive and Negative Affect Schedule*, and a *Friendship Activity Report*, which was designed for the study to determine the nature of peer relationships. Results indicated that women with HFASD displayed significantly better communication and social skills than men with HFASD on the ADOS. However, women and men with HFASD did not exhibit differences in number of friendships, friendship quality, loneliness, positive emotions, or negative emotions. Participants with HFASD exhibited higher levels of loneliness and negative emotions, as well as fewer friendships and lower friendship quality than TD participants. Additionally, there was a significant gender by diagnosis interaction on friendship quality scores, with TD women scoring higher on a measure indicating close, emotionally-supportive relationships than TD men, women with HFASD, and men with HFASD. The larger discrepancy between TD and HFASD women versus men on friendship quality warrants further investigation, as it may indicate that females with HFASD are at a higher risk for experiencing mental health issues related to lack of social support. In both HFASD and TD participants, higher levels of friendship quality were associated with lower levels of loneliness. Implications for gender-targeted interventions and future research are discussed.
This document is dedicated to the memory of my father and my brother and is in honor of my mother, whose support and encouragement have been invaluable throughout my life. To the women and men in the ASD community who inspired this project, I also dedicate this document to you.
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Chapter 1: Introduction

The term autism spectrum disorders (ASD) refers to a group of related neurodevelopmental conditions, presenting with a heterogeneous constellation of behavioral symptoms characterized by impairments in social communication, social interaction and restricted interests/repetitive patterns of behavior (American Psychiatric Association, 2000; American Psychiatric Association, 2013). Researchers have conceptualized ASD as occurring on a spectrum and presentation of these conditions varies widely, depending on the communicative and intellectual functioning of affected individuals. Although the current diagnostic classification system identifies one diagnosis, Autism Spectrum Disorder (American Psychiatric Association, 2013), the previous diagnostic system identified five distinct diagnoses, including Autistic Disorder, Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS), Asperger’s Disorder, Rhett’s Disorder, and Childhood Disintegrative Disorder (American Psychiatric Association, 2000).

There is ample evidence that ASD occurs more frequently in males than females, with current prevalence estimates suggesting a male to female ratio of about 4:1 across all levels of ASD (Boyle et al., 2011; Ehlers & Gillberg, 1993; Fombonne, 2003). In
individuals with moderate to profound ID, the male to female ratio in ID is more
commensurate, with estimates of 1.98:1 (Fombonne, 2007). However, discrepancies in
male to female ASD ratios in individuals with average IQ is higher (often referred to
high-functioning autism spectrum disorders (HFASD)), with an estimate of about 5.5:1
(Fombonne, 2007; Volkmar, Szatmari, & Sparrow, 1993). Additionally, males without
co-occurring ID are referred for assessment of ASD at a rate of about 10:1 to females
without ID (Ehlers & Gillberg, 1993; Kreiser & White, 2013). Much of the early
research on sex differences (a biological construct) in ASD and HFASD has focused
exclusively on discrepancies in the male to female ratio.

Gender differences (a socio-cultural construct) between males and females in the
presentation and characterization of ASD and HFASD has only recently gained
momentum in the literature. This burgeoning body of research suggests that gender may
also affect the presentation of HFASD, leading to a “gender-specific” ASD phenotype, in
which girls and women may present with different types of socio-communicative
impairment and restricted interests and behavior than boys and men (e.g. Kopp &
Gillberg, 2011). Preliminary evidence also suggests that gender may affect other
behavioral and emotional characteristics associated with ASD. For example, girls and
women with HFASD may appear more socially adept when compared directly to boys
and men with HFASD, but they may struggle significantly more in developing and
maintaining peer relationships throughout development due to gender differences in
social interactions (e.g. Holtmann, Bölte, & Poutska, 2007; Lai et al., 2011; McLennan,
Lord & Schopler, 1993). There is abundant evidence supporting some basic gender
differences in typical social relationships, indicating that females place more emphasis on emotional intimacy and males place more emphasis on action or interest-based social relationships (e.g. Geary, 1998; Maccoby, 1999).

The development of more complex social and peer relationships during adolescence and young adulthood is difficult for males and females with HFASD, who often desire meaningful social connections, but lack many of the social skills necessary to develop and maintain peer relationships. Lack of stable, meaningful social relationships has far-reaching implications for the overall health of individuals with and without disabilities. Peer rejection and difficulty developing and maintaining reciprocal friendships are associated with increased social isolation and loneliness in TD individuals and those with HFASD (e.g. DiTomasso & Spinner, 1997; Lasgaard et al., 2010; Weiss, 1973).

Other emotional correlates of loneliness and lack of social relationships include decreased positive affect, which is particularly associated with depressive disorders (Brown, Chorpita, & Barlow, 1998). Adolescent girls and women are twice as likely to be diagnosed with depression than their male counterparts (Nolen-Hoeksema, 2001; Nolen-Hoeksema & Girus, 1994). Thus, it is important to examine the relationship among loneliness, social relationships and emotional health in girls and women with HFASD, who may present with a higher risk of depressive disorders or other emotional disorders than boys and men with HFASD, by virtue of their gender.

The present study will focus on gender differences in the quality of peer relationships, friendships, and emotional correlates, such as loneliness and affect, among adults with
high-functioning autism spectrum disorders (HFASD) and typically developing (TD) adults. Literature on the diagnostic criteria, assessment methods, and prevalence in ASD and HFASD, the presentation of ASD and HFASD in adulthood, social and emotional development in ASD and HFASD, gender differences in social and emotional development in the TD population and in ASD and HFASD are reviewed.

_Autism Spectrum Disorder: Diagnostic Criteria_

The first cases of autism were described independently by Leo Kanner as “infantile autism syndrome” (Kanner, 1943) and by Hans Asperger as “autistic psychopathy” (Asperger, 1944; cited in Wing, 1981a). Both authors noted the presence of social and communicative deficits, as well as insistence on routine and repetitive patterns of behavior, although their “prototypical” cases exhibited differences in the presentation of symptoms. Kanner (1943) described more severe language deficits and the tendency for “aloofness” in the children he observed, while Asperger (1944) described no delays in spoken language and more interest in social engagement in the children he observed (described in Wing, 1981a).

The prevalence of and research on the latter two conditions are scarce, so these conditions will not be described in detail. Because the DSM-IV-TR (American Psychological Association, 2000) was in use at the beginning of the current study, diagnostic criteria from this system will be used throughout the manuscript.

Autistic Disorder, sometimes referred to as “classic autism” or “Kanner’s autism,” includes the most stringent criteria for impairments in the three core domains of social and communicative functioning and repetitive/stereotyped interests. According to the DSM-IV-TR, a diagnosis of Autistic Disorder requires meeting criteria in three areas of functioning: 1) qualitative impairment in social interaction; 2) qualitative impairment in communication; and 3) restricted repetitive and stereotyped patterns of behavior, interests and activities (American Psychiatric Association, 2000). Despite having the most stringent diagnostic criteria, individuals with Autistic Disorder exhibit a range of intellectual, communicative and adaptive functioning. PDD-NOS, also described as “atypical autism,” is diagnosed when not all of the criteria for Autistic Disorder are met. A diagnosis of PDD-NOS must include significant impairment in social interaction, but the criteria for impairment in communication or restrictive, repetitive and stereotyped patterns of behavior may be sub-threshold.

Asperger’s Disorder, also referred to as Asperger’s Syndrome (AS), was not formally included as a diagnostic entity until the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV; American Psychiatric Association, 1994).
Criteria for a diagnosis of Asperger’s Syndrome include: 1) qualitative impairment in social interaction, 2) restricted repetitive and stereotyped patterns of behavior, interest and activities, 3) clinically significant impairment in social, occupational, or other important areas of functioning, with 4) no clinically significant general delay in language, and 5) no clinically significant delay in cognitive developmental or adaptive behavior (DSM-IV-TR) (American Psychiatric Association, 2000). While the development of spoken language is not delayed or impaired in Asperger’s Syndrome, verbal communication is often perceived as odd, overly rule-focused or literal (American Psychiatric Association, 2000).

*High-functioning Autism Spectrum Disorders*

The term “high-functioning autism spectrum disorders” (HFASD) has been widely used in the literature to describe conditions in which the core impairments in social interaction and restricted and repetitive patterns of behavior of ASD are present, but cognitive impairment and general language impairment are absent. Asperger’s Syndrome is generally included in this descriptive category, due to the criteria that individuals must have normal cognitive functioning and no delays in spoken language. “High-functioning autism,” is a less well-defined term, which although not a formal diagnosis, has been widely used to describe individuals with characteristics of ASD with average or above average intellectual functioning and good current verbal communication skills, who may have presented with verbal communication impairments during early childhood. “High-
functioning autism” has become a catch-all phrase for individuals who do not meet the lack of language delay requirement in Asperger’s Syndrome.

In the 1980s and early 1990s, there was debate among researchers regarding whether Asperger’s Syndrome (AS) and high-functioning autism spectrum disorder (HFASD) should be separated into discrete diagnostic categories or conceptualized as variants in severity along the autism spectrum (e.g. Ozonoff et al., 1991; Rutter, 1983; Schopler, 1985; Szatmari et al., 1990; Wing, 1981a). Much of this research has been difficult to interpret due to the inconsistency in which AS and HFASD were defined. Most experts in the ASD field now conceptualize AS a variant along the autism spectrum, which is reflected in the changes in DSM-5.

The inclusion of the previously separate PDD diagnoses into one Autism Spectrum Disorder category in the DSM-5 was based on considerable evidence that the separate diagnoses, including Asperger’s Syndrome and high-functioning autism, are not reliably distinguished in diagnostic contexts and do not represent meaningful clinical distinctions (e.g., Leekam et al., 2000; Mayes, Calhoun, & Crites, 2001). One problem of differentiating AS from HFASD involves the difficulty in determining the presence of early language delays when assessed in older children and adults. Because the average age of AS diagnosis is higher than in other autism spectrum disorders, ranging from 7 to 11 years old, the ability to obtain accurate retrospective reports regarding early childhood language is less reliable than in earlier diagnoses (Howlin & Asgharian, 1999; Mandell,
Not surprisingly, clinicians often incorrectly diagnose Asperger’s Syndrome when autism would be a more appropriate diagnosis, and agreement between clinicians’ decisions and actual DSM-IV criteria is quite low (Kappa = 0.31; Williams et al., 2008).

Other studies examining the outcome and trajectories of children diagnosed with autism who develop fluent language and children diagnosed with AS have found few differences in these areas, and these individuals appear to be indistinguishable by late childhood to early adulthood (Howlin, 2003; Macintosh & Dissanayake, 2004). It appears that language impairment at the ages of 6 to 8 years old may be a better predictor of outcome than earlier language development (Bennett et al., 2008). Results from a comprehensive literature review of autism spectrum disorder subtypes suggest that the distinction between Asperger’s Syndrome and other subtypes is not empirically supported, and that current IQ is a more appropriate way to distinguish subtypes in autism spectrum disorders (Witwer & Lecavalier, 2008).

Autism Spectrum Disorders: Prevalence

Obtaining accurate prevalence estimates of ASD is difficult, as the rates may vary according to how broadly the disorder is defined and by the sophistication of the diagnostic tools. A meta-analysis of ASD prevalence studies from 13 countries, conducted from 1966 to 2001 reported an increase in autism during this time period (Fombonne, 2003). Using conservative diagnostic criteria for autism (PDD-NOS and
Asperger’s Disorder excluded), the author reported a median rate of 4.4/10,000 from studies conducted from 1966-1991 and a median rate of 12.7/10,000 from 1992-2001 (Fombonne, 2003). Based on less precise studies of “atypical autism,” Fombonne estimated the prevalence of PDD-NOS as 15/10,000 and of Asperger’s Syndrome as 2.5/10,000.

More recent studies have estimated higher prevalence rates in the United States (Kogan et al., 2009), Canada (Fombonne et al., 2006), and the United Kingdom (Baird et al., 2006) with current estimates of prevalence among all types of ASD at about 1%. The most recent study conducted by the CDC reported a rise in prevalence in the United States from 2007 to 2011-2012 (Blumberg et al., 2013). Prevalence rates of autism spectrum disorders based on parent reported diagnosis for children aged 6-17 years was estimated as 1 in 68 (1.5%; Blumberg et al., 2013). There has been an undisputed rise in the number of ASD diagnoses since the inclusion of “infantile autism” in the DSM-III (APA, 1980). However, there has been much debate about the cause of this apparent rise in prevalence, with some researchers arguing for a true increase in the rate of ASD due to environmental factors, and other researchers arguing that the increased rate of diagnosis is an artifact of evolving diagnostic criteria and assessment methods. The majority of empirically based studies with sound research methods attribute this phenomenon to factors such as expanding diagnostic criteria, earlier detection, increased sophistication of diagnosis and assessment tools, and an increased awareness of ASD (e.g. Fombonne, 2005; Rutter, 2005).
The ability of researchers and clinicians to diagnose autism spectrum disorders has changed considerably over time, and the increased awareness of ASD has necessitated more sophisticated, standardized diagnostic measures, as well as wide range of screening questionnaires. Lord and Corsello (2005) report several challenges associated with ASD assessment, including defining comparison groups, generating appropriate norms, and disentangling confounding factors, such as language impairment and intellectual and adaptive functioning levels, from diagnosis. However, they cite several diagnostic scales that, despite flaws, address many of these challenges quite effectively (Lord & Corsello, 2005). Among the most widely used diagnostic instruments that have been validated with both children and adult populations are the Autism Diagnostic Interview – Revised (ADI-R) (Le Couteur et al., 1989; Lord, Rutter & Le Couteur, 1994) and the Autism Diagnostic Observation Schedule (ADOS) (DiLavore, Lord & Rutter, 1995; Lord et al., 1989; Lord et al., 2000). While these measures comprise an important part of comprehensive assessment of ASD, the diagnostic “gold standard” is ultimately based on experienced clinician decision.

The Autism Diagnostic Interview (ADI) (Le Couteur et al., 1989) and its revised version the Autism Diagnostic Interview – Revised (ADI-R) (Lord, Rutter & Le Couteur, 1994), were designed to assess DSM-IV and ICD-10 (World Health Organization, 1992) criteria.
for autism spectrum disorders. This clinician-rated measure consists of an extensive semi-structured interview with a primary caregiver (Lord, Rutter & Le Couteur, 1994). Studies have reported good psychometric properties overall, with some difficulty in discriminating between autistic disorder and PDD-NOS and between ASD and nonverbal children with intellectual disabilities (Cox et al., 1999; Lord, Rutter & Le Couteur, 1994). It is noteworthy that factor analysis of the ADI-R subscales revealed a two-factor solution (rather than the traditional three core domains of impairments in ASD), with social and communicative deficits forming one factor and restricted, repetitive behaviors forming another (Lecavalier et al., 2006), which is reflected in changes to diagnostic criteria in DSM-5.

The Autism Diagnostic Observation Schedule – Generic (ADOS-G), was also developed to assess symptoms consistent with DSM-IV-TR (APA, 2000) and ICD-10 (WHO, 1992) criteria for autism spectrum disorders, in order to allow standardized observation of current communication and social functioning (Lord et al., 2000). The current version of the ADOS was developed based on two previous versions, the Autism Diagnostic Observation Schedule (ADOS) (Lord et al., 1989) and the Pre-Linguistic Autism Diagnostic Observation Schedule (PL-ADOS) (DiLavore, Lord & Rutter, 1995). The revised ADOS-G version was developed to extend the age range and verbal expressive level of individuals being evaluated, and it is comprised of four different modules, only one of which is administered to a particular individual, based on his or her level of expressive language (Lord et al., 2000). All modules share the format of planned social
interactions, or “presses,” in which social responses are elicited through various means. However, Modules 1 and 2 focus primarily on social interaction within the context of “play” situations, while Modules 3 and 4 rely more heavily on conversation and interview regarding socio-emotional insight and daily living tasks.

The ADOS-G and its previous versions were not designed to provide a diagnosis of an ASD, but rather as a complement to clinical judgment and the Autism Diagnostic Interview-Revised (ADI-R; Lord, Rutter & Le Couteur, 1994). The scoring algorithm allows for diagnostic categories of autism and PDD-NOS, or “autism spectrum,” which are determined by exceeding threshold levels on two domains: Reciprocal Social Interaction and Communication. While restricted, repetitive and stereotyped patterns of behavior and interests are coded on the ADOS-G, they were not originally included in the scoring algorithm for any of the modules (Lord et al., 2000). However, the algorithms for Modules 1, 2, and 3 have been revised to include this domain in the thresholds for ASD diagnostic categories, and the social and communication domains have been combined (Gotham et al., 2007). The revised algorithm has exhibited greater diagnostic reliability among the three modules (Gotham, Pickles, & Lord, 2011).

Due to the costly and time-consuming nature of clinician-administered diagnostic measures, screening instruments have been developed to determine if individuals may need further assessment for an autism spectrum disorder. Most screening instruments rely on caregiver or teacher report of observable behaviors, either in an observer-rated
questionnaire format or brief interview with a clinician. Examples include the Autism
Behavior Checklist (ABC; Krug, Arick, & Almond, 1980), the Social Responsiveness
Scale (SRS; Constantino et al., 2003; Constantino et al., 2004), and the Social
Communication Questionnaire (SCQ; Berument et al., 1999; Rutter, 2003). While the
SCQ has exhibited good discriminative validity in differentiating ASD and non-ASD
disorders, it does not perform as well in distinguishing among the ASD subtypes
(Howlin, 2000).

Screening instruments specifically designed to assess for autism symptoms associated
with Asperger’s Syndrome (AS) or high-functioning autism (HFASD) are relatively
scarce, and ones that provide adequate reliability and validity data are even scarcer (see
Matson & Boisjoli, 2008; Norris & Lecavalier, 2010). A few instruments that have been
designed to assess for symptoms of AS and HFASD in children include the Australian
Scale for Asperger’s Syndrome (Attwood, 1998; Garnett & Attwood, 1995), the
Childhood Asperger Syndrome Test (CAST; Scott et al., 2002), the Gilliam Asperger’s
Disorder Scale (GADS; Gilliam, 2001), and the Autism Spectrum Screening
Questionnaire (ASSQ; Ehlers, Gillberg, & Wing, 1999).

The ASSQ has been more widely studied than the other instruments, and it has
demonstrated promise as a screening measure. The ASSQ is a 27-item checklist designed
to be completed by caregivers or teachers of children suspected of having AS or HFASD,
and it includes items assessing core features of ASD (Ehlers, Gillberg, & Wing, 1999).
Scores range from 0 to 54, with higher scores indicating the presence of more autism spectrum symptoms. In an epidemiological sample of children aged 7 to 16 years, the ASSQ demonstrated good test-retest reliability and interrater reliability (Ehlers & Gillberg, 1993). In the clinical standardization sample of 110 children aged 7 to 16 years, the ASSQ demonstrated fair to good diagnostic validity, and the authors recommended a cut-off score of 19 for parent raters (Ehlers, Gillberg, & Wing, 1999). More recent studies have also found that the ASSQ demonstrated good diagnostic validity and good internal consistency (Posserud, Lundervold, & Gillberg, 2009; Posserud et al., 2008).

Recently, the ASSQ has been revised and expanded to include items assessing ASD symptoms that may present more frequently in girls than in boys (Kopp & Gillberg, 2011). Kopp and colleagues developed an 18-item extension of the ASSQ, called the ASSQ-GIRL, which when combined with the original 27-item ASSQ makes up the 45-item ASSQ – Revised Extended Version (ASSQ-REV) (Kopp & Gillberg, 2011). Items on the ASSQ-GIRL were based on input from clinicians with extensive experience in assessing and treating girls with ASD, and they included items such as “no time perception,” “difficulties with self-care,” “naïve,” and “episodes of eating problems” (Kopp & Gillberg, 2011). In a clinical sample of children and adolescents, aged 6 to 16 years old, mean scores on the ASSQ, the ASSQ-GIRL, and the ASSQ-REV did not differ between girls and boys with HFASD. However, several items on the ASSQ-GIRL discriminated between boys and girls with HFASD: boys with HFASD scored significantly higher on the item “lacks best friends,” while girls with HFASD scored significantly higher than boys on “avoids demands,”
“interacts mostly with younger children,” “has a different voice/speech,” and “difficulties completing simple daily activities” (Kopp & Gillberg, 2011).

The authors also compared children with HFASD to children with ADHD and community controls, and found that the ASSQ-GIRL did not improve diagnostic validity in the overall sample, (Kopp & Gillberg, 2011). However, the ASSQ-GIRL performed better in distinguishing girls with HFASD from TD girls. Despite difficulties in the psychometric properties of the original format of the ASSQ-GIRL, this measure is worth examining further, in order to provide additional information about the characterization of ASD symptoms in females (Kopp & Gillberg, 2011).

While the ASSQ was developed to screen for HFASD in children and adolescents and the language of the questions reflects this age range, the ASSQ may be a useful instrument for assessing ASD symptoms in adults as well, given its focus on current, observable behaviors and the promising findings from psychometric studies. Although the ASSQ has not been validated in an adult sample, studies utilizing the measure with adults have been found (Munesue et al., 2008; Nylander & Gillberg, 2001; Rydén & Bejerot, 2008). The language would need to be modified to reflect the age of the target population, and cut-off scores may need to be adjusted based on the purpose of the measure in specific populations of individuals, as researchers have demonstrated in clinical versus population samples (Ehlers, Gillberg, & Wing, 1999; Posserud, Lundervold, & Gillberg, 2009).
The Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001) is one of the only self-rated screening questionnaire available designed to assess autism spectrum traits in adults with at least average intellectual functioning. The AQ consists of 50 items, which represent five areas of autism traits, including social skills, attention-switching, attention to detail, communication, and imagination, with 10 questions in each domain (Baron-Cohen et al., 2001). In the development sample, the AQ was effective in discriminating adults with Asperger’s Syndrome (AS) and high-functioning autism (HFASD) from a matched community control group and a large sample of undergraduate students. According to the initial evaluation of the measure, the authors of the AQ reported excellent test-retest reliability, and inter-rater reliability between self and parent-report versions was good, with parents rating their children 2.8 points higher on the total score. Internal consistency for the five domains (social skills, attention-switching, attention to detail, communication, and imagination) was moderate to high, with Cronbach’s alpha coefficients ranging from .63 - .77 (Baron-Cohen et al., 2001).

Analyses from the development sample suggested that a score of 32+ is best at discriminating those with clinically significant autism traits from those without clinically significant autism traits, as 80% of individuals with an AS/HFASD diagnosis scored at or above this threshold and only 2% of the control groups scored above 32 (Baron-Cohen et al., 2001). The usefulness of the AQ has also been examined in clinical practice, with a sample of 100 consecutive patients referred for an ASD evaluation. In this context, the AQ showed a good ability to differentiate between those who received a diagnosis of AQ
and those who did not, with an area under the ROC = 0.78 (std. err. 0.06, 95% CI 0.7–0.9) (Woodbury-Smith et al., 2005). The authors reported that while a threshold score of 32+ may discriminate clinically significant autistic traits in the general population, a threshold score of 26+ in a clinical population resulted in more individuals being correctly identified with ASD (Woodbury-Smith et al., 2005).

Autism Spectrum Disorders in Adults

While the overwhelming majority of research focuses on the presentation and treatment of ASDs in children, there is an increasing recognition of the importance of lifespan issues affecting individuals with ASD (e.g. Orsmond, Krauss, Seltzer, 2004; Schroeder, LeBlanc, & Mayo, 1996). Studies on the behavioral correlates of ASD in adolescents and adults have shown a different pattern than in children, including a decrease in repetitive and stereotyped behaviors and maladaptive behaviors (Esbenson et al., 2008; Seltzer et al., 2004; Shattuck et al., 2007). Taylor and Seltzer (2010a) recently examined the rates of change in autism symptoms and maladaptive behaviors after graduation from high school in a longitudinal study. They reported that while autism symptoms and internalizing behaviors improved with age, the rates of change slowed significantly after participants transitioned from high school to day or vocational activities, especially in individuals without intellectual disabilities (Taylor & Seltzer, 2010b).
Despite improvements in ASD symptoms, research has suggested that children with autism and HFASD often show poor outcomes in adulthood, including limited employment opportunities, independent living skills, and peer relationships. For example, Howlin (2004) examined adult outcomes of 68 individuals diagnosed in childhood with ASD and a performance IQ of 50 or above, and reported that as adults, the majority of individuals depended substantially on family or other support services and few were employed permanently or reported close friendships. Billstedt and colleagues followed 108 individuals who had been diagnosed with HFASD in childhood through late adolescence and early adulthood, and they also reported high rates of dependence on family members for educational, residential, and vocational situations (Billstedt, Gillberg, & Gillberg, 2006). There is clearly a need for further investigation of the factors involved in positive outcomes for adults with HFASD, including the importance of peer relationships and social networks.

Peer Relationships and Friendship in ASD and HFASD

Impairment in social and interpersonal relationships is the hallmark feature of autism spectrum disorders, and consequently, the majority of individuals with ASD exhibit a limited ability to develop appropriate peer relationships (Ormond, Krauss, & Seltzer, 2004). Additionally, individuals who present with ASD vary considerably in their desire to form peer relationships. For example, some individuals with ASD may express little interest in developing social relationships throughout their development, while others,
particularly those with HFASD, express an increasing desire to develop peer relationships with age (e.g. Mesibov & Handlin, 1997; Volkmar & Klin, 1995). For individuals with ASD and HFASD who express interest in developing social relationships, there are several specific behavioral features associated with the conditions that may impair their abilities to form these relationships, including deficits in perspective taking, difficulty interpreting nonverbal social cues, and the presence of restricted, repetitive, or stereotyped interests and behavior.

A fundamental social skill that is impaired in most individuals with ASD and HFASD includes recognizing and interpreting non-verbal, or “pragmatic,” aspects of communication. These individuals are more likely to interpret the verbal content of a social interchange literally, rather than taking nonverbal aspects into account, such as body posture, facial expressions, and tone of voice. These subtle aspects of communication often provide more accurate representations of social intention than explicit verbal content, putting individuals with ASD and HFASD at a disadvantage in initiating and sustaining interactions with peers (Church, Alisanski, & Amanullah, 2000; Rogers, 2000).

The difficulty that individuals with ASD and HFASD present in understanding the concept of reciprocity is attributed by some researchers to deficits in Theory of Mind (ToM; Baron-Cohen, 1995). According to this theory, underlying brain mechanisms impair the ability of individuals with ASD to recognize that others’ mental states differ
from their own (e.g. Baron-Cohen, 2001). Research supports the idea that ToM is impaired in individuals with ASD, although individuals with HFASD appear to present with less severe deficits in this area (e.g. Baron-Cohen et al., 1997).

The presence of stereotyped/repetitive behaviors or intense focus on narrow interests may also contribute to the difficulty that individuals with ASD and HFASD have in developing friendships, as many are often only interested in participating in activities consistent with their narrow area of interest, or in constantly talking about these interests to the exclusion of other topics. Indeed, researchers have found a negative relationship between stereotypical behavior and engagement in social activities (e.g. Duncan et al., 1999).

While individuals with HFASD are more likely to report having friendships than more severely affected individuals on the autism spectrum, it appears that the way in which they perceive and understand these relationships differs from their TD peers (Church, Alisanski, & Amanullah 2000; Rogers, 2000). For example, researchers have identified several areas that present challenges in children with HFASD, including differentiating between a friend and an acquaintance, describing the reciprocal nature of friendship, and focusing exclusively on common interests as an indicator of friendship (Carrington, Templeton, & Papinczak, 2003).
Bauminger and colleagues (2003) studied social awareness and quality of peer social interactions in 18 children with HFASD and 17 age-matched TD children. In this sample, children with HFASD performed similarly to their TD peers in recognizing social desire and emotions in a picture-description task, but they identified significantly fewer alternatives for handling the social situations presented. Additionally, children with HFASD demonstrated lower levels of participation in peer interaction and less ability to engage in complicated, complex social interactions, such as coordinating eye gaze, facial expression and verbal communication. However, the authors noted that the children with HFASD displayed a higher rate of positive social interactions, such as sharing, smiling, and expressing affection, than previous studies have reported (Bauminger, Shulman, & Agam, 2003; Sigman & Ruskin, 1999).

Bauminger and colleagues (2004) also examined differences in perception of self and social relationships in 16 preadolescents and adolescents with HFASD and 16 TD controls. In this sample, while children with HFASD reported less intimacy, help, and companionship in their relationships with best friends than typical peers, they perceived the same level of relationship closeness as typical peers. The authors also reported that higher levels of companionship and closeness with friends were associated with higher feelings of self-worth in the entire sample of children, suggesting that the experience of intimate peer relationships is as salient to children with HFASD as it is to TD children.
The nature and quality of individual friendships and peer relationships in children with HFASD has recently gained attention in the literature. Chamberlain and colleagues (2006) differentiate between friendships, which consist of reciprocal, emotionally-close dyadic relationships, and social networks, which involve social and peer interaction patterns across time. They examined reciprocity of friendships, peer acceptance, and social networks of 398 children in regular education 2nd through 5th grade classes, including 17 children with HFASD. The authors reported that in an age-matched subgroup of HFASD and TD participants, the HFASD group experienced lower peer acceptance, decreased integration into classroom social networks, decreased companionship and decreased reciprocity than their peers (Chamberlain et al., 2006). Differences in social networks were assessed within the framework of social network centrality (SNC). SNC describes the degree to which children are connected to peers, and it consists of four levels, including nuclear, secondary, peripheral, and isolated, with “nuclear” referring to individuals who are most closely integrated with other peers and “isolated” referring to individuals who are not integrated into any peer or social networks. Significantly more participants with HFASD were classified as “peripheral” and significantly fewer were classified as “nuclear” than their TD classmates.

Locke and colleagues (2010) also examined friendship quality and social networks among 7 adolescents with HFASD and 13 typically-developing (TD) peers enrolled in a drama class at a regular education high school. The authors reported that individuals with HFASD experienced significantly lower friendship quality and social network status...
than their TD peers. Friendship quality was measured by the Friendship Qualities Scale, a 23-item questionnaire that assess five features of friendship, including companionship, help, security, closeness, and conflict (Bukowski, Boivin, & Hoza, 1994). Adolescents with HFASD reported significantly lower scores on the subscales of companionship (voluntary time spent together) and helpfulness (aid and protection from victimization) than their TD peers. TD peers were significantly more connected to social networks than HFASD participants, with 92% of TD participants being classified in social network centrality (SNC) as either “nuclear” or “secondary,” while 71% of HFASD participants were classified as either “peripheral” or “isolated” (Locke et al., 2010). These studies represent a very important step in understanding how children and adolescents with HFASD are included in regular classroom settings. However, there remains very little research assessing the social networks and friendship quality among adults.

Orsmond and colleagues (2004) investigated social relationships across the lifespan with a study characterizing peer relationships and social and recreational activities among both adolescent and adults with ASD. Although this study excluded individuals with HFASD, the findings are relevant to the developing research in peer relationships among all levels of the autism spectrum. Participants included 235 adolescents (age range = 10-21 years, n = 185) and young adults (age range = 22-47, n = 50) who lived at home with their families. Mothers of ASD participants completed the ADI-R (Lord, Rutter & Le Couteur, 1994), which includes an item measuring current functioning in regards to peer relationships. In order for a peer relationship to be considered a “friendship,” the
following four criteria must be met: 1) the relationship must be with someone in the individuals’ same age range, 2) the activities in which they participate must be varied, 3) activities must take place outside prearranged settings, and 4) there must be reciprocity and mutual responsiveness in the relationship (Lord, Rutter & Le Couteur, 1994).

Results indicated that only 8% had at least one friendship that met all of the above criteria, and 24% were reported to have no peer relationships meeting any of the criteria (Orsmond, Krauss, & Seltzer, 2004).

A recent study using data from the National Longitudinal Transition Study 2 examined social participation among recent high school graduates with ASD compared to other disability groups who had received special educational services in school, including those with intellectual disability, emotional disturbance, and learning disability (Orsmond et al., 2013). Results of the study indicated that young adults with an ASD were significantly more likely to be socially isolated, which included never seeing friends, never getting called by friends, and never being invited to activities. Several factors, such as having lower conversation ability, lower functional skills, and living with a parent, were predictive of decreased rates of social participation (Orsmond et al., 2013).

Only one study examining the quality of friendships in adults with HFASD was found. Baron-Cohen & Wheelwright (2003) developed a brief self-report measure to assess several aspects of friendship characteristics in TD and HFASD populations, the *Cambridge Friendship Questionnaire (FQ)*. The FQ was designed to assess the degree to
which respondents enjoy close, supportive relationships; the degree to which these friendships are important to them; the degree to which respondents are interested in other people; and the degree to which respondents enjoy interacting with people for its own sake. Scores range from 0 to 135, with higher scores indicating the presence of higher levels of close, supportive friendships, which can be conceptualized as higher “quality” friendships. In a sample of 68 adolescents and adults with HFASD (mean age = 34.3 years) and 76 TD adolescents and adults (mean age = 40.5 years), the HFASD sample scored significantly lower (mean score = 56.5, SD = 21.7) on the FQ than the TD sample (mean score = 80.2, SD = 15.9). Results of this study suggest that, in addition to having fewer peer relationships (Orsmond, Krauss, and Seltzer, 2004), adults with ASD may experience less satisfaction in their relationships and receive less emotional support from friendships than their TD peers (Baron-Cohen & Wheelwright, 2003).

Loneliness in ASD and HFASD

Loneliness is a complex negative emotion that is closely tied to the composition and quality of peer relationships (Margalit, 1994). A solid research base suggests that individuals who enjoy close, emotionally supportive social relationships tend to experience low levels loneliness, while individuals who lack these types of social relationships tend to experience higher levels of loneliness (e.g. DiTomasso & Spinner, 1997; Weiss, 1973). Early theories of loneliness included emotional (Bowlby, 1973, Sullivan, 1953), and social-cognitive models (Perman & Peplau, 1982). The emotional
and socio-cognitive perspective are not necessarily mutually exclusive, as evidenced by Weiss’ early model of loneliness, which conceptualizes emotional and social-cognitive loneliness as related, but distinct facets of the overarching construct of loneliness.

According to this model, emotional loneliness involves an affective, subjective response to current social relationships, while socio-cognitive loneliness involves a cognitive response, including self-evaluation, self-perception, and social comparison (e.g. Weiss, 1973).

Given the social deficits that individuals with ASD and HFASD experience, as well as apparently lower quality peer relationships compared to TD peers, loneliness is an important area to study in this population. Bauminger and Kasari (2001) outline several factors that must be taken into account when considering the experience of loneliness in individuals with ASD, including the ability to understand the self as distinct from others, the ability to compare their relationships to other peers, and the ability to understand other complex emotions that are related to loneliness, such as pride and embarrassment.

One of the earlier studies examining loneliness in younger children diagnosed with HFASD, aged 7 to 11 years, reported that they were able to identify the socio-cognitive aspects of loneliness (e.g. dissatisfaction with social relationships and social exclusion) as well as TD peers, but they struggled to identify affective components, such as sadness or depression (Bauminger & Kasari, 2000). Although children with HFASD appeared to have more difficulty understanding the affective component of loneliness, they reported
experiencing higher levels of loneliness than the control group, based on scores from the Illinois Loneliness Questionnaire (Asher et al., 1984).

As loneliness is so closely tied with friendships and social networks, many of the studies described in the above section examined the relationship between these social aspects and loneliness. For example, Bauminger and colleagues (2003) examined more in-depth features of loneliness using a loneliness-understanding interview and a loneliness self-report scale in preadolescents and adolescents with HFASD, aged 8 to 17 years. On the loneliness self-report scale preadolescents and adolescents with HFASD reported higher levels of loneliness than their TD peers. However, unlike their younger counterparts with HFASD in an earlier study (Bauminger & Kasari, 2000), the preadolescents and adolescents with HFASD in this sample demonstrated a similar understanding of both the socio-cognitive and affective components of loneliness as their TD peers (Bauminger et al., 2003).

Two other studies described above also examined loneliness, in addition to social relationships. Contrary to the majority of research thus far, Chamberlain and colleagues (2006) reported that although children in elementary school with HFASD had fewer friendships and were less involved in peer networks, they did not report higher levels of loneliness than their TD peers. The authors suggest that children with HFASD may have experienced lower levels of loneliness in this study due to lack of social awareness or to a need for fewer peer relationships then TD peers (Chamberlain et al., 2006). However,
Locke and colleagues reported that adolescents with HFASD reported higher levels of loneliness than their TD peers (Locke et al., 2010). The differences in participant developmental levels between the two studies may account for the different findings, as the nature of adolescent friendships are more complex, and adolescents with HFASD may have gained more social awareness of their difficulties.

Lasgaard and colleagues examined the relationship between loneliness and perceived social support among 39 adolescent boys with ASD (age range = 13-17 years, mean age = 14.2 years) and a control sample of 199 TD adolescent boys (age range = 13-16 years, mean age = 14.1) from a national probability study (Lasgaard et al., 2010). Based on scores from the UCLA Loneliness Scale: Version 3 (Russell, 1996), boys with ASD reported significantly higher levels of loneliness than their TD peers, and loneliness was negatively correlated with levels of perceived social support from classmates, parents, and close friends in both groups.

Similar to the ASD peer relationship literature, there are few studies investigating loneliness in adults, although one study examining the experience of loneliness and isolation in young adults with HFASD was found. In a sample of 37 adults with HFASD and 82 TD undergraduate students, Merkler (2007) reported that individuals with HFASD reported more social isolation than TD individuals. Additionally, the experiences of adults with HFASD differed depending on whether the isolation occurred with dyadic social interactions or peer network interactions. Results indicated that participants with
HFASD expressed more distress, or negative affect, as measured by the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) when isolated from peer networks than when isolated from dyadic relationships.

This study also provided support for a previous study in the typically-developing (TD) population (DiTomasso & Spinner, 1997) that reported feelings of loneliness and lack of friendships and relationships with peers were better predictors of loneliness and mental health problems, including depressive and anxiety disorders, than lack of family or romantic relationships (Merkler, 2007). The degree to which loneliness is related to distress and negative affect is a particularly important relationship to examine, as both loneliness and negative affect have been associated with depressive and anxiety disorders in individuals with ASD (e.g. Ghaziuddin, 2005; Sterling et al., 2008) and TD individuals (e.g. Cacioppo et al., 2006; Heinrich & Gullone, 2006).

Positive and Negative Affect

Positive Affect (PA) and Negative Affect (NA) refer to emotional experiences that can be described as transient moods states or relatively stable personality traits (Watson, Clark, & Tellegen, 1988). PA refers to the degree to which an individual feels engaged, active, and interested in his or her environment, and it is uniquely related to social relationships. The state of high PA involves a sense of pleasurable engagement, often leading to socially-motivated approach behavior, and the state of low PA involves sadness and
lethargy, often leading to social withdrawal. NA refers to the degree to which an individual feels subjective distress. High NA is associated with a variety of negative mood states, such as fear, anxiety, or anger, while low NA is associated with a state of calmness and equanimity (Watson et al., 1988).

Only one published study examining positive affect and negative affect in adults with high functioning ASD was found (Samson, Huber & Gross, 2012). In a sample of 27 adults with HFASD and an equal number of age-, gender-, and education-matched TD participants, adults with HFASD experienced similar levels of positive affect, but higher levels of negative affect, as measured by the Positive and Negative Affect Schedule (PANAS; Samson et al., 2012: Watson et al., 1988). The study examined emotion regulation strategies in these groups, and participants with HFASD displayed more difficulty identifying and describing their emotions, used reappraisal (changing the emotional impact of a situation) less frequently, and used suppression (the inhibition of emotion-related behaviors) more frequently than TD participants (Samson et al., 2012).

Low positive affect (PA) is particularly linked to depressive disorders, and has better predictive validity for the presence of depressive disorders than high negative affect (NA), which is related to a wide range of depressive and anxiety disorders (Jolly et al., 1994; Tellegen, 1985; Watson & Clark, 1984; Watson, Clark & Carey, 1988). Depressive disorders are common psychological disorders diagnosed among individuals with ASD, particularly verbally fluent individuals with average-to-above-average
cognitive skills (Benson & Brooks, 2013; Howlin & Moorf, 1997). Although low PA is not a direct representation of depressive symptoms, it can be an important indicator of psychological distress and social withdrawal.

The connection among positive and negative emotions, symptoms of anxiety and depression, loneliness, and peer relationships appears to be a worthy topic of research, but studies in this area are rare. Only one study on this topic in adults with ASD was examined. Mazurek (2014) examined the relationship among loneliness, friendship and emotional functioning in 108 adults with ASD. Results of the study indicated that higher levels of loneliness were associated with increased levels of depressive and anxiety symptoms (measured using the Patient Health Questionnaire, Spitzer et al., 1999), and increased quality and quantity of friendships were associated with decreased loneliness. This study examines an important topic that warrants further investigation and it highlights the similarities between friendship and emotional well-being in individuals with ASD and TD individuals.

**Gender Differences in Typically Developing Individuals:**

**Social and Emotional Aspects**

In order to understand the social environment in which individuals with ASD and HFASD develop and maintain peer relationships and friendships, it is important to understand the context in which these relationships take place. In TD children, gender is
one of the most important factors in defining the nature of peer relationships. There are well-established gender differences in social interactions between TD children: girls tend to express more emotional concern for others, play in smaller, cooperative groups, and express anger and frustration in less assertive ways than boys their age; in contrast, boys tend to interact in larger groups, with more focus on competition and social status (e.g. Geary, 1998; Maccoby 1999).

Beginning in adolescence, gender disparities between social and peer interaction style intensify. Girls place increasing emphasis on emotional intimacy and interpersonally-focused conversations (Larson & Richards 1989; Raffaelli & Duckett 1989); while boys continue to interact in larger groups that center around activities, hobbies, or common interests (see Maccoby, 1999 for review).

In addition to increasing disparities in peer and social interactions in adolescence, gender differences in some emotional problems also increase during this period of development. Most notably, beginning in adolescence, between the ages of about 13 to 15 years old, girls consistently begin to present with more depressive symptoms than boys, which continues through adulthood, with women ultimately being diagnosed with depression two times more often than men (e.g. Nolen-Hoeksema, 1990). Interestingly, there are no gender differences in rates of depression before adolescence, which has generated several different explanations. One particular model has gained the most support in the literature, which involves an interactive diathesis-stress model, in which females are
more genetically predisposed to developing depression, but features are not expressed until gender-specific social and developmental challenges associated with adolescence are present (Nolen-Hoeksema & Girus, 1994). For example, because girls’ social interactions tend to be more cooperative and interpersonally focused, they may experience de-moralizing social situations when interacting with boys in friendship and romantic relationships, due to the more assertive and competitive nature of boys’ interactions (Nolen-Hoeksema, 2001; Nolen-Hoeksema & Girus, 1994). While there are numerous other factors involved in the development of depression, it is clear that gender differences in social interaction styles and peer relationships play important roles in the development of emotional and mental health issues. What is not clear, however, is if the same gender differences in social functioning and emotional problems are apparent in individuals with ASD.

*Gender differences in Autism Spectrum Disorders*

Since the 1960s, numerous studies have established the fact that males present with ASD at a significantly higher rates than females, with estimates of about 4 males to every 1 female (e.g. Lotter, 1967; Fombonne, 2007). Another robust finding is that as intellectual functioning increases, the discrepancy in prevalence between males and females becomes larger, with estimates among individuals with average cognitive functioning at about 5.5 males to every 1 female (Fombonne, 2007). Despite the fact that these gender disparities in prevalence have been studied for over five decades, it is only within the past two
decades that researchers have begun to examine this phenomenon in-depth and generate broader research questions (e.g. Holtman, Bölte, & Poutska, 2007; Lai et al., 2011; McLennan, Lord & Schopler, 1993).

Koenig and Tsatsanis (2005) outline three areas of research to be addressed when examining prevalence discrepancies in males and females with ASD: 1) determining if there is a true sex discrepancy between males and females, or if this phenomenon can be explained by the under-diagnosis of females due to differential symptom presentation; 2) determining if females with ASD present with more severe forms of adaptive and socio-communicative deficits than males with ASD, in addition to the well-established phenomenon that females present with more intellectual disability as a whole; and 3) if these ratios represent a true disparity in male to female rates of ASD, explaining the underlying neuropathological mechanisms.

Of course, it is possible that each of these areas could, in part, explain the sex disparities in rates of ASD – there may indeed be a true sex difference in the prevalence of ASD, females may present with lower levels of functioning than males in some areas (and perhaps higher levels in other areas), and females may be under-diagnosed. Several lines of research and models have been proposed to address different aspects of these questions.
Proponents of the liability/threshold model assert that females are less likely to develop ASD because they have a higher genetic threshold for being affected than males. Consequently, females are more severely affected than males when ASD is present (e.g. Murphy et al., 2011; Tsai, Stewart, & August, 1981; Volkmar, Szatmari, & Sparrow, 1993). Other researchers argue that different developmental and biological mechanisms in males and females are involved in development of ASD, as evidenced by differential cognitive and biological profiles (e.g. Carter, 2007; Sahyoun et al., 2010).

Several researchers have presented models asserting that underlying differences between males and females in brain systems can explain the gender discrepancies in ASD. For example, the extreme male brain theory (EMB) posits that ASD represents the exaggerated presence of typical “male” characteristics, such as better logical or “systemizing” skills (Baron-Cohen, & Hammer, 1997; Lai et al., 2013). Sex differences in hormonal development may contribute to brain and behavioral differences in males and females (e.g. Halpern, 2000). Other researchers hypothesize that males and females have an equal genetic predisposition for developing ASD, but that females are better able to compensate socially, resulting in the potential under-diagnosis of females with ASD and HFASD (e.g. Skuse, 2007). Not surprisingly, evidence for each of these models has been mixed, but an examination of this research is beyond the scope of the present review.
Kreiser and White (2013) conducted a thorough review of the extant literature on this topic, and argued that in addition to biological and genetic sex differences, sociocultural influences, such as gender expectations, intrapersonal processes, and community norms, also play a strong, interactive role in the discrepancy between rates of ASD diagnosis in males and females. In particular, they argued that females without co-occurring intellectual disability, or females with higher-functioning forms of ASD, may be underdiagnosed due to a different presentation of symptoms, including less stereotyped and repetitive behaviors and increased prevalence of internalizing problems. The authors discussed methodological flaws of previous studies examining differential ASD rates, including the tendency for males to disproportionately be represented in clinical settings for externalizing behavior problems. While epidemiological studies exist, they often rely on existing records of individuals with a formal ASD diagnosis, which may exclude females who are often diagnosed later in life; additionally, expectancy biases in clinicians and biases in the development of widely used ASD assessment measures may have impacted identification of females with ASD (Kreiser & White, 2013).

Kreiser and White (2013) also review evidence suggesting that females with HFASD may exhibit some advantages over their male counterparts in more subtle social skills, such as interpreting nonverbal social cues and recognizing emotions (also reviewed in Koenig & Tsatsanis, 2005 and Skuse, 2007). Consequently, females with HFASD may present with less severe socio-communicative deficits than males with HFASD with similar cognitive functioning. However, females may be at more of a disadvantage than
males with HFASD in developing peer relationships with same-gender peers during adolescence and early adulthood (e.g. Koenig & Tsatsanis, 2005; Solomon, 2011). Because more distinct gender differences in social style emerge during this period of development, with females placing more emphasis on emotional expression, females with HFASD may be at a greater risk for experiencing loneliness and emotional difficulties (Solomon, 2011). Literature on gender differences in the presentation of autism spectrum disorders with a focus on adolescents and young adults with high-functioning autism spectrum disorders will be reviewed.

**Gender differences in Autism Spectrum Disorders With and Without Co-occurring ID**

In one of the first studies to examine gender differences in the clinical presentation of ASD symptoms, Lord and colleagues compared a clinical sample of 381 boys and 91 girls (aged 3 to 8 years old) diagnosed with ASD on measures assessing social skills, language functioning, affective behavior, and stereotyped or repetitive play and behaviors (Lord, Schopler & Revicki, 1982). Results from the study indicated that boys showed more frequent unusual visual interests and less appropriate play than girls with ASD (Lord et al., 1982).

Volkmar and colleagues reported no significant differences in ASD symptoms and adaptive functioning among boys and girls diagnosed with autism, PDD-NOS and a developmental disability control group (Volkmar, Szatmari, & Sparrow, 1993).
Similarly, Pilowsky and colleagues failed to find any significant gender differences in ASD symptoms in an age- and mental age-matched sample of 18 girls and women and 18 boys and men (age range between 1.7 and 32.3 years, mean age = 10.5 years), as measured by well-established clinician-rated autism diagnostic instruments (Pilowsky et al., 1998).

In a clinically-referred sample of children diagnosed with an ASD (aged 1.5 to 2.8 years), boys were rated by parents as having more advanced social development than girls on a measure of adaptive functioning. However, girls and boys did not differ on clinical manifestations of ASD symptoms, as measured by the ADOS (Carter et al., 2007).

Hartley and Sikora (2009) found that boys diagnosed with ASD showed more deficits on the Restricted/Repetitive Interests/Behavior subscale of the ADOS and fewer deficits on the Communication subscale, but there were no significant differences in the Social subscale. On a parent-rated scale of behavioral problems, girls displayed more sleep and depressive/anxiety problems than boys.

Rivet (2010) reported no significant gender differences ASD symptoms among toddlers, school-age children, and adults. However, Amr and colleagues reported some gender differences in an age- and IQ-matched sample of children diagnosed with ASD, with boys exhibiting poorer “emotional responsiveness” and more “delinquent” problem behaviors, and girls exhibiting more cognitive problems (2011).
Studies examining gender differences in individuals with HFASD have generally included a wider age range of participants, including adolescents and adults. In an age and IQ-matched sample of 21 boys and men and 21 girls and women diagnosed with high-functioning autism spectrum disorders (IQ > 60, mean age = 14 years, age range = 6-36 years), McLennan and colleagues found significant differences in social functioning (McLennan, Lord & Schopler, 1993). On the ADI-R, boys and men were rated as displaying more deficits than women in early social development, including social play and play abnormality. However, girls and women were reported to have more severe deficits in current friendships than boys and men, including the presence of fewer reciprocal relationships. It is important to note the wide range of ages in this sample, and how that may have affected retrospective reporting.

Holtmann and colleagues reported no striking differences in the triad of autism symptoms, as measured by the ADOS-G and ADI-R in a sample of 23 girls and women and 23 boys and men diagnosed with HFASD, matched on age (mean age = 11.8 years, age range = 5-20 years) and IQ (Holtmann, Bölte & Poutska, 2007). However, the authors noted some subtle differences on the ADI-R, with males reportedly displaying more “inappropriate facial expressions” and difficulty in “showing and directing attention,” and females reportedly displaying more deviant behavior in current “group play with peers.” Although the latter finding was not statistically significant, the authors reported a large effect size. Additionally, on a measure of behavior problems, girls and
women were rated by parents as having more social, attention, and thought problems than boys and men.

In a clinically-referred Japanese sample, Koyama and colleagues reported no gender differences between 26 girls (mean age = 8 years) and 116 boys (mean age = 9 years) in autism symptoms as measured on a clinician-rated autism observation scale. Bölte and colleagues examined gender differences in autism symptoms and psychopathology in a sample of 35 adolescent boys and 21 adolescent girls diagnosed with HFASD, and a sample of their siblings who were not diagnosed with HFASD (Bölte, Duketis, Poustka, & Holtmann, 2011). Results indicated that boys and girls with HFASD displayed no significant differences in the Social and Communication subscales of the ADOS-G, on the ADI-R, and on a parent-rated psychopathology questionnaire.

Solomon and colleagues (2011) examined gender differences among 20 girls and 20 boys diagnosed with HFASD and 19 girls and 17 TD boys (age range = 8-20 years). Boys and girls with HFASD did not differ on ASD symptoms, as measured by several caregiver-rated questionnaires, but girls with HFASD were more impaired than TD girls. On a self-report measure of depression, girls with HFASD scored significantly higher than TD girls (Solomon et al., 2011). In a sample of 129 children and adolescent girls and boys diagnosed with ASD and TD girls and boys, Worley and Matson (2011) reported that participants diagnosed with ASD scored significantly higher on an informant-based
psychiatric symptom measure than TD participants, but there were no significant differences on these symptoms between girls and boys diagnosed with ASD.

Park and colleagues (2012) examined cognitive and behavioral sex differences in children with HFASD (n = 111) and TD controls (n=51) in a Korean sample, and found that females with ASD displayed fewer communication deficits and restricted, repetitive behaviors than IQ and age-matched males with ASD on a care-giver reported diagnostic measure. However, there were no significant differences between males and females with ASD or between children with ASD and TD children on a measure of emotional and behavioral symptoms.

In the development sample of the Autism Spectrum Quotient (described in ASD assessment section above), Baron-Cohen and colleagues examined gender differences among men and women with and without HFASD on AQ scores (Baron-Cohen et al., 2001). The authors reported that individuals with HFASD scored significantly higher than an age-matched sample of TD adults and a sample of university students. A main effect for gender was also found, with women scoring significantly lower than men on the AQ. Additionally, an interaction between group and gender was found, such that men and women diagnosed with HFASD did not differ on AQ scores, while TD women scored lower on the AQ than TD men.
In the development sample of the Cambridge Friendship Questionnaire (FQ) described in the section above, there were no significant differences between male (mean = 53.2, SD = 18.3) and female (mean = 59.8, SD = 25.1) adolescents and adults with HFASD on FQ scores (Baron-Cohen & Wheelwright, 2003). However, TD females scored significantly higher on the FQ (mean = 90.0, SD = 16.1) than TD males (mean = 70.3, SD = 15.7). These results provide additional support to the literature on gender differences in TD friendships, which indicate that females experience closer, more emotionally supportive relationships than males (Maccoby, 1999). Results also indicated that while females and males with HFASD did not differ in reported friendships quality, there was a larger difference between HFASD females and HFASD males.

More recently, Lai and colleagues (2011) reported significant differences between women and men with HFASD on ASD symptoms in a sample of 29 women and 33 men matched on age and IQ. In this sample, women scored significantly lower on an observational measure of social skills than men (the Social subscale of the ADOS), indicating less severe social deficits, yet they scored higher on a self-reported measure of autism symptoms (the AQ). Additionally, women with HFASD were less likely to score above the threshold for autism spectrum on the ADOS. The authors speculated that although women may have presented with better social skills in a structured setting, they may have reported more “autistic” symptoms than their male counterparts because they felt more “different” than their TD peers. Results from this project also indicated that
while adults with HFASD scored higher on measures of depression and anxiety than TD controls, men and women with HFASD did not differ in on these measures.

While results from gender studies in HFASD are considerably mixed, based on the variety of demographic characteristics examined and research methods used, a clear trend does emerge from the literature: girls and women with HFASD tend to experience more severe deficits in a variety of social and emotional areas compared to TD girls and women, while discrepancies in these areas do not appear to be as significant between boys and men with HFASD and TD boys and men.

Understanding differences in social and emotional experiences among women and men with HFASD and their TD peers has the potential to elucidate the ways in which ASD symptoms present and develop throughout the lifespan within a socio-cultural context, and to inform appropriate treatment methods. If women with HFASD do struggle more than men with HFASD in the development and maintenance of peer relationships and suffer emotional problems as a result, it is critical that gender-specific interventions and supports be developed to address the developmental, social, and emotional needs of all individuals with HFASD.

This study examined gender differences among women and men with HFASD and TD women and men in the areas of social and emotional functioning.
Hypotheses

A. Women and Men with HFASD

1. Women with HFASD will exhibit less severe observable impairments in social interaction than men HFASD.
2. Women with HFASD will report having fewer friendships than men with HFASD.
3. Women and men with HFASD will not report differences in friendship quality.
4. Women with HFASD will report higher levels of loneliness than men with HFASD.
5. Women with HFASD will report lower levels of positive affect (PA) than men with HFASD.

B. Adults with HFASD and Typically Developing Adults

1. Adults with HFASD will report having fewer friendships than TD adults.
2. Adults with HFASD will report having lower quality friendships than TD adults.
3. Adults with HFASD will report higher levels of loneliness than TD adults.
4. Adults with HFASD will report lower levels of positive affect (PA) than TD adults.

C. Gender x Diagnosis

There will be a 2 x 2 (Gender x Diagnosis) interaction predicting friendship quality. Specifically, among TD adults, women will exhibit higher quality friendships than men, and the disparity between friendship quality in TD women and women with HFASD will be greater than the disparity between TD men and men with HFASD.
Chapter 2: Method

Participants

Participants with High Functioning Autism Spectrum Disorder (HFASD) included 56 adults aged 18 to 40 years old (mean age = 26.3 years, SD = 6.0 years). The sample consisted of 28 women and 28 men, who did not differ on age ($t = .15, p = .508$, ethnicity (Fisher’s Exact Test, $p = .705$), highest education level ($\chi^2 = .36, p = .835$), or category of ASD (Asperger Syndrome vs. PDD-NOS or Autism; $\chi^2 = 2.30, p = .317$). Women were significantly older than men ($t = 2.83, p = .007$) when they were diagnosed with an ASD, with a moderate effect size (Cohen’s $d = .76$). Additionally, there were no differences between the groups on The Wechsler Abbreviated Scale of Intelligence – Second Edition (WASI-II) Verbal Comprehension Index (VCI) scores ($F(1, 54) = .08, p = .785$) or Perceptual Reasoning Index (PRI) scores ($F(1, 54) = .69, p = .408$).

Men with HFASD were less likely to live independently (25%) than women with HFASD (50%), although the difference only approached significance ($\chi^2 = 3.73, p = .053$). There were no significant differences between women and men with HFASD on participation in a day activity (employed and/or a student; $\chi^2 = .33, p = .567$). Women
and men with HFASD did not differ on the proportion of participants with at least one psychiatric diagnosis ($\chi^2 = 2.83$, $p = .089$) or psychotropic medication use ($\chi^2 = .72$, $p = .397$). More HFASD women (61%) were diagnosed with two or more psychiatric diagnoses than HFASD men (29%), although this difference only approached significance ($\chi^2 = 3.53$, $p = .060$). See Table 1 for details.

*Parent/caregiver participants* included 56 adults, with the following relationships to participants: 79% mothers (n = 44), 16% fathers (n = 9), and 5% other family members (n = 3). There were no significant differences between men and women with HFASD on the proportion of mothers, fathers, and other family members who completed measures about HFASD participants ($\chi^2 = 1.69$, $p = .428$).

*Typically-developing (TD) participants* included 56 adults (28 women and 28 men) with a mean age of 26.4 years (SD = 4.6 years) who had not been diagnosed with ASD. During the recruitment process, 278 individuals agreed to be contacted by the researchers, and 163 individuals (97 women and 66 men) completed all 5 self-report measures. TD participants were roughly matched on education level, leaving 45 women and 40 men. Of these 85 TD participants, 5 women and 10 men were eliminated due to scores of 26 or higher on the Autism Spectrum Quotient (AQ), leaving 70 participants (40 women and 30 men). Of the remaining TD participants, 14 (12 women and 2 men) were eliminated randomly to ensure equal numbers of participants in each group.
The final sample of TD participants did not differ from HFASD participants on age ($t = -0.05$, $p = .958$), highest level of education ($\chi^2 = 3.66$, $p = .160$), or ethnicity ($\chi^2 = .57$, $p = .450$). A significantly larger proportion of TD participants lived independently (Fisher’s Exact Test, $p < .001$), were employed ($\chi^2 = 10.19$, $p < .001$), and participated in a day activity (were employed and/or students) ($\chi^2 = 9.25$, $p < .001$) than participants with HFASD. A larger proportion of HFASD participants were diagnosed with at least one psychiatric diagnosis ($\chi^2 = 34.42$, $p < .001$) and prescribed psychotropic medication (Fisher’s Exact Test, $p < .001$) than TD participants. See Table 2 for details.

The TD women and men did not differ on age ($t = .75$, $p = .46$), ethnicity (Fisher’s Exact Test, $p = .09$), or education level ($\chi^2 = .24$, $p = .89$). There were no significant differences between TD women and men on living situation (Fisher’s Exact Test, $p = 1.00$), employment ($\chi^2 = .11$, $p = .74$) or day activity (employed and/or a student; Fisher’s Exact Test, $p = .500$). The TD men and women did not differ on the proportion of participants with a psychiatric diagnoses ($\chi^2 = .00$, $p = .500$), number of psychiatric diagnoses, 1 vs. 2 or more (Fisher’s Exact Test, $p = .704$), or psychotropic medication use (Fisher’s Exact Test, $p = .305$). See Table 3 for details.

**Recruitment**

**Participants with a high functioning autism spectrum disorder (HFASD):** Inclusion criteria were: 1) a previous diagnosis of an ASD by a clinician in the community, as
confirmed by parents/caregivers; 2) consent by individuals with HFASD to allow parents/caregivers to complete questionnaires about their behavior, psychiatric diagnoses, and early development; 3) a score of 19 or above on the parent/caregiver-rated *Autism Spectrum Screening Questionnaire-Revised Extended Version (ASSQ-REV): Adult Version*; and 4) being between the ages of 18 to 40 years; 5) having a high school diploma. Exclusion criteria included: a previous diagnosis of 1) Intellectual Disability, 2) Prader-Willi Syndrome, 3) Down Syndrome, or 4) Fragile X Syndrome. Other exclusion criteria include having a legal guardian and lack of fluency in the English language.

*Parent/caregiver Participants:* Inclusion criteria were: 1) being a parent or family member of a participant with HFASD 2) knowing the participant with HFASD since birth or early development. Exclusion criteria included lack of fluency in the English language.

*Participants with HFASD* and *parent/caregiver participants* were recruited through several community organizations providing services to individuals with ASD and their families. The director of a large social and vocational support program, Aspirations, which is based at the Ohio State University Nisonger Center, provided researchers with permission to present study aims/information and recruitment materials to adults with HFASD who participate in the program and their parents/caregivers. Researchers presented materials at group meetings, through the group’s email listserv, and posted information on the group website.
Other local organizations, including the Autism Society of Ohio, the Autism Society of America – Central Ohio Chapter, the Autistic Self-Advocacy Network (ASAN) – Central Ohio Chapter, were contacted to ask permission to present study aims/information and recruitment materials to adults with HFASD and their parents/caregivers involved in the organizations. Researchers provided recruitment materials through email list-serves and newsletters, and posted information on the organizations’ websites.

*TD participants* were recruited through ResearchMatch.org, a national electronic, web-based recruitment tool created by the Clinical & Translational Science Awards Consortium in 2009 that is maintained at Vanderbilt University. Inclusion criteria were: 1) being between the ages of 18 to 40 years and 2) having a high school diploma. Exclusion criteria included a previous or suspected diagnoses of 1) an autism spectrum disorder 2) Intellectual Disability, 3) Prader-Willi Syndrome, 4) Down Syndrome, or 5) Fragile X Syndrome. Other exclusion criteria include having a legal guardian and lack of fluency in the English language. Additionally, TD participants who scored greater than 25 on the AQ were not included in the current study to ensure that this group was comprised of individuals without significant self-reported ASD traits (based on the threshold suggested by Woodbury-Smith et al., 2005).

*Study Measures*
A Participant Diagnostic Information: Parent/caregiver Report questionnaire, containing 5 items, was developed for the study to determine eligibility for participants with HFASD. Parent/caregiver participants completed this measure, and were asked about the type of ASD diagnosis, date of diagnosis, and the type of clinician who made the diagnosis (Questionnaire 1).

The Autism Spectrum Screening Questionnaire-Revised Extended Version (ASSQ-REV): Adult Version, based on the original ASSQ (Ehlers, Gillberg, & Wing, 1999) and ASSQ-REV (Kopp & Gillberg, 2011), is a 45-item questionnaire developed to assess for additional features associated with high-functioning autism spectrum disorders in girls. The ASSQ-REV is comprised of the original 27 ASSQ items, in addition to the ASSQ-GIRL scale, which includes 18 new items, designed to assess for the “female phenotype” of ASD, such as “avoids demands” and “interacts with younger children” (Kopp & Gillberg, 2011). Items are rated on a 3-point scale, with “0” indicating normality, “1” indicating abnormality, and “2” indicating definite abnormality (Ehlers, Gillberg, & Wing, 1999). Scores range from 0 to 54 with higher scores indicating the presence of more autism spectrum traits. The authors recommend that the most appropriate cut-off score for clinically-referred individuals to be referred for further assessment is 19 or above (e.g. Ehlers, Gillberg, & Wing, 1999; Kopp & Gillberg, 2011). In order for individuals with HFASD to be eligible for participation in the current study, their parents/caregivers must have rated them with a score of at least 19 or above, on the original 27-item ASSQ. Parent/caregiver participants completed both the original 27-
item ASSQ, in addition to the additional 18 items comprising the ASSQ-GIRL for both women and men with HFASD. The language of the instructions and 4 items on the ASSQ-REV was modified slightly to reflect the age of individuals being assessed (ASSQ-REV: Adult Version; see Questionnaire 2).

The *Autism Diagnostic Observation Schedule-Generic (ADOS-G)* is a standardized semi-structured assessment designed to evaluate reciprocal social interaction and communication skills of individuals with signs of an autism spectrum disorder (Lord et al., 2000). The ADOS-G has demonstrated substantial inter-rater and test–retest reliability for individual items, excellent inter-rater reliability within domains and excellent internal consistency, with good discrimination between those diagnosed with an ASD and those not diagnosed with an ASD. De Bilt et al. (2004) reported good convergent validity of the ADI-R and ADOS-G with the DSM-IV-TR classifications of Autistic Disorder (AD) and PDD, and fair agreement between the ADI-R and the ADOS-G in a sample of individuals with intellectual disability.

In the present study, Module 4 was administered to HFASD participants, as they were verbally fluent adults for whom more sophisticated conversation concerning social and emotional insight, as well as future plans and independent living are more appropriate. Module 4 was administered to the participants who have previously been diagnosed with an ASD, along with other measures described below. Module 4 of the ADOS-G includes 10-15 activities, which provide 31 accompanying ratings, including structured tasks and
conversations concerning social and emotional understanding. Each item is coded on a scale, including “0” = behavior shows no evidence of abnormality, “1” = behavior mildly abnormal or slightly unusual, “2” = behavior definitely abnormal, “3” = behavior markedly abnormal, “7” = behavior abnormal but not on the specified dimension, and “8” = behavioral did not occur/rating is inapplicable. The current thresholds on the total ADOS-G score for autism spectrum and autism are 7 and 10, respectively (Lord et al., 2003). The ADOS-G Reciprocal Social Interaction subscale thresholds are 4 for autism spectrum and 6 for autism, and the ADOS-G Communication subscale thresholds are 2 for autism spectrum and 3 for autism.

The *Wechsler Abbreviated Scale of Intelligence – Second Edition (WASI-II)* (Wechsler, 2011) is a widely-used, well-standardized brief measure of intelligence that is based on the Wechsler Adult Intelligence Scale – Fourth Edition (WAIS-IV; Wechsler, 2008) and the Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV; Wechsler, 2003). The WASI-II is a revision of the original Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999) which was based on the Wechsler Adult Intelligence Scale – Third Edition (WAIS-III; Wechsler, 1997) and the Wechsler Intelligence Scale for Children – Third Edition (WISC-III; Wechsler, 1991). The WASI-II consists of four subtests, including Vocabulary, Similarities, Block Design and Matrix reasoning, and requires about 30 minutes to administer. From these subtests, Verbal IQ (VIQ), Performance IQ (PIQ), and Full Scale IQ (FSIQ) scores can be calculated (Wechsler, 2011). Reviews of the WASI-II indicate that it corresponds well to the
WAIS-IV and the WISC-IV, and that it exhibits good to excellent reliability and validity (McCrimmon & Smith, 2013). The WASI-II was administered to HFASD participants to assess cognitive functioning.

Although individuals with ASD were not used in the standardization sample of the WASI-II (Wechsler, 2011), they were used in the standardization sample of the WAIS-IV (Wechsler, 2008). The WASI-II has been used successfully in research with individuals diagnosed with ASD, indicating its feasibility and utility in this population (e.g. Latham, et al., 2013). Additionally, the WAIS-III and WASI demonstrated sound psychometric properties in adults with high-functioning ASD, despite uneven ability profiles compared to TD adults, including above-average scores on the Block Design subtest and below-average scores on the Comprehension subtest (Minshew, Turner, & Goldstein, 2005; Siegal et al., 1996).

A Participant Demographic Information questionnaire, consisting of 16 items, was developed for this study to determine demographic information about HFASD and TD participants, such as ethnicity, marital status, education level, employment, and previous psychiatric diagnoses (Questionnaire 3).

The Autism Spectrum Quotient (AQ) is a 50-item self-report screening questionnaire designed to assess autism spectrum traits in adults with at least average intellectual functioning (Baron-Cohen et al., 2001). The items represent five areas of autism traits,
including social skills, attention-switching, attention to detail, communication, and imagination, with 10 questions in each domain. Individuals are asked to rate how well a statement in each item describes them by choosing one of four responses: “definitely agree,” “slightly agree,” “slightly disagree,” and “definitely agree,” and scores range from 0 to 50 (Baron-Cohen et al., 2001). Participants with HFASD and TD participants completed the AQ.

The *Friendship Questionnaire (FQ)* is a 35-item self-report measure designed to assess four different aspects of friendship in adults with at least average intellectual functioning: 1) the degree to which respondents enjoy close, supportive relationships; 2) the degree to which these friendships are important to them; 3) the degree to which respondents are interested in other people; and 4) the degree to which respondents enjoy interacting with people for its own sake (Baron-Cohen & Wheelwright, 2003). Items assess a variety of aspects, including comfort with emotional expression in friendships and preferences for social contact. Scores range from 0 to 35, with higher scores reflecting higher quality friendships than lower scores. The authors reported that the FQ demonstrated good construct validity, with a high alpha coefficient (Cronback’s α = 0.84), and good convergent and divergent validity with independent measures (Baron-Cohen & Wheelwright, 2003). Participants with HFASD and TD participants completed the FQ.

The *UCLA Loneliness Scale: Version 3 (ULS-3)* is a 20-item questionnaire designed to assess satisfaction with social relationships (Russell, 1996). It was revised from the
original UCLA Loneliness Scale (Russell et al., 1978) and the first revised version (Russell et al., 1980) in order to balance negative and positive statements and clarify the wording (Russell, 1996). The ULS exhibited high internal consistency (coefficient α ranging from .89 to .94) and good test-retest reliability across a one-year period ($r = .73$) in a sample of 489 college students (203 males and 286 females). A study examining subscales of several different loneliness scales reported that the ULS exhibited the highest internal consistency of the measures (coefficient α = .94), and that it principally taps into the construct of social loneliness with moderate loadings on both emotional loneliness and negative affect (Cramer & Barry, 1999). Participants with HFASD and TD participants completed the ULS-3.

*The Positive and Negative Affect Schedule (PANAS)* is comprised of two 10-item scales designed to assess Positive Affect (PA) and Negative Affect (NA), two distinct, independent dimensions of emotions/mood (state) or personality factors (trait) (Watson, Clark, & Tellegen, 1988). In the development sample, the PANAS demonstrated excellent internal consistency, convergent and divergent validity, and test-retest reliability (Watson, Clark, & Tellegen, 1988). A subsequent study confirmed that the PANAS exhibited good construct validity and reliability in a large normative sample, but the authors argued, based on their results, that the PA and NA scales were not completely orthogonal, as the original authors intended (Crawford & Henry, 2004). Participants with HFASD and TD participants completed the PANAS with specific instructions to “indicate to what extent you generally feel this way, that is, how you feel on average.”
A Friendship Activity Report was developed for this study to characterize the social relationships of participants and the types of activities in which they engage with peers. The questionnaire was developed to capture the four criteria required for “friendship” on the ADI-R item concerning current peer relationships, which include: 1) the relationship must be with someone in the individuals’ same age range, 2) the activities in which they participate must be varied, 3) activities must take place outside prearranged settings, and 4) there must be reciprocity and mutual responsiveness in the relationship (Lord, Rutter & Le Couteur, 1994). Participants with HFASD and TD participants completed the Friendship Activity Report (Questionnaire 4).

**Procedure**

This study was approved by the Ohio State University Institutional Review Board (IRB). Researchers were site-certified through the Ohio State University Nisonger Center to administer the Autism Diagnostic Observation Schedule (ADOS): Module 4. Both ADOS administrators in the study achieved 80% reliability with a researcher who had been certified to provide research training for the ADOS at the OSU Nisonger Center. Rater 1 administered 39 ADOS assessments (70%), and Rater 2 administered 17 ADOS assessments (30%). There were no significant differences between the proportion of ADOS assessments that Rater 1 and Rater 2 administered to women and men with HFASD ($\chi^2 = .084, p = .771$).
Interrater agreement was examined in a subset of 23 ADOS assessments (42%), and both raters were blind to original ADOS scores. Rater 1 coded 12 video recordings and Rater 2 coded 11 video recordings of ADOS assessments. Interrater agreement between diagnostic categories was examined using Cohen’s Kappa. For agreement between raters on the category of ASD vs. no diagnosis, Kappa = .911 (p < .001), indicating large, significant interrater agreement. For agreement between raters on three diagnostic categories (Autism vs. Autism Spectrum vs. no diagnosis), Kappa = .736 (p < .001), also indicating large, significant interrater agreement. Raters agreed on diagnostic category (ASD vs. no diagnosis) on 96% of the assessments. Final ADOS item and domain scores were determined via consensus scoring by the two raters.

Individuals with HFASD who expressed interest in the study provided informed consent to allow parents/caregiver participants to complete questionnaires about their behavior, psychiatric diagnoses, and early development (Consent Form 1), as well as a form authorizing researchers to use personal health information in research (Consent Form 2). Once potential participants diagnosed with HFASD provided consent, parents/caregivers were contacted to determine interest in the study. Parent/caregivers who expressed interest in the study were provided with an initial packet of questionnaires, including study information and aims, informed consent to participate (Consent Form 3) and two forms to determine the eligibility of their son, daughter, or family member with HFASD for the study: 1) a Participant Diagnostic Information: Parent/caregiver Report
questionnaire and 2) the *Autism Spectrum Screening Questionnaire-Revised Extended Version (ASSQ-REV): Adult Version* (See Table 4).

Parent/caregiver participants were provided with pre-stamped, addressed envelopes in which to return study materials. Upon receipt of signed consent form and study materials (whether or not all materials had been completed), researchers provided compensation in the form of a $5 gift card to a department store to parent/caregiver participants, regardless of whether or not the individual with HFASD was eligible for participating in the next part of the study. Individuals with HFASD who were not eligible for further participation based on parent/caregiver reports, were contacted to inform them of this fact and to thank them for their interest in the study.

Eligible individuals with HFASD who were interested in participating in the second part of the study were scheduled for individual appointments at the Ohio State University Nisonger Center to complete the following assessments: (1) the *Diagnostic Observation Schedule-Generic (ADOS-G)*, (2) the *Wechsler Abbreviated Scale of Intelligence – Second Edition (WASI-II)*, (3) a *Participant Demographic Information* questionnaire, (4) the *Autism Spectrum Quotient (AQ)*, (5) the *Cambridge Friendship Questionnaire (FQ)*, (6) the *UCLA Loneliness Scale: Version 3 (ULS-3)*, (7) the *Positive and Negative Affect Schedule (PANAS)*, and (8) the *Friendship Activity Report* (See Table 4). These measures took participants approximately 2.5 to 3 hours to complete. Participants with HFASD were compensated with a $50 gift card to a department store or an online retail
store and provided with a parking pass when needed. Participants received compensation regardless of whether or not they completed all study assessments and questionnaires.

TD participants who agreed to be contacted by ResearchMatch.org were provided study information (Consent Form 4) and asked to complete the following measures on-line: (1) a Participant Demographic Information questionnaire, (2) the Autism Spectrum Quotient (AQ), (2) the Cambridge Friendship Questionnaire (FQ), (3) the UCLA Loneliness Scale: Version 3 (ULS-3), (4) the Positive and Negative Affect Schedule (PANAS), and (5) the Friendship Activity Report. On-line data from community participants was managed through StudyTrax, an integrated survey and study management electronic capture (EDC) system. Participants were compensated with a $3 gift card to a department store or an online retail store per completed survey, with a chance to earn up to $15 worth of gift cards to their vendor of choice for completing all five measures. See Table 4 for details.
Chapter 3: Results

**Hypothesis A1:** Women with HFASD will exhibit less severe observable impairments in communication and social interaction than men with HFASD.

Mean differences on Autism Diagnostic Observation Schedule (ADOS) total scores and Communication and Social Interaction domain scores between women and men with HFASD were examined using a Multivariate Analysis of Variance (MANOVA). This procedure was used to account for the relationship among ADOS total and domain scores. ADOS total scores were significantly correlated with the Communication ($r = .793, p < .001$), Social ($r = .908, p < .001$), and RRB ($r = .305, p = .022$) domain scores. Additionally, ADOS Social domain scores were significantly correlated with Communication scores ($r = .487, p < .001$) and RRB scores ($r = .317, p = .017$), but RRB scores were not significantly correlated with Communication scores ($r = .149, p = .273$). Levene’s Test of equality of error variances indicated that error variance was equal across groups (Total ADOS: $F(1, 54) = .76, p = .388$; Communication domain: $F(1, 54) = .08, p = .783$; Social domain: $F(1, 54) = .30, p = .587$; RRB domain: $F(1, 54) = .27, p = .603$).
Using Pillai’s trace, there was a significant effect of gender on ADOS total and domain scores, $V = .25, F(4, 51) = 4.31, p < .001$. Separate univariate ANOVAs revealed the following effects: on ADOS total scores, women with HFASD scored significantly lower than men with HFASD ($F(1, 54) = 15.43, p < .001, \omega^2 = .23$), indicating fewer overall deficits in the areas of social and communication skills (the cutoff score for the ADOS includes the Communication and Social Interaction domains, but not the RRB domain). Women with HFASD scored significantly lower than men with HFASD on Communication domain scores ($F(1, 54) = 9.32, p = .004, \omega^2 = .13$) and on Social Interaction domain scores ($F(1, 54) = 13.07, p = .001, \omega^2 = .18$). In order to correct for multiple comparisons, the Bonferroni procedure was completed ($\alpha = .05/4 = .0125$), and differences on ADOS total score and domain scores were significant at the .0125 level. Effect sizes for ADOS Total scores, Communication domain scores, and Social domain scores indicated large effect sizes, according to guidelines outlined in Kirk (1996).

Women with HFASD scored lower than men with HFASD on the RRB domain, but this difference was not significant and the effect size was small ($F(1, 54) = 3.48, p = .07, \omega^2 = .04$). See Table 5 for details.

Differences between men and women with HFASD on individual item scores were examined using chi-square analyses. There were four ADOS items in which women scored significantly lower than men, with a score of “0” indicating no impairment in the specific skill being assessed. On the item labeled “Conversation,” women were significantly more likely than men to receive a score of “0,” indicating that conversation
skills, such as turn-taking and building upon responses, were not impaired ($\chi^2 = 14.29, p < .001$). On the item labeled “Responsibility,” women were significantly more likely than men to receive a score of “0,” indicating the ability to be responsible for daily activities of living independently (Fisher’s Exact Test, $p = .034$). On the item labeled “Quality of Social Response,” women were significantly more likely than men to receive a score of “0,” indicating a range of appropriate responses to social overtures ($\chi^2 = 7.78, p = .020$). On the item labeled “Amount of Reciprocal Social Communication,” women were significantly more likely than men to receive a score of “0,” indicating extensive use of verbal or nonverbal behaviors for social interchange ($\chi^2 = 5.79, p = .016$). See Table 6 for details.

In order to determine if these four individual items could explain gender differences among domain scores, these items were removed, and mean differences on ADOS total scores and Communication and Social Interaction domain scores were examined using a Multivariate Analysis of Variance (MANOVA). Levene’s Test of equality of error variances indicated that error variance was equal across groups (Total ADOS: $F(1, 54) = .42, p = .521$; Communication domain: $F(1, 54) = .27, p = .607$; Social domain: $F(1, 54) = .30, p = .588$). Using Pillai’s trace, there was no significant effect of gender on ADOS total and domain scores, $V = .09, F(4, 51) = 1.88, p = .145$). These results indicate that once these four items are removed, gender differences on total ADOS scores, and the Social and Communication domains do not differ.
Additionally, a smaller proportion of women with HFASD (n = 10, 36%) met the cutoff score of 7 on the ADOS than men with HFASD (n = 20, 71%), indicating a diagnosis of “autism spectrum” ($\chi^2 = 7.18, p = .007$).

**Hypothesis A2:** Women with HFASD will report having fewer friendships than men with HFASD.

**Hypothesis B1:** Adults with HFASD will report having fewer friendships than TD adults.

Friendships were measured in two different ways on the Friendship Activity Report. Differences between the number of reported “casual friends” and “close friends” between women and men with HFASD and between HFASD and TD participants were examined using a one-way ANOVA. There were no significant differences between the number of reported casual friends ($F(1, 54) = 2.00, p = .163$) or close friends ($F(1, 54) = .68, p = .414$) in men and women with HFASD. Participants with HFASD reported significantly fewer casual friends ($F(1, 54) = 6.47, p < .001$) and close friends ($F(1, 54) = 5.10, p = .002$) than TD participants.

Additionally, The Friendship Activity Report was coded to reflect the four criteria required for “friendship” on the ADI-R item concerning current peer relationships, which include: 1) the relationship must be with someone in the individuals’ same age range, 2) the activities in which they participate must be varied, 3) activities must take place
outside prearranged settings, and 4) there must be reciprocity and mutual responsiveness in the relationship (Lord, Rutter & Le Couteur, 1994). A score of “0” indicated that all four items had been met; “1” indicated a friendship with at least participation in varied activities; and “2” indicated no friendships. Chi-square analyses were conducted to examine differences in the proportion of friendships between men and women with HFASD and TD men and women.

Women and men with HFASD did not differ on the proportion of individuals who reported at least one friend meeting full criteria for “friendship,” at least one friend with whom they participated in varied activities, and individuals who reported no friends ($\chi^2 = 2.50, p = .286$). The TD participants had a greater proportion of friendships meeting full criteria (Fisher’s Exact Test, $p < .001$) than participants with HFASD. See Table 7 for details.

**Hypothesis A3**: Women and men with HFASD will not report differences in friendship quality.

**Hypothesis B2**: Adults with HFASD will report having lower quality friendships than TD adults.

**Hypothesis C1**: There will be a 2 x 2 (Gender x Diagnosis) interaction predicting friendship quality. Specifically, among TD adults, women will exhibit higher quality friendships than men, and the disparity between friendship quality in TD women and
women with HFASD will be greater than the disparity between TD men and men with HFASD.

A 2 x 2 between subjects factorial ANOVA was conducted to examine mean differences on Cambridge Friendship Questionnaire (FQ) scores between men and women with HFASD, participants with HFASD and TD participants, and the interaction between gender and diagnosis. There was a significant main effect of diagnosis on FQ scores ($F(1, 110) = 19.46, p < .001, \omega^2 = .11$), with HFASD participants scoring significantly lower on this measure than TD participants. There was also a significant main effect of gender on FQ scores ($F(1, 110) = 21.91, p < .001, \omega^2 = .13$), with women scoring significantly higher than men. See Table 9 for details.

There was a significant interaction between diagnosis and gender on FQ scores ($F(3, 108) = 7.86, p = .006, \omega^2 = .02$), indicating that differences on FQ scores between HFASD and TD participants could be explained by gender differences at least in part. Simple effects analysis indicated no significant differences on mean FQ scores between women and men with HFASD ($F(1, 54) = 1.29, p = .258, \omega^2 = .007$). However, TD women scored significantly higher than TD men ($F(1, 54) = 28.01, p < .001, \omega^2 = .38$) and women with HFASD ($F(1, 54) = 29.43, p < .001, \omega^2 = .034$) at the $p = .0125$ level. There were no significant differences between men with HFASD and TD men on mean FQ scores ($F(1, 54) = 1.16, p = .287, \omega^2 = .003$). See Table 8 and Figure 1 for details.
**Hypothesis A4:** Women with HFASD will report higher levels of loneliness than men with HFASD.

**Hypothesis B3:** Adults with HFASD will report higher levels of Loneliness than TD adults.

A 2 x 2 between subjects factorial ANOVA was conducted to examine mean differences on UCLA Loneliness Scale: Version 3 (ULS-3) scores between men and women with HFASD and participants with HFASD and TD participants. There was a significant main effect of diagnosis on mean ULS-3 scores, with participants with HFASD scoring significantly higher than TD participants ($F(1, 110) = 35.23, p < .001, \omega^2 = .23$), indicating higher levels of loneliness in participants with HFASD. The main effect of gender on mean ULS-3 scores ($F(1, 110) = 1.33, p = .252, \omega^2 = .0002$) and the interaction between gender and diagnosis were not significant ($F(3, 108) = .19, p = .664, \omega^2 = .01$). See Tables 8 and 9 for details.

**Hypothesis A5:** Women with HFASD will report lower levels of Positive Affect (PA) than men with HFASD.

**Hypothesis B4:** Adults with HFASD will report lower levels of Positive Affect (PA) than TD adults.
A 2 x 2 between subjects factorial ANOVA was conducted to examine mean differences on Positive Affect (PA) scores on the PANAS between men and women with HFASD and participants with HFASD and TD participants. The main effect of diagnosis ($F(1, 110) = 2.89, p = .092, \omega^2 = .02$), gender ($F(1, 110) = .11, p = .783, \omega^2 = .0008$), and the interaction between diagnosis and gender on PA scores ($F(3, 108) = .30, p = .584, \omega^2 = .001$) were not significant. See Tables 8 and 9 for details.

**Additional Results**

Differences in negative emotions among the groups were also explored. A 2 x 2 between subjects factorial ANOVA was conducted to examine mean differences on Negative Affect (NA) scores on the PANAS between men and women with HFASD and participants with HFASD and TD participants. There was a significant main effect of diagnosis on mean NA scores, with participants with HFASD scoring significantly higher than TD participants ($F(1, 110) = 37.46, p < .001, \omega^2 = .24$), indicating higher levels of negative emotions in participants with HFASD. The main effect of gender on mean NA scores ($F(1, 110) = 1.85, p = .177, \omega^2 = .003$) and the interaction between diagnosis and gender ($F(3,108) = 3.69, p = .061, \omega^2 = .03$) were not significant. See Tables 8 and 9 for details.

Differences in self-reported ASD symptoms among the groups were also explored. A 2 x 2 between subjects factorial ANOVA was conducted to examine mean differences on
Autism Spectrum Quotient (AQ) scores between men and women with HFASD and participants with HFASD and TD participants. There was a significant main effect of diagnosis on mean AQ scores, with participants with HFASD scoring significantly higher than TD participants \((F(1, 110) = 139.67, p < .001, \omega^2 = .55)\), indicating higher reported levels of ASD symptoms. This finding was expected given the eligibility requirement that TD adults who scored above 25 on the AQ not be included in the study. The main effect of gender \((F(1, 110) = 2.54, p = .114, \omega^2 = .01)\) and the interaction between diagnosis and gender on mean AQ scores \((F(3, 108) = .03, p = .862, \omega^2 = .08)\) were not significant. See Tables 8 and 9 for details.

Differences in parent-reported ASD symptoms among participants with HFASD were explored using a one-way ANOVA. There were no significant differences between women and men with HFASD on mean ASSQ-Total (the original 27 items) scores \((F(1, 54) = 1.45, p = .234, \omega^2 = .01)\). However, women with HFASD scored significantly higher than men with HFASD \((F(1, 54) = 11.74, p = .001, \omega^2 = .16)\) on mean ASSQ-GIRL scores, with a large effect size. See Table 10 for details.

Relevant information on the relationships among ASD symptoms, loneliness, friendship quality and emotions were also examined. Pearson correlations were calculated between AQ scores and the outcome measures, FQ, ULS-3, PA, and NA scores. In the total group, AQ scores were significantly negatively correlated with FQ scores \((r = -.495, p < .001)\) and PA scores \((r = -.408, p < .001)\), indicating that as ASD symptoms increased,
friendship quality and positive affect decreased. AQ scores were positively correlated with ULS-3 scores ($r = .626, p < .001$) and NA scores ($r = .573, p < .001$), indicating that as ASD symptoms increased, levels of loneliness and levels of positive affect increased. Similar relationships were found in the HFASD group and in the TD group. Results in the TD group should be interpreted with caution, though, due to the restrictions placed on AQ scores. See Table 11 for details.

The relationships among loneliness, friendship quality and emotions were also examined. Pearson correlations were calculated among FQ scores, ULS-3 scores, PA scores, and NA scores. In the total group, FQ scores were significantly negatively correlated with ULS-3 scores ($r = -.489, p < .001$) and NA scores ($r = -.224, p = .009$), indicating that loneliness and level of negative emotions increased when friendship quality decreased. FQ scores were significantly positively correlated with PA scores ($r = -.489, p < .001$), indicating that as friendship quality increased, positive emotions increased. Scores on the ULS-3 were significantly negatively correlated with PA scores ($r = -.550, p < .001$) and significantly positively correlated with NA scores ($r = .502, p < .001$), indicating that as loneliness levels increased, positive emotions decreased and negative emotions increased. PA scores were significantly negatively correlated with NA scores ($r = -.313, p < .001$), indicating that as levels of positive emotions increased, levels of negative emotions decreased. See Table 12 for details.
In the HFASD group, similar relationships were found among all of the outcome measures except FQ scores, which were not significantly correlated with NA scores \( (r = -0.021, p = .439) \), indicating no relationship among friendship quality and level of negative emotions (Table 13). In the TD group, FQ scores were not significantly correlated with PA scores \( (r = 0.042, p = .378) \) or NA scores \( (r = -0.117, p = .196) \), indicating no relationship among friendship quality and level of negative or positive emotions (Table 14). To investigate the relationships among friendship quality and positive and negative emotions, correlations were calculated for each of the four group (HFASD women and men, TD women and men). FQ scores were significantly negatively correlated with NA scores \( (r = -0.323, p = .047) \) only in TD women. Additionally, FQ scores were significantly positive correlated with PA scores in TD women \( (r = 0.331, p = .042) \) but not in TD men \( (r = -0.106, p = .296) \).
Chapter 4: Discussion

Gender Differences in Adults with HFASD

One of the major goals of this study was to examine gender differences in core ASD symptoms, as well as the nature of friendships, loneliness, and positive and negative emotions in adults with HFASD. The primary measure used to assess ASD symptoms was the Autism Diagnostic Observation Schedule (ADOS): Module 4, a well-researched measure that has been shown to identify ASD in individuals across all developmental and age ranges. Results of the current study supported the first hypothesis (A1) that women with HFASD would exhibit less severe observable impairments in communication and social interaction than men with HFASD. Women scored significantly lower than men on both the communication and social domains of the ADOS, indicating fewer deficits in social-communicative skills. In particular, women were less likely to show impairment in items measuring conversation skills, responsibility for daily activities of living, appropriate responses to social overtures, and amount of reciprocal communication. These results are consistent with findings from a similar study examining gender differences in adults with HFASD (Lai et al., 2011). Lai and colleagues found that
women with HFASD scored significantly lower than men with HFASD on the ADOS social and communication domains, indicating fewer deficits in these areas.

Additionally, a smaller proportion of women with HFASD (36%) met the ADOS cutoff score than men with HFASD (71%) in the current study. These results are also consistent with the pattern found in the study by Lai and colleagues (2011). In their sample, only 21% of women with HFASD, as compared with 58% of men with HFASD were classified as “autism spectrum” on the ADOS.

Although the ADOS has demonstrated good psychometric properties in much of the research, there is evidence to suggest that the original algorithm is not as sensitive in identifying older children and adolescents with high-functioning ASD. However, a study examining the revised algorithm for Module 3 indicated that the revised version increased the sensitivity of the measure significantly (Kamp-Becker et al., 2011). At the time of the current study, the algorithm for Module 4 had not been updated. However, since the completion of the study, the algorithm has been revised (Hus & Lord, 2014). It will be worthwhile to compare men and women with HFASD in this sample using the revised algorithm in a future study to determine if it affects classification rates.

Findings from the current study suggest that although women with HFASD exhibited fewer deficits in the core ASD symptom domains of social interaction and communication than men with HFASD, there were no gender differences in the core
domain of restricted and repetitive behavior (RRB). These results are not consistent with the majority of studies examining gender differences in core ASD symptoms, which have found no significant differences between females and males with ASD on social and communication domains, but have found that males exhibit more stereotyped and repetitive behaviors than females (or that females’ stereotyped interests may be more socially acceptable than males’ interests). It is possible that the current results do not reflect a true gender difference in core ASD symptomatology. However, it is also possible that these results reflect a different presentation of ASD symptoms at different developmental levels, as most studies have primarily examined differences in ASD symptoms in children or groups with mixed ages. To our knowledge, the current study is only one of two studies (including Lai et al., 2011) exploring gender differences in adults with HFASD using a standardized observation measure.

Contrary to hypothesis A2 that women with HFASD will report having fewer friendships than men with HFASD, there were no significant differences between men and women with HFASD on reported number of peer relationships or reciprocal friendships. These results are not consistent with results from the study by McLennan and colleagues, which found that girls and women with HFASD had fewer parent-reported reciprocal relationships than boys and men with HFASD, despite showing fewer early deficits in social development (McLennan, Lord & Schopler, 1993). It is possible that the wider age range, including children and adults, and the use of parent-reported friendship indicators in the previous study contributed to the different findings in the current study, which had
a more narrow age range and used self-reported measures of friendship. Perhaps men and women with HFASD do not differ on the number or composition of friendships. The current findings may be related to the fact that the HFASD sample was drawn largely from a group of individuals who were already participating in a community social skills and support group for individuals with ASD. Due to the small number of studies examining gender differences in peer relationships among individuals with ASD, it is important that more research examine this topic. As predicted, there were no significant differences between women and men with HFASD on friendship quality (hypothesis A3).

Contrary to the hypothesis that women with HFASD would display higher levels of loneliness than men with HFASD (hypothesis A4), there were no significant gender differences in levels of loneliness. Due to the lack of differences in peer relationships between women and men with HFASD, it is not surprising that levels of loneliness did not differ, as friendships are generally considered a protective factor against loneliness (e.g. DiTomasso & Spinner, 1997; Weiss, 1973). The measure used to assess loneliness in the current study, the UCLA Loneliness Scale: Version 3 (ULS-3), has not been studied extensively in the ASD population, so it is possible that this measure does not capture different facets of loneliness that may be important to individuals with ASD. For example, the questionnaire is worded in a way that assumes individuals prefer social contact and emotional closeness with others. Although individuals with HFASD often report being interested in close, supportive relationships or being involved in peer groups, some individuals with HFASD may not seek out or be comfortable with as much social
contact. Therefore, information gathered from this loneliness scale by itself may not be particularly informative if a lack of desire for close relationships decreases the subjective distress that individuals with HFASD experience regarding loneliness. Additional measures assessing for positive and negative emotions may need to be included.

Additionally, the hypothesis that women with HFASD would display lower levels of positive affect (PA), as measured by the PANAS, than men with HFASD was not supported (hypothesis A5). As with the UCLA Loneliness Scale: Version 3 (ULS-3), the PANAS has not been studied extensively in the ASD population, which may also pose problems for interpreting these scores. Taken alone, the lack of differences between women and men with HFASD on positive affect may suggest that women with HFASD are not at a higher risk of experiencing symptoms of depression than men with HFASD, in contrast to the relationship found in the TD population. In fact, one of the few studies examining depressive symptoms in adults with HFASD found no gender differences on self-report measures of depression or anxiety (Lai et al., 2011). However, it is important to note that low positive affect is only one component of significant depressive symptoms, which include a variety of other factors, such as cognitive style, emotional regulation skills, and genetic and environmental influences. Therefore, conclusions from these results are somewhat limited, and require a more thorough examination of the complex elements contributing to depressive disorders.
Negative emotions were also examined in women and men with HFASD, and no significant gender differences were found. The current study did not make specific predictions concerning level of negative emotions, and the findings are subject to the same limitations described above regarding the limited use of the PANAS in research with individuals with ASD. Nonetheless, these findings do pose interesting questions about the relationship between positive and negative affect and psychological diagnoses. In the current sample, a high percentage of both women (89%) and men (71%) with HFASD reported being diagnosed with at least one psychological condition. There were no significant differences between women and men with HFASD on reported types of psychiatric diagnoses. However, twice as many women with HFASD (61%) reported being diagnosed with two or more psychological conditions than men with HFASD (29%). This difference was not statistically significant. It is not clear whether more women with HFASD were misdiagnosed with other psychological conditions prior to being diagnosed with an ASD, or if the diagnoses represented co-occurring psychiatric conditions.

In addition to a standardized observation measure of ASD symptoms, self-report and parent/caregiver-report measures of ASD symptoms were assessed. On the Autism Spectrum Quotient (AQ), women and men with HFASD did not indicate differences in self-reported ASD symptoms. Although the majority of research using the AQ to measure ASD symptoms has not reported differences between females and males with HFASD, results of one study indicated that women with HFASD scored significantly higher on this measure
than mean with HFASD (Lai et al., 2011). In the previous study, the authors suggested that women may have exhibited higher scores than men because they perceived themselves to be more “different” than their typically developing peers. However, it is uncertain if AQ scores would accurately reflect this type of information, and future research should utilize other measures specifically designed to assess social self-perception to examine this variable.

Parent/caregivers completed a measure assessing ASD symptoms, the Autism Spectrum Screening Questionnaire: Revised Edition (ASSQ-REV). ASSQ Total scores (containing the original 27 items) were used as a measure to determine study eligibility for HFASD participants, so it is not surprising that there were no significant differences between women and men with HFASD on this measure. However, ASSQ-GIRL scores were not used to determine eligibility, and women with HFASD did score significantly higher than men with HFASD on this measure. Although girls with ASD scored higher than boys with ASD on the ASSQ-GIRL in the development sample, the difference was not significant (Kopp & Gillberg, 2011). In the current study, women with HFASD scored significantly higher on the following items: “too much sympathy,” “very determined,” and “exaggeratedly fanciful.” Females with HFASD may indeed display more sympathy and be overly imaginative compared to males with HFASD, which could be related to social traits that are reinforced in girls (i.e. showing concern for others and encouraging imaginative play). Additionally, females with HFASD may show increased determination to complete goals or tasks than men with HFASD due to educational and occupational inequalities that many TD females face. However, differences in these individual items should be interpreted with caution, as the ASSQ-GIRL requires further research to determine its diagnostic utility.
The majority of the hypotheses regarding differences between HFASD and TD participants were supported by the results of the study. Participants with HFASD reported fewer peer relationships and fewer reciprocal friendships than TD participants (hypothesis B1). These results are consistent with previous research, as well as one of the core symptom domains in ASD, which includes impairment in reciprocal social interaction. Participants with HFASD also reported lower levels of friendship quality than TD participants (hypothesis B2). Although there have been fewer studies examining friendship quality in individuals with HFASD (Baron-Cohen & Wheelwright, 2003; Locke et al., 2010; Mazurek, 2014), the current results are also consistent with these findings. Finally, adults with HFASD reported higher levels of loneliness than TD participants (hypothesis B3), a finding which is supported by the majority of studies examining differences in loneliness in children and adolescents with ASD and TD individuals (e.g. Bauminger & Kasari, 2000; Lasgaard et al., 2010; Locke et al., 2010; Merkler, 2007).

Contrary to expectations, HFASD and TD participants did not differ on reported levels of positive affect (hypothesis B4). These results are surprising given the research suggesting higher levels of psychological distress, depressive disorders, and social withdrawal in individuals with ASD compared to the general population (see Benson &
Brooks, 2013 for review). The findings are also surprising given the significantly higher percentage of participants with HFASD (80%) versus TD participants (25%) who reported being diagnosed with at least one psychological condition. Of the HFASD participants reporting a previous psychological diagnosis, 57% reported being diagnosed with a mood disorder and 23% reported being diagnosed with an anxiety disorder. In the TD group, 20% reported being diagnosed with a mood disorder and 7% reported being diagnosed with an anxiety disorder. The lack of differences between the groups on positive affect may also have been related to differences in rates of psychotropic medication use. A significantly higher proportion of participants with HFASD (66%) reported being prescribed at least one psychotropic medication compared to TD participants (7%). If participants with HFASD were currently taking medication prescribed to regulate mood, it is possible this affected their reported levels of positive emotions. Interestingly, participants with HFASD did report higher levels of negative emotions than TD participants.

Interaction between Gender and Diagnosis on Friendship Quality

Consistent with predictions of the study, there was a significant interaction between gender and ASD diagnosis, indicating that differences on Cambridge Friendship Questionnaire (FQ) scores between HFASD and TD participants could be explained by gender differences at least in part. Specifically, women with HFASD scored significantly lower than TD women on the FQ, but there were no significant differences between men
with HFASD and TD men. These results support previous research examining gender differences in the TD population, which indicate that women experience closer and more supportive friendships than men (Maccoby, 1999). The larger discrepancy between women with HFASD and TD women on friendship quality scores may suggest that women with HFASD are at a particular disadvantage in experiencing more caring, empathic relationships compared to men with HFASD.

These findings are also consistent with results from the development sample of the FQ, which indicated that there was a larger discrepancy between HFASD and TD females in reported levels of friendship quality than between HFASD and TD males (Baron-Cohen & Wheelwright, 2003). In the current study, both women and men with HFASD displayed higher scores (mean FQ score = 65.8, SD = 19.6) than females and males in the development sample (mean FQ score = 56.5, SD = 21.7). It should be noted that the original study included participants who were almost 10 years older, on average, than participants in the current study. Additionally, the age range of participants in the original FQ study (age range = 13 - 66 years) was considerably larger than the age range of participants in the current study (age range = 18 – 40 years), which may have impacted the results. More studies are needed to examine the psychometric properties of the FQ, as the current research on this measure is limited.

Additional Findings
The relationships among autism symptoms, friendship quality, loneliness, and emotions were also examined. Higher self-reported levels of ASD symptoms were associated with higher levels of loneliness and negative emotions, as well as lower levels of friendship quality and positive emotions. This relationship was consistent among all participants, which suggests an association between self-reported ASD symptoms and factors that are often associated with well-being and positive quality of life, such as friendships and positive emotions. As mentioned above, findings in the TD group should be interpreted with caution, as TD participants who scored above 25 on the AQ were not included in the study. A separate study examining the full range of AQ scores in TD participants will be conducted in the future.

Relationships among the outcome measures also provided interesting information about social and emotional factors in both HFASD and TD participants. In both groups, higher levels of loneliness were associated with higher levels of negative emotions and lower levels of positive emotions. These results are consistent with the majority of research in the TD population, and they are congruent with findings from a recent study examining similar variables (Mazurek, 2014). These findings provide additional support for initial research suggesting that important similarities exist between the emotional and social needs of individuals with HFASD and those in the TD population. Additional analyses revealed that some of these relationships differed depending on participants’ gender and diagnosis. Although lower levels of friendship quality were associated with higher levels of negative affect in the total sample, this relationship was not significant in either the
HFASD or TD group alone. When these variables were examined in each of the four
groups, only TD women showed a significant relationship between lower levels of
friendship quality and higher levels of negative affect. Additionally, while lower levels
of friendship quality were associated with lower levels of positive emotions in women
and men with HFASD and TD women, this relationship was not found in TD men. These
results may suggest that friendship quality has different emotional salience for TD men.
However, research examining causal relationships among these factors, as well as
potential moderators, is needed as the underlying nature of these associations cannot be
determined with the current study design.

**Implications**

There are several important implications of this study. In particular, it is one of the few
studies to examine gender differences in ASD symptoms in adults with HFASD, and to
the author’s knowledge, it is the first study to examine gender differences among HFASD
and TD adults in the areas of peer relationships, loneliness, and emotions. Results
suggest that women with HFASD presented with fewer social and communicative
deficits than men with HFASD, which may be a factor contributing to under-diagnosis of
ASD in females without co-occurring intellectual disability.

Results of this study provide additional support for the limited research suggesting that
females with HFASD may present with different challenges than males with HFASD.
While women with HFASD exhibited fewer observable social deficits when compared to men with HFASD in this sample, they did not report closer, more supportive friendships than men with HFASD. Although it is unclear if they desired to have closer friendships than their male counterparts, the difference between TD women and those diagnosed with HFASD was clearly greater than differences between HFASD and TD men. Further investigation in the area of friendships is warranted in order to examine if gender impacts the relationship between close friendships on psychological distress. Regardless of whether an individual is diagnosed with ASD, there are different social norms and expectations for all females and males. The differences in sociocultural expectations undoubtedly impacts females with ASD and may pose more emotional and social challenges for females with HFASD, where expectations are more congruent with the TD population. The expectation that women should be more socially-aware and empathic than men has the potential to place more pressure on females with HFASD to conform to certain social standards, which can take a toll on their emotional health. Unfortunately, only anecdotal reports support these specific challenges for women, which will require more in-depth measures of the specific impact of friendships on emotional well-being in females with ASD (Faherty, 2006). Based on gender differences in the presentation of social deficits and experience in friendships, it is clear that the experiences of girls and women with ASD cannot be compared directly to their male counterparts without considering the socio-cultural context of gender relations.
These findings, along with anecdotal support and limited empirical research, may be helpful in suggesting treatments specific to females with HFASD that could more effectively help them navigate their unique challenges. While social skills groups are extensively researched in individuals with HFASD, this study suggests that groups designed specifically for girls and women could increase their usefulness, with a specific focus on understanding different gender expectations in society and how they impact the development of social skills. While peer support groups and peer mentors during childhood and adolescence are suggested for both females and males with ASD, it may be useful for girls to participate in female-specific TD support groups to provide modeling and experience for managing the increasingly complex social demands that develop during this time, such as higher rates of “relational” aggression and increased sexual pressure in girls.

It is still unclear if females with ASD are at a higher risk of experiencing psychological distress and depressive disorders than males with ASD. However, given the specific sociocultural risk factors associated with the development of psychological distress and depressive disorders in TD adolescent girls, which ASD girls also experience (e.g. loss of status and power and increased gender inequality in educational and occupational settings), treatments focused on emotion regulation skills might be warranted in girls with ASD in order to prevent increased psychological distress. Given some of the different psychosocial factors that females experience compared to males in the general population, women with ASD may also benefit from treatment including psychoeducation regarding themes such as personal safety, romantic relationships,
effective communication, assertiveness, and self-advocacy in educational and employment settings.

Study Limitations

There are several limitations to the current study. The most significant challenge to the study included the inability of researchers to confirm diagnoses of autism spectrum disorders in HFASD participants, using the gold-standard diagnostic interview, the ADI-R, due to limited resources. However, this limitation is common in the majority of studies examining ASD in adults due to the difficulty in obtaining access to parents/caregivers of adults with ASD, who may have difficulty accurately reporting early childhood symptoms or who may no longer be involved in their children’s lives. Another limitation to the current study was the inability of the ADOS raters to be blind to the different groups of participants with HFASD due to the obvious presentation of participants’ gender. Additionally, raters were not blind to the diagnosis of women and men with HFASD, which may have resulted in a biased interpretation of ADOS scores.

An additional limitation of the study included the composition of participants with HFASD, as they were mainly drawn from an organization providing social skills training and social support to adults with ASD in the community. It is likely that participants with ASD who were already involved in a social group are not representative of most individuals with ASD in the community, who may not be aware of these particular services. HFASD participants in the current study may also have exhibited better social
skills than other individuals with ASD due to the fact that they were willing to interact with other individuals instead of just completing questionnaires online.

**Future Directions**

Understanding gender differences in the presentation of ASD symptoms, as well as associated factors, such as social relationships and emotions, is an important area of study. Studies of these factors among adults are particularly rare, and more research in this population is needed to determine how they impact important life outcomes for individuals with ASD. Research thus far has utilized cross-sectional designs to examine gender differences among different age groups, which has allowed for a large volume of studies to be conducted in a relatively short amount of time. However, future research should include longitudinal studies that examine these variables over the lifespan, including changes in the pattern of ASD symptoms over time and the effects of social and cultural factors on the presentation of ASD symptoms.

Additionally, differences in the nature and composition of peer relationships at different developmental stages, and the effects of these relationships on emotional well-being are critical issues to study, given the ever-growing population of adults with ASD. An important area of future research should also include naturalistic or simulated observations of social interactions, as self-report may pose difficulties for individuals
with ASD, who may have more limited insight into the nature of their current skills regarding social interactions.
References


Kreiser, N. L., & White, S. W. (2013): ASD in females: are we overstating the gender


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APPENDIX A:

TABLES AND FIGURES
Table 1: Characteristics of HFASD Women and Men

<table>
<thead>
<tr>
<th></th>
<th>Women (n = 28)</th>
<th>Men (n = 28)</th>
<th>Test Value</th>
<th>p</th>
</tr>
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<tbody>
<tr>
<td>Mean Age in Years (SD)</td>
<td>26.4 (6.2)</td>
<td>26.2 (5.9)</td>
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<tr>
<td>Ethnicity: n (%)</td>
<td></td>
<td></td>
<td>Fisher’s Exact Test</td>
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<td>Caucasian</td>
<td>23 (82)</td>
<td>25 (89)</td>
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<td>5 (18)</td>
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<tr>
<td>African American</td>
<td>3 (11)</td>
<td>0 (0)</td>
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<td></td>
</tr>
<tr>
<td>Biracial</td>
<td>2 (7)</td>
<td>3 (11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest Education Level: n (%)</td>
<td></td>
<td></td>
<td>χ2 = 3.731</td>
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<tr>
<td>High School Diploma</td>
<td>18 (64)</td>
<td>19 (68)</td>
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<td>.835</td>
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<td>Bachelor/Graduate Degree</td>
<td>10 (36)</td>
<td>9 (32)</td>
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<tr>
<td>Bachelor Degree</td>
<td>8 (27)</td>
<td>8 (28.5)</td>
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<tr>
<td>Graduate Degree</td>
<td>2 (7)</td>
<td>1 (3.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living Situation: n (%)</td>
<td></td>
<td></td>
<td>χ2 = 3.50</td>
<td>.061</td>
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<td>Independently/With partner</td>
<td>14 (50)</td>
<td>7 (25)</td>
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<tr>
<td>With parents/family</td>
<td>14 (50)</td>
<td>21 (75)</td>
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<tr>
<td>Employed: n (%)</td>
<td>11 (40)</td>
<td>18 (64)</td>
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<tr>
<td>Day Activity (Employed and/or student): n (%)</td>
<td>18 (64)</td>
<td>20 (71)</td>
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<td>ASD Type: n (%)</td>
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<td>Asperger Syndrome</td>
<td>21 (75)</td>
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<td>Autism or PDD-NOS</td>
<td>7 (25)</td>
<td>12 (43)</td>
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<tr>
<td>Mean Age in Years of ASD Diagnosis (SD)</td>
<td>19.7 (8.2)</td>
<td>12.9 (9.6)</td>
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<td>WASI-II: VCI score (SD)</td>
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<td>Psychiatric Diagnoses: n (%)</td>
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<td>Number of Diagnoses</td>
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<td>One</td>
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<td></td>
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<td>Two or More</td>
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<td></td>
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<td>Type of Diagnosis: n (%)</td>
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<td>Mood Disorder</td>
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<td>8 (29)</td>
<td>5 (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADHD</td>
<td>11 (39)</td>
<td>10 (36)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Psychiatric Diagnoses</td>
<td>3 (11)</td>
<td>0 (0)</td>
<td>Fisher’s Exact Test</td>
<td>.162</td>
</tr>
</tbody>
</table>

Continued
<table>
<thead>
<tr>
<th>Psychotropic Medication n (%)</th>
<th></th>
<th></th>
<th>$\chi^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any</td>
<td>20 (71)</td>
<td>17 (61)</td>
<td>.717</td>
<td>.397</td>
</tr>
<tr>
<td>Number of Medications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>6 (21)</td>
<td>7 (25)</td>
<td>.948</td>
<td>.623</td>
</tr>
<tr>
<td>Two or More</td>
<td>14 (50)</td>
<td>10 (36)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: HFASD = High Functioning Autism Spectrum Disorder; WASI-II: VCI = Wechsler Abbreviated Scale of Intelligence – Second Edition: Verbal Comprehension Index; WASI-II: PRI = Wechsler Abbreviated Scale of Intelligence – Second Edition: Perceptual Reasoning Index; ADHD = Attention Deficit Hyperactivity Disorder
Table 2: Characteristics of HFASD and TD Sample

<table>
<thead>
<tr>
<th></th>
<th>HFASD Participants (n = 56)</th>
<th>TD Participants (n = 56)</th>
<th>Test Value</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender: n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>28 (50)</td>
<td>28 (50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>28 (50)</td>
<td>28 (50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Age in Years (SD)</td>
<td>26.3 (6.0)</td>
<td>26.4 (4.6)</td>
<td>( t = -.053 )</td>
<td>.958</td>
</tr>
<tr>
<td>Ethnicity: n (%)</td>
<td></td>
<td></td>
<td>( \chi^2 = .570 )</td>
<td>.450</td>
</tr>
<tr>
<td>Caucasian</td>
<td>48 (86)</td>
<td>45 (80)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Caucasian</td>
<td>8 (14)</td>
<td>11 (20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest Education Level: n (%)</td>
<td></td>
<td></td>
<td>( \chi^2 = 3.664 )</td>
<td>.160</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>37 (66)</td>
<td>27 (48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor/Graduate Degree</td>
<td>19 (34)</td>
<td>29 (52)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>16 (29)</td>
<td>24 (43)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate Degree</td>
<td>3 (5)</td>
<td>5 (9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living Situation: n (%)</td>
<td></td>
<td></td>
<td>Fisher’s Exact Test</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Independently/With partner</td>
<td>21 (37.5)</td>
<td>52 (93)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With parents/family</td>
<td>35 (62.5)</td>
<td>4 (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed: n (%)</td>
<td>29 (52)</td>
<td>45 (80)</td>
<td>( \chi^2 = 10.191 )</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Day Activity (Employed and/or student): n (%)</td>
<td>38 (68)</td>
<td>51 (91)</td>
<td>( \chi^2 = 9.253 )</td>
<td>.002</td>
</tr>
<tr>
<td>Psychiatric Diagnoses: n (%)</td>
<td></td>
<td></td>
<td>( \chi^2 = 34.421 )</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>At least one</td>
<td>45 (80)</td>
<td>14 (25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Diagnosis: n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mood Disorder</td>
<td>32 (57)</td>
<td>11 (20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety Disorder</td>
<td>13 (23)</td>
<td>4 (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADHD</td>
<td>21 (38)</td>
<td>5 (9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Psychiatric Diagnoses</td>
<td>3 (5)</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychotropic Medication: n (%)</td>
<td></td>
<td></td>
<td>Fisher’s Exact Test</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>At least one</td>
<td>37 (66)</td>
<td>4 (7)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: HFASD = High Functioning Autism Spectrum Disorder; TD = Typically Developing; ADHD = Attention Deficit Hyperactivity Disorder
## Table 3: Characteristics of TD Women and Men

<table>
<thead>
<tr>
<th></th>
<th>TD Women (n = 28)</th>
<th>TD Men (n = 28)</th>
<th>Test Value</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age in Years (SD)</td>
<td>26.8 (5.5)</td>
<td>25.9 (3.6)</td>
<td><em>t = .753</em></td>
<td>.455</td>
</tr>
<tr>
<td>Ethnicity: n (%)</td>
<td></td>
<td></td>
<td>Fisher’s Exact Test</td>
<td>.089</td>
</tr>
<tr>
<td>Caucasian</td>
<td>20 (71)</td>
<td>25 (89)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Caucasian</td>
<td>8 (29)</td>
<td>3 (11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>4 (14)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biracial</td>
<td>3 (11)</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1 (4)</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest Education Level: n (%)</td>
<td></td>
<td></td>
<td>χ² = .237</td>
<td>.888</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>13 (46)</td>
<td>14 (50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor/Graduate Degree</td>
<td>15 (54)</td>
<td>14 (50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>12 (43)</td>
<td>12 (43)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate Degree</td>
<td>3 (11)</td>
<td>2 (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living Situation: n (%)</td>
<td></td>
<td></td>
<td>Fisher’s Exact Test</td>
<td>1.000</td>
</tr>
<tr>
<td>Independently/With partner</td>
<td>26 (93)</td>
<td>26 (93)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With parents/family</td>
<td>2 (7)</td>
<td>2 (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed: n (%)</td>
<td>23 (82)</td>
<td>22 (79)</td>
<td>χ² = .113</td>
<td>.737</td>
</tr>
<tr>
<td>Employed and/or student: n (%)</td>
<td>26 (93)</td>
<td>25 (89)</td>
<td>Fisher’s Exact Test</td>
<td>.500</td>
</tr>
<tr>
<td>Psychiatric Diagnoses: n (%)</td>
<td></td>
<td></td>
<td>χ² = .000</td>
<td>1.000</td>
</tr>
<tr>
<td>Any</td>
<td>7 (25)</td>
<td>7 (25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Diagnoses</td>
<td></td>
<td></td>
<td>Fisher’s Exact Test</td>
<td>.704</td>
</tr>
<tr>
<td>One</td>
<td>4 (14)</td>
<td>4 (14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two or More</td>
<td>3 (11)</td>
<td>3 (11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Diagnosis: n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mood Disorder</td>
<td>6 (21)</td>
<td>5 (18)</td>
<td>Fisher’s Exact Test</td>
<td>.500</td>
</tr>
<tr>
<td>Anxiety Disorder</td>
<td>2 (7)</td>
<td>2 (7)</td>
<td>Fisher’s Exact Test</td>
<td>.500</td>
</tr>
<tr>
<td>ADHD</td>
<td>2 (7)</td>
<td>3 (11)</td>
<td>Fisher’s Exact Test</td>
<td>.500</td>
</tr>
<tr>
<td>Psychotropic Medication: n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any</td>
<td>3 (11)</td>
<td>1 (4)</td>
<td>Fisher’s Exact Test</td>
<td>.305</td>
</tr>
</tbody>
</table>

Note: TD = Typically Developing; ADHD = Attention Deficit Hyperactivity Disorder
### Table 4: Participant Measures

<table>
<thead>
<tr>
<th>Parents/caregiver Participants</th>
<th>Participants with HFASD</th>
<th>TD Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>To determine eligibility:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant Diagnostic</td>
<td>Autism Diagnostic</td>
<td></td>
</tr>
<tr>
<td>Information: Parent/caregiver</td>
<td>Observation Schedule -</td>
<td></td>
</tr>
<tr>
<td>Report</td>
<td>Generic (ADOS-G)</td>
<td></td>
</tr>
<tr>
<td><strong>To determine eligibility:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASSQ-REV</td>
<td>Wechsler Abbreviated Scales</td>
<td>Wechsler Abbreviated Scales</td>
</tr>
<tr>
<td></td>
<td>of Intelligence – Second</td>
<td>of Intelligence – Second</td>
</tr>
<tr>
<td></td>
<td>Edition (WASI-II)</td>
<td>Edition (WASI-II)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant Demographic</td>
<td>Participant Demographic</td>
<td>Participant Demographic</td>
</tr>
<tr>
<td>Information</td>
<td>Information</td>
<td>Information</td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autism Spectrum Quotient (AQ)</td>
<td>Autism Spectrum Quotient</td>
<td>Autism Spectrum Quotient</td>
</tr>
<tr>
<td></td>
<td>(AQ)</td>
<td>(AQ)</td>
</tr>
<tr>
<td>Cambridge Friendship</td>
<td>Cambridge Friendship</td>
<td>Cambridge Friendship</td>
</tr>
<tr>
<td>Questionnaire (FQ)</td>
<td>Questionnaire (FQ)</td>
<td>Questionnaire (FQ)</td>
</tr>
<tr>
<td>UCLA Loneliness Scale:</td>
<td>UCLA Loneliness Scale:</td>
<td>UCLA Loneliness Scale:</td>
</tr>
<tr>
<td>Version 3 (ULS-3)</td>
<td>Version 3 (ULS-3)</td>
<td>Version 3 (ULS-3)</td>
</tr>
<tr>
<td>Positive and Negative Affect</td>
<td>Positive and Negative</td>
<td>Positive and Negative</td>
</tr>
<tr>
<td>Schedule (PANAS)</td>
<td>Affect Schedule (PANAS)</td>
<td>Affect Schedule (PANAS)</td>
</tr>
<tr>
<td>Friendship Activity Report</td>
<td>Friendship Activity Report</td>
<td>Friendship Activity Report</td>
</tr>
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</table>
Table 5: Gender Differences in ADOS Scores in Participants with HFASD

<table>
<thead>
<tr>
<th></th>
<th>Women $(n = 28)$</th>
<th>Men $(n = 28)$</th>
<th>Test Value</th>
<th>$p$</th>
<th>$\omega^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADOS Total: Mean (SD)</td>
<td>5.5 (3.0)</td>
<td>8.8 (3.2)</td>
<td>$F = 15.4$</td>
<td>&lt; .001</td>
<td>.23</td>
</tr>
<tr>
<td>ADOS Communication:</td>
<td>1.6 (1.4)</td>
<td>2.8 (1.5)</td>
<td>$F = 9.3$</td>
<td>.004</td>
<td>.13</td>
</tr>
<tr>
<td>ADOS Social: Mean (SD)</td>
<td>4.0 (2.2)</td>
<td>6.1 (2.3)</td>
<td>$F = 13.1$</td>
<td>.001</td>
<td>.18</td>
</tr>
<tr>
<td>ADOS RRB: Mean (SD)</td>
<td>0.5 (0.7)</td>
<td>1.0 (1.0)</td>
<td>$F = 3.5$</td>
<td>.068</td>
<td>.04</td>
</tr>
</tbody>
</table>

Note: HFASD = High Functioning Autism Spectrum Disorder; ADOS = Autism Diagnostic Observation Schedule; RRB = Restricted and Repetitive Behavior
Table 6: Gender Differences on Significant ADOS Items in HFASD Participants

<table>
<thead>
<tr>
<th></th>
<th>Women (n = 28)</th>
<th>Men (n = 28)</th>
<th>Test Value</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conversation</strong></td>
<td></td>
<td></td>
<td>χ² = 14.29</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>No Impairment: n (%)</td>
<td>23 (82)</td>
<td>9 (32)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Responsibility</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Impairment: n (%)</td>
<td>11 (39)</td>
<td>4 (14)</td>
<td>Fisher’s Exact Test</td>
<td>.034</td>
</tr>
<tr>
<td><strong>Quality of Social Response</strong></td>
<td></td>
<td></td>
<td>χ² = 7.78</td>
<td>.020</td>
</tr>
<tr>
<td>No Impairment: n (%)</td>
<td>17 (61)</td>
<td>7 (25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Amount of Reciprocal Social Communication</strong></td>
<td></td>
<td></td>
<td>χ² = 5.79</td>
<td>.016</td>
</tr>
<tr>
<td>No Impairment: n (%)</td>
<td>19 (68)</td>
<td>10 (36)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: HFASD = High Functioning Autism Spectrum Disorder; ADOS = Autism Diagnostic Observation Schedule
Table 7: Friendships in HFASD and TD Participants

<table>
<thead>
<tr>
<th></th>
<th>HFASD Group (n = 56)</th>
<th></th>
<th>TD Group (n = 56)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women (n = 28)</td>
<td>Men (n = 28)</td>
<td>Women (n = 28)</td>
<td>Men (n = 28)</td>
</tr>
<tr>
<td>Reported # Casual friends: mean (SD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.1 (6.3)</td>
<td>13.7 (23.9)</td>
<td>24.9 (18.8)</td>
<td>28.6 (27.4)*</td>
</tr>
<tr>
<td>Reported # Close friends: mean (SD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.7 (2.1)</td>
<td>3.5 (4.8)</td>
<td>6.6 (5.9)</td>
<td>5.7 (3.2)**</td>
</tr>
<tr>
<td>Friends meeting full criteria:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n (%)</td>
<td>13 (46)</td>
<td>15 (54)</td>
<td>28 (100)</td>
<td>28 (100)*</td>
</tr>
<tr>
<td>Friends meeting at least one criteria:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n (%)</td>
<td>10 (36)</td>
<td>5 (18)</td>
<td>28 (100)</td>
<td>28 (100)*</td>
</tr>
<tr>
<td>No friendships:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n (%)</td>
<td>5 (18)</td>
<td>8 (29)</td>
<td>0 (0)</td>
<td>0 (0)*</td>
</tr>
</tbody>
</table>

Note: HFASD = High Functioning Autism Spectrum Disorder; TD = Typically Developing.* Significant difference between total TD and ASD group at the $p < .001$ level,**Significant difference at the $p = .05$ level
Table 8: Mean Scores on Outcome Measures by Diagnosis and Gender

<table>
<thead>
<tr>
<th>Measure</th>
<th>HFASD Group (n = 56)</th>
<th>TD Group (n = 56)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women (n = 28)</td>
<td>Men (n = 28)</td>
</tr>
<tr>
<td>FQ Mean (SD)</td>
<td>68.9 (19.4)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>62.7 (19.7)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>ULS-3 Mean (SD)</td>
<td>48.5 (8.7)</td>
<td>51.5 (11.8)</td>
</tr>
<tr>
<td>PA Mean (SD)</td>
<td>34.9 (8.2)</td>
<td>33.7 (8.1)</td>
</tr>
<tr>
<td>NA Mean (SD)</td>
<td>23.9 (8.6)</td>
<td>28.3 (7.4)</td>
</tr>
<tr>
<td>AQ Mean (SD)</td>
<td>28.5 (8.3)</td>
<td>26.7 (5.8)</td>
</tr>
</tbody>
</table>

Note: HFASD = High Functioning Autism Spectrum Disorder; TD = Typically Developing; FQ = Cambridge Friendship Questionnaire; ULS-3 = UCLA Loneliness Scale: Version 3; PA = Positive Affect; NA = Negative Affect; AQ = Autism Spectrum Quotient, a - No significant differences among groups on FQ mean, b – Significant difference on FQ mean at the p = .05 level from other group means.
Table 9: Mean Scores on Outcome Measures for HFASD and TD Participants

<table>
<thead>
<tr>
<th>Measure</th>
<th>HFASD Group (n = 56)</th>
<th>TD Group (n = 56)</th>
<th>Test Value</th>
<th>p</th>
<th>$\omega^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>FQ</td>
<td>Mean (SD)</td>
<td></td>
<td>F = 19.46</td>
<td>&lt; .001</td>
<td>.11</td>
</tr>
<tr>
<td></td>
<td>65.8 (19.6)</td>
<td>80.4 (19.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ULS-3</td>
<td>Mean (SD)</td>
<td></td>
<td>F = 35.23</td>
<td>&lt; .001</td>
<td>.23</td>
</tr>
<tr>
<td></td>
<td>50.0 (10.4)</td>
<td>39.1 (9.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA</td>
<td>Mean (SD)</td>
<td></td>
<td>F = 2.89</td>
<td>.092</td>
<td>.02</td>
</tr>
<tr>
<td></td>
<td>34.3 (8.1)</td>
<td>36.6 (5.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>Mean (SD)</td>
<td></td>
<td>F = 37.46</td>
<td>&lt; .001</td>
<td>.24</td>
</tr>
<tr>
<td></td>
<td>26.1 (8.2)</td>
<td>18.0 (5.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AQ</td>
<td>Mean (SD)</td>
<td></td>
<td>F = 139.67</td>
<td>&lt; .001</td>
<td>.55</td>
</tr>
<tr>
<td></td>
<td>27.6 (7.1)</td>
<td>13.0 (5.9)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: HFASD = High Functioning Autism Spectrum Disorder; TD = Typically Developing; FQ = Cambridge Friendship Questionnaire; ULS-3 = UCLA Loneliness Scale: Version 3; PA = Positive Affect; NA = Negative Affect; AQ = Autism Spectrum Quotient
Table 10: Comparison between HFASD Women and Men on Parent-Report ASD Measures

<table>
<thead>
<tr>
<th></th>
<th>Women (n = 28)</th>
<th>Men (n = 28)</th>
<th>Test Value</th>
<th>p</th>
<th>$\omega^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ASSQ Total (SD)</td>
<td>27.9 (5.4)</td>
<td>26.1 (5.3)</td>
<td>F = 1.451</td>
<td>.234</td>
<td>.01</td>
</tr>
<tr>
<td>Mean ASSQ-GIRL (SD)</td>
<td>16.3 (5.8)</td>
<td>11.5 (4.5)</td>
<td>F = 11.741</td>
<td>.001</td>
<td>.16</td>
</tr>
</tbody>
</table>

Note: HFASD = High Functioning Autism Spectrum Disorder; ASSQ = Autism Spectrum Screening Questionnaire
Table 11: Correlations among AQ Scores and Outcome Measures

<table>
<thead>
<tr>
<th></th>
<th>Total Group (n = 112)</th>
<th>HFASD Group (n = 56)</th>
<th>TD Group (n = 56)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pearson Correlation AQ Score ($r$)</td>
<td>Pearson Correlation AQ Score ($r$)</td>
<td>Pearson Correlation AQ Score ($r$)</td>
</tr>
<tr>
<td>FQ</td>
<td>-.495**</td>
<td>-.299*</td>
<td>-.467**</td>
</tr>
<tr>
<td>ULS-3</td>
<td>.626**</td>
<td>.350*</td>
<td>.579**</td>
</tr>
<tr>
<td>PA</td>
<td>-.408**</td>
<td>-.453**</td>
<td>-.418**</td>
</tr>
<tr>
<td>NA</td>
<td>.573**</td>
<td>.293*</td>
<td>.447**</td>
</tr>
</tbody>
</table>

Note: HFASD = High Functioning Autism Spectrum Disorder; TD = Typically Developing; AQ = Autism Spectrum Quotient; FQ = Cambridge Friendship Questionnaire; ULS-3 = UCLA Loneliness Scale: Version 3; PA = Positive Affect; NA = Negative Affect; *Significant at the .05 level; **Significant at the .001 level
Table 12: Correlations among Friendship Quality, Loneliness, and Positive and Negative Affect Scores: Total Group (n = 112)

<table>
<thead>
<tr>
<th></th>
<th>FQ</th>
<th>ULS-3</th>
<th>PA</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>FQ</td>
<td>___</td>
<td>-.489**</td>
<td>.312**</td>
<td>-.224*</td>
</tr>
<tr>
<td>ULS-3</td>
<td>___</td>
<td>___</td>
<td>-.550**</td>
<td>.502**</td>
</tr>
<tr>
<td>PA</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>-.313**</td>
</tr>
<tr>
<td>NA</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
</tbody>
</table>

Note: FQ = Cambridge Friendship Questionnaire; ULS-3 = UCLA Loneliness Scale: Version 3; PA = Positive Affect; NA = Negative Affect, *Significant at the .05 level; **Significant at the .001 level
Table 13: Correlations among Friendship Quality, Loneliness, and Positive and Negative Affect Scores: HFASD Group (n = 56)

<table>
<thead>
<tr>
<th></th>
<th>FQ</th>
<th>ULS-3</th>
<th>PA</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>FQ</td>
<td>___</td>
<td>-.467**</td>
<td>.449**</td>
<td>-.021</td>
</tr>
<tr>
<td>ULS-3</td>
<td>___</td>
<td></td>
<td>-.553**</td>
<td>.258*</td>
</tr>
<tr>
<td>PA</td>
<td>___</td>
<td></td>
<td></td>
<td>-.239*</td>
</tr>
<tr>
<td>NA</td>
<td>___</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: HFASD = High Functioning Autism Spectrum Disorder; FQ = Cambridge Friendship Questionnaire; ULS-3 = UCLA Loneliness Scale: Version 3; PA = Positive Affect; NA = Negative Affect. *Significant at the .05 level; **Significant at the .001 level
Table 14: Correlations among Friendship Quality, Loneliness, and Positive and Negative Affect Scores: TD Group (n = 56)

<table>
<thead>
<tr>
<th></th>
<th>FQ</th>
<th>ULS-3</th>
<th>PA</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>FQ</td>
<td></td>
<td>-.297*</td>
<td>.042</td>
<td>-.117</td>
</tr>
<tr>
<td>ULS-3</td>
<td></td>
<td></td>
<td>-.548**</td>
<td>.479**</td>
</tr>
<tr>
<td>PA</td>
<td></td>
<td></td>
<td></td>
<td>-.339*</td>
</tr>
<tr>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: TD = Typically Developing; FQ = Cambridge Friendship Questionnaire; ULS-3 = UCLA Loneliness Scale: Version 3; PA = Positive Affect; NA = Negative Affect, *Significant at the .05 level; **Significant at the .001 level
Figure 1: Friendship Questionnaire Scores by Diagnosis and Gender

Note: HFASD = High Functioning Autism Spectrum Disorder; TD = Typically Developing
APPENDIX B:

QUESTIONNAIRES
Participant ID: __________

Date: ________________

**Participant Diagnostic Information: Parent/Caregiver Report**

**Directions:** Please provide the following information about your son, daughter or family member who expressed interest in participating in the study and has given researchers permission to obtain this information from you.

1. **Participant age (in years):** __________

2. **Gender:**
   - □ Female (1)
   - □ Male (2)

3. **Has your son/daughter/family member received a high school diploma?**
   - □ Yes (1)
   - □ No (2)

4. **Has your son/daughter/family member ever been diagnosed with any of the following developmental conditions (check all that apply). Please indicate the age of your son/daughter/family member at the time of diagnosis:**
   - □ Autism (1) age: ____________
   - □ Prader-Willi Syndrome (5) age: ____________
   - □ Asperger’s Syndrome (2) age: ____________
   - □ Down Syndrome (6) age: ____________
   - □ High-functioning autism (3) age: ____________
   - □ Fragile X Syndrome (7) age: ____________
   - □ PDD-NOS (4) age: ____________
   - □ Intellectual Disability (8) age: ____________

5. **Please provide the following information about the above diagnosis if it is Autism, Asperger’s Syndrome, High-functioning autism, or PDD-NOS:**
   a. **Date of diagnosis (year):** ____________
   b. **What is the name of professional who provided the diagnosis?** ____________
   c. **What type of professional provided the diagnosis?**
      - □ Clinical Psychologist (1)
      - □ School Psychologist (4)
      - □ Psychiatrist (2)
      - □ Social Worker (5)
      - □ Primary Care Physician/Pediatrician (3)
      - □ Other (please describe) (6) age: ____________
   d. **Where was the diagnosis made? (i.e. OSU Nisonger Center – Columbus, OH; Nationwide Children’s Hospital – Columbus, OH; Franklin County School System)**
      ____________________________________________
      ____________________________________________
Questionnaire 2

Autism Spectrum Screening Questionnaire – Revised Extended Version (ASSQ-REV): Adult Version
(adapted from Ehlers, Gillberg, & Wing, 1999; Kopp & Gillberg, 2011)

1) Autism Spectrum Screening Questionnaire (ASSQ)

This *individual* stands out from other *individuals* of his/her age in the following way:

<table>
<thead>
<tr>
<th></th>
<th>No 0</th>
<th>Somewhat 2</th>
<th>Yes 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 is old-fashioned or precocious</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 is regarded as an ‘eccentric professor’ by <em>others</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 lives somewhat in a world of his/her own with restricted idiosyncratic intellectual interests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 accumulates facts on certain subjects (good rote memory) but does not really understand the meaning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 has a literal understanding of ambiguous and metaphoric language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 has a deviant style of communication with a formal, fussy, ‘old-fashioned’ or ‘robotlike’ language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 invents idiosyncratic words and expressions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 has a different voice or speech</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 expresses sounds involuntarily; clears throat, grunts, smacks, cries or screams</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 is surprisingly good at some things and surprisingly poor at others</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 uses language freely but fails to make adjustments to fit social contexts or the needs of different listeners</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 lacks empathy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 makes naïve and embarrassing remarks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 has a deviant style of gaze</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 wishes to be sociable but fails to make relationships with peers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 can be with other <em>peers</em> but only on <em>his/her terms</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 lacks best friend</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 lacks common sense</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 is poor at games; no idea of cooperating in a team, scores ‘own goals’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 has clumsy, ill coordinated, ungainly, awkward movements or gestures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 has involuntary face or body movements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 has difficulties in completing simple daily activities because of compulsory repetition of certain actions or thoughts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 has special routines; insists on no change</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 shows idiosyncratic attachment to objects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 <em>is or was</em> bullied by <em>peers</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 has markedly unusual facial expression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27 has markedly unusual posture</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* indicates change in language from original version
2) ASSQ-GIRL

This individual* stands out from other individuals* of his/her age in the following way:

<table>
<thead>
<tr>
<th>No</th>
<th>Somewhat</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 Copies you (can be in a very discrete way)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29 Episodes of eating problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 No time perception</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 Too much sympathy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 Extremely interested in pop/ rock bands, soap operas or natural disasters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33 Avoids demands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 Very determined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 Difficulties with choice; always avoids choosing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36 Difficulties with selfcare</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37 Carefree or overmeticulous as regards physical appearance/dress</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38 Naïve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39 Comes too close to others</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>40 Interacts mostly with younger individuals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 Engages in dangerous activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42 Exaggeratedly fanciful</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43 Talks without content</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44 Writes long stories (can be in stark contrast to level of talk)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45 Acts or lives different parts (TV stars, videos, animals)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* indicates change in language from original version
Questionnaire 3

Participant Demographic Information
Participant ID: __________
Date: ________________

Directions: Please provide the following information about yourself using the blank spaces provided or check the answer that best fits you.

6. Age (in years): ______________

7. Gender:  □ Female (1)
            □ Male (2)

8. Ethnicity (please check all that apply):
   □ Prefer not to respond (0)
   □ Asian/Pacific Islander (4)
   □ Black or African American (1)
   □ Native American (5)
   □ Caucasian/White (2)
   □ Bi-racial/Multi-racial (6)
   □ Latino/Latina (3)
   □ Other (please describe) (7) _____________

9. Marital Status:  □ Single (1)
                       □ In a romantic relationship, but not married (2)
                       □ Married (3)
                       □ Divorced/Separated (4)
                       □ Other (please describe) (5) ________________

10. Current Living Situation:
    □ Independently - Alone (1)
        □ Supported Living (5)
    □ Independently - Roommate(s) (2)
        □ With romantic partner (6)
    □ Less than 24 hrs) support staff - Alone (3)
        □ With family (7)
    □ Less than 24 hrs) support staff – Roommate(s) (4)
        □ Other (please describe) (8): ______

11. Are you a member of any organizations or clubs?  □ Yes (1)
(i.e. Aspirations, Book Club, school or hobby club, etc.)  □ No (2)

If you answered yes, in what organizations and/or clubs do you participate? ______________

12. What is your current level of education?
    □ Attending High School (1)
        □ Attending professional/graduate school (3)
    □ Attending College (2)
        □ No longer attending school (4)

13. What is the highest degree you have earned:
    □ High School Diploma (1)
        □ Master’s Degree (4)
    □ Associate’s Degree (2)
        □ Doctoral Degree (5)
    □ Bachelor’s Degree (3)
        □ Professional Degree (6)
    □ Other (please describe): (7) __________

14. Are you employed?  □ Yes - Full-time (40 or more hours/week) (1)
                       □ Yes - Part-time (less than 40 hours/week) (2)
                       □ No – Have had a job in the past (3)
                       □ No – Have never been employed (4)
15. If you are currently employed, what is your occupation/job?

__________________________________________________________________________

16. If you are not currently employed but have been in the past, what is the job that you have held for the longest period of time?

Job: ___________________________ How long? __________________

17. How many total paid jobs have you had during your lifetime (do not include trainings or internships unless you were paid)?

__________________________________________________________________________

18. Have you ever been diagnosed with any of the following conditions? Check all that apply. If known, please indicate your age when you received the diagnosis:

- Autism (1) age: __________
- Prader-Willi Syndrome (5) age: __________
- Asperger’s Syndrome (2) age: __________
- Down Syndrome (6) age: __________
- High-functioning autism (3) age: __________
- Fragile X Syndrome (7) age: __________
- PDD-NOS (4) age: __________
- Intellectual Disability (8) age: __________

19. Have you ever been diagnosed with any of the following psychological conditions? Check all that apply. If known, please indicate your age when you received the diagnosis.

- I prefer not to answer this question (0)
- Depression (1) age: __________
- OCD (7) age: __________
- Bipolar (2) age: __________
- Anxiety (8) age: __________
- ADHD (3) age: __________
- Social Anxiety Disorder (9)
- Schizophrenia (4) age: __________
- PTSD (10)
- Psychotic disorder-NOS (5) age: __________
- Borderline Personality Disorder (11) age: __________
- Schizoid Personality Disorder (6) age: __________
- Other (specify) (12) age: __________

20. Please list any medications (for emotional problems, seizures, etc.) that you currently take (ex: Paxil, Risperdal, Ritalin, Adderall, Prozac): ____________________________________________

___________________________________________________________________________________

21. Do you currently receive any supportive services (i.e. counseling)?

- Prefer not to answer (0)
- Yes (1)
- No (2)

If you answered yes, what type of supportive services do you receive? ____________________________

__________________________________________________________________________
Questionnaire 4

Friendship Activity Report

Participant ID: __________
Date: ________________

Section 1:

1) What does friendship mean to you? Please describe in one or two sentences.

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

2) What are the most important characteristics that you look for in a friend? Please describe in one or two sentences.

____________________________________________________________________________________
____________________________________________________________________________________

3) How do you know if someone is interested in being your friend? Please describe in one or two sentences.

____________________________________________________________________________________
____________________________________________________________________________________

4) What do you consider the difference between a friend and a close friend? Please describe in one or two sentences.

____________________________________________________________________________________
____________________________________________________________________________________

5) Please circle the letter beside the statement that describes you best.
   a. I prefer being friends with people who are the same gender as me.
   b. I prefer being friends with people who are the opposite gender as me.
   c. I have no preference for the gender of my friends.

If you do have a specific preference, please explain in one or two sentences

____________________________________________________________________________________
____________________________________________________________________________________

6) How many friends do you have? ________
   How many of your friends are male? ________ How many of your friends are female? ________

7) How many close friends do you have? ________
   How many of your close friends are male? ________ How many of your close friends are female? ________

Section 2:

Please answer the following questions about EACH person that you consider to be a close friend (you may list up to 4 friends). If you have less than 4 close friends, only answer questions about the number of close friends that you have.

If you do not have any close friends, you may answer these questions in regards to any people your age with whom you sometimes spend time in social settings (outside of school or work), or you may leave this section blank.
FRIEND 1:

- First Name: ________________________
- Gender: ___________________________
- Age: ______________________________
- How long have you known your friend (in years)? _____________________
- How did you meet your friend? (please circle one answer):
  (a) Work (1)
  (b) School (2)
  (c) Family(3)
  (d) Social Group (e.g. Aspirations, Book Club) (4) (please specify): _________________
  (e) Internet, social-networking site (e.g. Facebook) (5) (please specify): _________________
  (f) Other (6) (please describe): _____________________________________________
- When was the last time that you spent time with your friend, in person, not on the internet? (please circle one answer):
  (a) In the past week (1)
  (b) In the past month (2)
  (c) In the past 3 months (3)
  (d) In the past 5 months (4)
  (e) In the past 1 year (5)
  (f) More than 1 year ago (6)
- When was the last time that you talked to your friend on the phone? (please circle one answer):
  (a) In the past week (1)
  (b) In the past month (2)
  (c) In the past 3 months (3)
  (d) In the past 5 months (4)
  (e) In the past 1 year (5)
  (f) More than 1 year ago (6)
- When was the last time that you emailed your friend or contacted him or her through a social networking site (i.e. Facebook)? (please circle one answer):
  (a) In the past week (1)
  (b) In the past month (2)
  (c) In the past 3 months (3)
  (d) In the past 5 months (4)
  (e) In the past 1 year (5)
  (f) More than 1 year ago (6)
- About how often do you spend time with your friend (in person, not on the internet)? (please circle one answer):
  (a) 1 time per week or more (1)
  (b) 1 time per month or more (2)
  (c) 1 time every 3 months or more (3)
  (d) 1 time every 6 months or more (4)
  (e) 1 time per year or more (5)
  (f) Less than 1 time per year (6)
- Please circle any of the following activities that you do with your friend (in person, not on the internet), or list any activities that are not listed below. You may circle as many activities as you like:
Going out to eat
Going out to the movies
Playing video games
Watching TV or movies at home
Playing a sport or going for a walk
Watching sports in the community
Going to a museum, concert, art exhibit, play or other community event
Just talking
Other (please list any other activities not listed here):

When you participate in an activity with your friend, how do you usually make your plans?

(a) You contact your friend via phone, text, email, or Facebook/other social networking site
(b) Your friend contacts you via phone, text, email or Facebook/other social networking site
(c) Your parents arrange the activities
(d) You attend a pre-arranged activity (i.e. through Aspirations, a book club, a school-related club, a sports club, or a club related to a hobby or activity that you like)
(e) Other (please describe):

Do you ever ask your friend for help with an activity, such as moving, loaning you money, or letting you borrow his or her car?
Yes
No

Does your friend ever ask you for help with activities, such as the ones described above?
Yes
No

Please circle the letter beside the statement that describes your friendship the best.

a) I ask my friend for help with these activities more than my friend asks me for help.
b) My friend asks me for help with these activities more than I ask my friend for help.
c) We ask for help from each other about the same amount.

Do you feel comfortable talking to your friend about emotional issues, such as feeling upset about a fight with another friend, a family member, or a romantic partner, about being worried/anxious about a school or work activity, or being proud of an accomplishment you made?
Yes
No

Does your friend talk to you about emotional issues, such as the ones described above?
Yes
No

Please circle the letter beside the statement that describes your friendship the best.

a) I talk to my friend about emotional issues more than my friend talks to me about them.
b) My friend talks to me about emotional issues more than I talk to my friend about them.
c) We talk to each other about emotional issues about the same amount.

Are you satisfied by your relationship with your friend?
Yes
No
FRIEND 2: Same format
FRIEND 3: Same format
FRIEND 4: Same format
APPENDIX C:

CONSENT FORMS
Consent Form 1

The Ohio State University Consent to Participate in Research

Study Title: Gender Differences in Social Skills, Peer Relationships, and Emotional Correlates in Adults with High Functioning Autism Spectrum Disorders

Researcher: Betsey A. Benson, Ph.D.

Sponsor:

This is a consent form for research participation. It contains important information about this study and what to expect if you decide to participate. Your participation is voluntary. Please consider the information carefully. Feel free to ask questions before making your decision whether or not to participate. If you decide to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose: You are being asked to participate in this study to help understand social and emotional characteristics of men and women with HFASD and typically developing adults.

Procedures/Tasks: If you agree to participate, there will be two phases to the study.

Phase 1: I agree to allow researchers to contact my parents or other family members who have known me since early childhood to ask them to complete two questionnaires about my psychological diagnostic information and behavior to determine eligibility for the study. If I do qualify for the study, based on the answers provided by my parents or other family members, and I decide to participate, I agree to allow my parents/family members to complete several additional questionnaires about my early developmental information and my social relationships.

Phase 2: I agree to participate in two researcher-administered assessments, one measuring social interactions and the other measuring cognitive ability, at the Ohio State University Nisonger Center. I agree to allow the social interaction assessment to be videotaped, in order to ensure that the researchers agree on the results of the assessment. I also agree to complete seven questionnaires assessing the following information: demographic information, autism symptoms, friendships, social relationships, emotions, and social support.

Duration:
Phase 1 of the study should take about 5-10 minutes to complete.

Phase 2 of the study should take about 2.5 to 3 hours to complete, not including travel time to the Nisonger Center.

You may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you, and you will not lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

It is important to note that if you participate in the first phase of the study and you decide not to participate in the second phase, you are NOT REQUIRED to complete the second phase just because you sign the consent form.

*Risks and Benefits:*

The expected benefits from the study include increased knowledge about the presentation and associated features of autism spectrum disorders in both women and men, and increased understanding of social and emotional differences between adults with HFASD and typically developing adults.

The risks of participating in the study will be minimal given the actions that researchers will take to ensure the confidentiality and security of your information. However, if there were a breach in security, unauthorized people may gain access to your personal information. Additionally, you may experience some discomfort in answering questions about your emotional experiences. However, you are welcome to stop participating in the study at any time and you are welcome to contact the researchers to express any concerns that you may have while participating in the study.

*Confidentiality:*

Efforts will be made to keep your study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your participation in this study may be disclosed if required by state law. Also, your records may be reviewed by the following groups (as applicable to the research):

- Office for Human Research Protections or other federal, state, or international regulatory agencies;
- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
- The sponsor, if any, or agency (including the Food and Drug Administration for FDA-regulated research) supporting the study.
Incentives:

For Phase 1, there is no compensation.

For Phase 2, you will be compensated for attending the study session at the Ohio State University Nisonger Center, regardless of whether or not you complete all of the assessment measures. You may choose a gift card for $50 to either Amazon.com or to Target.

*By law, payments to subjects are considered taxable income.*

Participant Rights:
You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you are a student or employee at Ohio State, your decision will not affect your grades or employment status.

If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study.

An Institutional Review Board responsible for human subjects research at The Ohio State University reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Contacts and Questions:
For questions, concerns, or complaints about the study you may contact Whitney Brooks at Whitney.Brooks@osumc.edu or 919-622-4892 or Dr. Betsey Benson at Betsey.Benson@osumc.edu or 614-688-3214.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

If you are injured as a result of participating in this study or for questions about a study-related injury, you may contact Whitney Brooks at Whitney.Brooks@osumc.edu or 919-622-4892 or Dr. Betsey Benson at Betsey.Benson@osumc.edu or 614-688-3214.
Signing the consent form

I have read (or someone has read to me) this form and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

Printed name of subject

Signature of subject

AM/PM

Date and time

Investigator/Research Staff

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

Printed name of person obtaining consent

Signature of person obtaining consent

AM/PM

Date and time
THE OHIO STATE UNIVERSITY
AUTHORIZATION TO USE
PERSONAL HEALTH INFORMATION IN RESEARCH

Title of the Study: Gender Differences in Social Skills, Peer Relationships, and Emotional Correlates in Adults with High Functioning Autism Spectrum Disorders

OSU Protocol Number: 2012B0028

Principal Investigator: Betsey A. Benson, Ph.D.

Subject Name__________________________________________________________

Before researchers use or share any health information about you as part of this study, The Ohio State University is required to obtain your authorization. This helps explain to you how this information will be used or shared with others involved in the study.

- The Ohio State University and its hospitals, clinics, health-care providers and researchers are required to protect the privacy of your health information.
- You should have received a Notice of Privacy Practices when you received health care services here. If not, let us know and a copy will be given to you. Please carefully review this information. Ask if you have any questions or do not understand any parts of this notice.
- If you agree to take part in this study your health information will be used and shared with others involved in this study. Also, any new health information about you that comes from tests or other parts of this study will be shared with those involved in this study.
- Health information about you that will be used or shared with others involved in this study may include your research record and any health care records at the Ohio State University. For example, this may include your medical records, x-ray or laboratory results. Psychotherapy notes in your health records (if any) will not, however, be shared or used. Use of these notes requires a separate, signed authorization.
Please read the information carefully before signing this form. Please ask if you have any questions about this authorization, the University’s Notice of Privacy Practices or the study before signing this form.

Initials/Date: ________________

**Those Who May Use, Share And Receive Your Information As Part Of This Study**

- Researchers and staff at The Ohio State University will use, share and receive your personal health information for this research study. Authorized Ohio State University staff not involved in the study may be aware that you are participating in a research study and have access to your information. If this study is related to your medical care, your study-related information may be placed in your permanent hospital, clinic or physician’s office records.

- Those who oversee the study will have access to your information, including:
  - Members and staff of the Ohio State University’s Institutional Review Boards, including the Western Institutional Review Board
  - The Office for Responsible Research Practices
  - University data safety monitoring committees
  - The Ohio State University Research Foundation

- Your health information may also be shared with federal and state agencies that have oversight of the study or to whom access is required under the law. These may include:
  - The Food and Drug Administration
  - The Office for Human Research Protections
  - The National Institutes of Health
  - The Ohio Department of Job and Family Services

These researchers, companies and/or organization(s) outside of The Ohio State University may also use, share and receive your health information in connection with this study:
• Health care facilities, research site(s), researchers, health care providers, or study monitors involved in this study: NONE;

• Private laboratories and other persons and organizations that analyze your health information in connection with this study: NONE;

• The research sponsor and companies owned or connected with the sponsor: NONE;

• Contract Research Organization(s): NONE;

• Independent data and safety monitoring boards and others who monitor the conduct of the study: NONE.

The information that is shared with those listed above may no longer be protected by federal privacy rules.

Initials/Date________________

Authorization Period
This authorization will not expire unless you change your mind and revoke it in writing. There is no set date at which your information will be destroyed or no longer used. This is because the information used and created during the study may be analyzed for many years, and it is not possible to know when this will be complete.

Signing the Authorization
• You have the right to refuse to sign this authorization. Your health care outside of the study, payment for your health care, and your health care benefits will not be affected if you choose not to sign this form.

• You will not be able to take part in this study and will not receive any study treatments if you do not sign this form.

• If you sign this authorization, you may change your mind at any time. Researchers may continue to use information collected up until the time that you formally changed your mind. If you change your mind, your authorization must be revoked in writing. To revoke your authorization, please write to:

  Dr. Betsey Benson
  371L McCampbell Hall
  1518 Dodd Dr.
Columbus, OH 43210

- Signing this authorization also means that you will not be able to see or copy your study-related information until the study is completed. This includes any portion of your medical records that describes study treatment.

Contacts for Questions

- If you have any questions relating to your privacy rights, please contact [Sherry Feinstein (614-247-7190)].
- If you have any questions relating to the research, please contact [Whitney Brooks at Whitney.Brooks@osumc.edu or 919-622-4892 or Dr. Betsey Benson at Betsey.Benson@osumc.edu or 614-688-3214].

Signature

I have read (or someone has read to me) this form and have been able to ask questions. All of my questions about this form have been answered to my satisfaction. By signing below, I permit [Dr. Betsey Benson and Whitney Brooks] and the others listed on this form to use and share my personal health information for this study. I will be given a copy of this signed form.

Signature________________________________________________________
(Subject)

Name___________________________________________________________
(Print name above)

Date__________ Time _________ AM / PM
Study Title: Gender Differences in Social Skills, Peer Relationships, and Emotional Correlates in Adults with High Functioning Autism Spectrum Disorders

Researcher: Betsey A. Benson, Ph.D.

This is a consent form for research participation. It contains important information about this study and what to expect if you decide to participate.

Your participation is voluntary.
Please consider the information carefully. Feel free to ask questions before making your decision whether or not to participate. If you decide to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose: You are being asked to participate in this study to help understand social and emotional characteristics of men and women with HFASD and typically developing adults.

Procedures/Tasks: If you agree to participate, there will be two phases to the study.
Phase 1: With the informed consent of my son, daughter, or family member, I agree to complete two questionnaires about his or her psychological diagnostic information and about his or her current behavior to determine if he or she is eligible to participate in the study.

Phase 2: If my son, daughter, or family member does participate in the study, I agree to complete six additional questionnaires concerning my demographic information and my son/daughter/family member’s demographic information, early developmental history, autism symptoms, peer relationships and social support.

Duration:
Phase 1 of the study should take about 25 minutes to complete.

Phase 2 of the study should take about 1.5 hours to complete.
You may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you, and you will not lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

It is important to note that if you participate in the first phase of the study and you decide not to participate in the second phase, you are NOT REQUIRED to complete the second phase just because you sign the consent form.

**Risks and Benefits:**

The expected benefits from the study include increased knowledge about the presentation and associated features of autism spectrum disorders in both women and men, and increased understanding of social and emotional differences between adults with HFASD and typically developing adults.

The risks of participating in the study will be minimal given the actions that researchers will take to ensure the confidentiality and security of your son, daughter, or family member’s information. However, if there were a breach in security, unauthorized people may gain access to your son, daughter, or family member’s personal information.

**Confidentiality:**

Efforts will be made to keep your study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your participation in this study may be disclosed if required by state law. Also, your records may be reviewed by the following groups (as applicable to the research):

- Office for Human Research Protections or other federal, state, or international regulatory agencies;
- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
- The sponsor, if any, or agency (including the Food and Drug Administration for FDA-regulated research) supporting the study.

**Incentives:**

For Phase 1, you will be compensated with a $5 gift card to Target, for signing and returning the consent form along with the questionnaires, regardless of whether or not you complete all the questionnaires.
For Phase 2, you will be compensated with a $10 gift card to Target, for returning the questionnaires, regardless of whether or not you complete all the questionnaires.

*By law, payments to subjects are considered taxable income.*

**Participant Rights:**
You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you are a student or employee at Ohio State, your decision will not affect your grades or employment status.

If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study.

An Institutional Review Board responsible for human subjects research at The Ohio State University reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

**Contacts and Questions:**
For questions, concerns, or complaints about the study you may contact Whitney Brooks at Whitney.Brooks@osumc.edu or 919-622-4892 or Dr. Betsey Benson at Betsey.Benson@osumc.edu or 614-688-3214.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

If you are injured as a result of participating in this study or for questions about a study-related injury, you may contact Whitney Brooks at Whitney.Brooks@osumc.edu or 919-622-4892 or Dr. Betsey Benson at Betsey.Benson@osumc.edu or 614-688-3214.

**Signing the consent form**

I have read (or someone has read to me) this form and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.
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**Investigator/Research Staff**

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

<table>
<thead>
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<th>Printed name of person obtaining consent</th>
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</table>
Title of Study: Gender Differences in Social Skills, Peer Relationships, and Emotional Correlates in Adults with High Functioning Autism Spectrum Disorders

Description of Study: This research is being conducted by Whitney Brooks, M.A. and Betsey Benson, Ph.D. at the Ohio State University Nisonger Center. There is little information on adults with autism spectrum disorders and on gender issues in this population. It is important to learn about the social and emotional experiences of adults with ASD, in comparison with typically developing adults. The purpose of the study is to examine differences in friendships and emotions between adults with autism spectrum disorders and typically developing adults, as well as gender differences among the groups.

The study will include five questionnaires, assessing demographic information, peer relationships, and emotions. There will be 5 questionnaires. You will be compensated a gift card worth $3 for each questionnaire that you complete, for a chance to earn up to $15 in gift cards. It is estimated that each questionnaire will take you about 15 minutes to complete. The questionnaires will be available for you to complete over a designated two-week period of time. At the end of the two weeks, the questionnaires will be closed. We will email you a gift card to either Amazon.com or Target.com, the value of which is determined by how many questionnaires you complete.

Potential Risks: There may be some risks from participating in this research study. You may experience discomfort in answering some questions about your emotional experiences. You will be able to withdraw participation at anytime. Another risk is identification through the internet. Although every effort to protect confidentiality will be made, no guarantee of internet survey security or email can be given as, although unlikely, transmissions can be intercepted and IP addresses can be identified.

Potential Benefits: This research is not designed to help you personally, but the results may help researchers advance knowledge about important issues in adults with autism spectrum disorders.

Participation: Your participation in this research is voluntary. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you are otherwise entitled.

For questions, complaints or concerns about the research, or if you feel you have been harmed by study participation, you may contact Whitney Brooks at Whitney.Brooks@osumc.edu or 919-622-4892 or Dr. Betsey Benson at Betsey.Benson@osumc.edu or 614-688-3214.

For questions about your rights as a research participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may
contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

In completing any of the study questionnaires, I have consented to participation.