

Educator Awareness Concerning Traits of Females with High-Functioning  
Autism Spectrum Disorder

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## ABSTRACT

There is an increasing awareness among researchers and educators that a significant number of males are diagnosed with autism spectrum disorder (ASD) in comparison to females. Recent research has found noted differences related to ASD characteristics associated with females. The differences are particularly noted in females with average to above average intelligence.

Multi-informant rating scales, questionnaires, and observations are frequently used within educational settings to aid in the evaluation process of children suspected of having disabilities. Educator knowledge and understanding of phenotypic traits associated with both males and females with ASD is a necessity for proper diagnosis.

While some research exists examining the educational experiences and perspectives of females with ASD and their families, there is a paucity of research related to knowledge and understanding of females with high functioning autism spectrum disorder (HFASD) from the perspective of educators.

The current study aimed to identify levels of educator awareness concerning females with HFASD within an elementary school setting with the hope of identifying and providing education if needed, regarding areas of misunderstanding of the female ASD phenotype. Elementary educators (n=53) completed a dichotomous survey. Results of the survey indicated that elementary educators are familiar with phenotypic traits of females with HFASD. Additionally, the educators were divided into three subgroups: general education teachers (n=23), special education teachers (n=12), and support staff (n=18). No statistical differences pertaining to knowledge level among the three subgroups were found.

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## Chapter I

### INTRODUCTION

The term autism has been recognized since the early 1900's when it was first used by German psychiatrist Eugen Bleuler to describe a subset of schizophrenic patients who were particularly withdrawn and self-absorbed (Evans, 2013). Subsequently, knowledge and understanding of autism has greatly evolved to encompass a broad scope of characteristics and abilities displayed by individuals that is now referred to as autism spectrum disorder (ASD).

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition released by the American Psychiatric Association (DSM-5) (APA, 2013) describes ASD as persistent deficits in social communication and interaction across multiple settings as well as a history of restricted, repetitive patterns of behavior. The changes in definition and diagnostic criteria, recognition of ASD as a spectrum, and better identification and screening methods have all, in some aspect, contributed to an increase in the prevalence of individuals identified with this condition.

In 2000, the Centers for Disease Control (CDC, 2007) estimated the prevalence of ASD as approximately 1 in 150 individuals. By 2018, the CDC reported that approximately 1 in 59 children are identified with ASD and a recent study by Maenner et al. (2020) found that ASD affects approximately 1 in 44 children.

While ASD is reported to occur in all racial, ethnic, and socioeconomic groups, there is a significant disproportionality between the reported numbers of identified males and females. On average, four males are diagnosed for every female (Baio et al., 2018; Fombonne, 2003; Maenner et al., 2020). Multiple studies have found that the gender

ratio is dependent on intellectual functioning. The male to female ratio has been reported as low as 2:1 in individuals with co-occurring intellectual disabilities and as high as 6:1 among those with average to above average intelligence quotients (IQ) (Fombonne, 2009; Kirkovski et al., 2013; Loomes et al., 2017; Volkmar et al., 1993). Additionally, females with milder forms of autism, termed high-functioning autism (HFASD), typically receive a diagnosis later than males, whereas females diagnosed at an earlier age tend to have lower intellectual functioning (Begeer et al., 2013; Goin-Kochel et al., 2006; Koenig & Tsatsanis, 2005; Shattuck et al., 2009; Siklos & Kerns, 2007).

Research shows a significant disparity between the representation of males and females in ASD research, as most studies include majority male samples. Increased awareness of disproportionate ratios between the two genders has led to a significant increase in research over the past two decades. Recent research has provided insight and greater understanding of ASD characteristics and possible presentation differences in males and females, particularly in those individuals with average to above average cognitive ability. While the core criteria of ASD remains the same for both males and females, there is considerable heterogeneity in the symptom presentation in females diagnosed with HFASD.

Studies completed by Lai et al. (2011) and Rynkiewicz et al. (2016) found that females with HFASD may have less pronounced symptoms of ASD. In a study completed by May et al. (2014), males diagnosed with ASD exhibited increased external behaviors such as hyperactivity while females exhibited increased internal behaviors such as social phobias. Restrictive interests and repetitive behaviors are also areas that males and females with ASD may appear different. The restrictive interests of females

diagnosed with ASD appear less unusual compared to males with ASD. Females' chosen topics of interest tend to be related to social stimuli such as books, celebrities, and animals and are like those of neurotypical females, whereas males may focus on inanimate objects such as trains and traffic lights (Halladay et al., 2015; Kirkovski et al., 2013; Lai et al., 2015; Tubío-Funqueiriño et al., 2020). While the topic of interests for females are similar to neurotypical females, these restrictive interests may differ with increased intensity and quality (Gould & Ashton-Smith, 2011).

Females with ASD exhibit fewer social communication differences. Studies have shown that females have an increased ability to maintain conversation and a desire to initiate friendships (Lai et al., 2015; Lai et al., 2011). Additional gender differences regarding pragmatic language skills were also noted in studies analyzing narratives in males and females. Females with ASD's narratives possess characteristics that increase their ability to answer questions and strengthen interpersonal skills (Conlon et al., 2019; Kauschke et al., 2016). Females with HFASD are also more likely to have intact play and imitation skills, which are often considered core impairments in ASD (Kirkovski et al., 2013).

Lastly, multiple studies have discussed the ability of females with ASD to “camouflage” or “mask” real struggles with social communication. Masking or camouflaging involves conscious, observation of others by females with ASD to learn how to act in social settings. This involves adopting social roles and following social scripts including learning how to participate in reciprocal conversations, use of affect, gestures, and eye contact (Attwood, 2006; Gould & Ashton-Smith, 2011; Lai et al., 2011; Ratto et al., 2018; Tubío-Funqueiriño et al., 2020).

According to research, the terms camouflage and mask have been used to describe females imitating the social skills of others in ways that may allow the perception that the behavior is typical, thus complicating diagnosis (Attwood, 2006; Gould & Ashton-Smith, 2011; Lai et al., 2011, Lai et al., 2017; Tubío-Fungueiriño et al., 2020).

Due to an increased awareness of ratio and phenotypic discrepancies, researchers have provided evidence supporting the idea that available standardized and non-standardized diagnostic procedures for ASD may be biased against females and particularly females considered to have HFASD (Kaat et al., 2020; Kirkovski, et al., 2013; Ratto et. al, 2018). Noted phenotypic differences between males and females have been discovered primarily through qualitative studies, dynamic assessment, and other means of informal measurements. Current information regarding evaluation and standardized measures are based on small numbers of females; therefore, there is potential to lead to imprecise information regarding the differences between males and females with ASD (Kaat et al., 2020). Information regarding ASD mannerisms, evaluation methods, and treatment methods is primarily derived from studies based on standardized instruments normed on a majority male population. Insufficient development and access to assessment tools that utilize a similar sample size of male and female participants has led to many individuals receiving a delayed diagnosis, a misdiagnosis, or no diagnosis.

A study by Navot et al. (2017) found that 9 out of 11 female participants were diagnosed with ASD after age six, with four of these being diagnosed after age 10 despite early maternal concerns. Additionally, the mothers in the Navot et al. study reported a lack of pediatrician awareness of characteristics of females with ASD, therefore making

it difficult to gain proper diagnostic referrals. Empirical evidence has also found that females are either misdiagnosed or undiagnosed, as many common differences between males and females with ASD are unknown by individuals participating in the educational evaluation process (i.e., speech-language pathologists, school psychologists, general education, and special education teachers (Ratto et al. 2018; Tint & Weiss 2018). Multiple studies have also found that parents report that educators also have decreased knowledge of the female phenotype associated with ASD (Cook et al., 2018; Hull et al., 2017; Jarman and Rayner, 2015). Locke et al. (2014) noted that many families rely on school resources; however, many school systems are ill-equipped with the knowledge and resources for both the use of formal and informal evaluation methods needed to make accurate diagnoses.

Research shows that it can be difficult to identify both males and females with HFASD, as they often perform adequately on standardized assessments (Gómez-Pérez et al., 2019). Due to this fact, it is important to continue to explore additional diagnostic pathways for females in particular. The use of multi-informant rating scales are of particular importance to the population of females with HFASD as most “gold standard” instruments are not standardized on an adequate sample of females and as previously mentioned these individuals often perform adequately on standardized instruments.

Although multi-informant questionnaires and rating scales are often used as part of the diagnostic process in educational settings, multiple studies have found discrepancies in agreement between parent and educator opinions/assessments of the severity of symptoms displayed by females with HFASD (Cook et al., 2018; Hull et al., 2017; Jarman & Rayner, 2015). These disagreements may indicate a difference in



knowledge and perception of difficulties these females with HFASD face in the academic setting, thus impacting scores on multi-informant assessments.

A primary concern regarding the delayed and misdiagnosis of females is the missed opportunity for individuals to receive early intervention supports and services. Research shows that early intervention services provide positive outcomes for individuals with ASD in the areas of language, cognition, and adaptive behavior skills (Clark et al., 2017, Clark et al., 2018). A qualitative study by Bargiela et al. (2016) examined females who were asked to describe their experiences of being misdiagnosed for several years prior to obtaining a diagnosis of ASD. The lives of these adult women were negatively impacted as a result of misdiagnoses leading to inappropriate behavioral interventions, educational placements, and psychiatric treatments.

Increased educator knowledge of females with HFASD may provide a better understanding regarding the discrepancy between the identification of males and females with ASD, aid in earlier recognition and diagnosis, and provide opportunities for early intervention. In turn, the early identification of females with HFASD may lead to the possibility of increased success for these individuals academically, socially, emotionally, and adaptively regarding life skills.

## Chapter II

### REVIEW OF LITERATURE

#### *Definition of Autism Spectrum Disorder*

The DSM-5 (APA, 2013) defines ASD as a pervasive neurodevelopmental disorder characterized by impairments in social communication and restricted, repetitive patterns of behavior, interests and activities. The DSM-5 further describes those individuals receiving a diagnosis of ASD as exhibiting persistent deficits in three areas of social communication and social interaction across multiple contexts. The three areas are described as deficits in social-emotional reciprocity, deficits in nonverbal communication skills used for social interaction, and deficits in the development, maintenance, and understanding of relationships. The latter part of the description notes that two out of four types of restricted, repetitive behaviors (RRB) must be present. These four areas are stereotyped or repetitive motor movements, use of objects, or speech, insistence on sameness, highly restricted fixated interests, and hypo- or hyper-reactivity to sensory input or unusual interests in sensory aspects of the environment.

#### *Severity Levels of Autism Spectrum Disorder*

The DSM-5 (APA, 2013) combined the previous diagnoses of Asperger's disorder, autistic disorder, childhood disintegrative disorder and pervasive developmental disorder not otherwise specified (PDD-NOS) into one term entitled autism spectrum disorder (Hiller et al., 2014). This spectrum encompasses a broad range of ability levels, classifying individuals by varying degrees of severity and is important for both clinical and research purposes (Lord & Bishop, 2015). Clinically, severity classification allows for a more accurate description of similarities and differences between individuals and

narrower prognosis discussions. In research, severity metrics aid in understanding developmental trajectories, better measure response to treatment, and aid in investigating the etiology of both genetic and idiopathic natures (Thurman et al., 2014).

Mehling and Tassé (2016) found that classification of severity levels has often varied. Multiple studies have noted that ASD severity has been informally assigned based on IQ, language acquisition/functioning levels, and severity of behavior problems (Gotham, et al., 2012; Weitlauf et al., 2014). Weitlauf et al. (2014) found that severity is determined by adaptive behavior functioning in addition to the previously mentioned areas.

Others have classified an individual's severity level based on direct measures of ASD symptomology such as the Autism Diagnostic Observation Schedule (ADOS) (Lord et al., 2012) and the Autism Diagnostic Interview, Revised (ADI-R) (Le Couteur et al., 2003). Gotham et al. (2009) cautioned that these assessments were not normalized for this purpose and may vary with chronological age and IQ.

Additionally, multiple studies have classified severity levels of individuals based mainly on intellectual functioning (Di Rezze et al., 2012; Nicholas et al., 2008). Mazurek et al. (2019) noted that behavioral observations of autism severity were taken into account when considering the DSM-5 severity ratings; however, strong associations between the use of IQ and severity levels suggests that diagnosticians are utilizing cognitive functioning to determine severity levels. Use of IQ alone may not adequately characterize variability across the multi-faceted domains of ASD such as core ASD symptomology, cognitive functioning, adaptive functioning, and expressive language levels (Di Rezze et al., 2012). It is also important to note that there are numerous

comorbidities, including behavior problems, psychopathology, genetic etiologies including related and unrelated syndromes, and health conditions that may impact the severity of ASD symptomology expression (Matson & Goldin, 2014).

The release of the DSM-5 by the APA (2013) introduced a new classification of severity levels based on the intensity of needed supports. Mehling and Tassé (2016) argued that levels of needed support are impacted not only by core ASD symptomology, but also cognitive, language, behavioral, and adaptive functioning, as well as characteristics of the individual's environment. For purposes of this discussion, severity level descriptions will be based on guidance provided by the DSM-5 (APA, 2013).

#### *Level Three-Requiring Very Substantial Support*

Individuals who are categorized as severity level three require very substantial support throughout the lifespan and present with severe deficits in the areas of social communication, both verbally and non-verbally. These individuals rarely initiate social interactions and offer minimal response when attempts at social engagements are made by individuals of all ages. Additionally, extremely restricted, repetitive behaviors, inflexibility of behavior and extreme difficulty coping with change are present in most all environments (APA, 2013; Masi et al., 2017).

#### *Level Two-Requiring Substantial Support*

Individuals who are categorized as severity level two require substantial support and exhibit marked deficits in the areas of social communication and restricted, repetitive behaviors, but with less severity than individuals in level three. Social skills are substantially impaired even when supports are in place. These individuals exhibit limited initiation of social interactions and have reduced and/or abnormal responses when

socially engaged by others. These individuals show inflexible behaviors and have difficulty coping with change. Restricted, repetitive behaviors are present in a variety of settings and are obvious to individuals who are not familiar with the person who is diagnosed with ASD (APA, 2013; Masi et al., 2017).

#### *Level One-Requiring Support*

Individuals who are categorized as severity level one exhibit noticeable impairments in social communication, both verbally and non-verbally. Inflexible behaviors may cause interference with functioning across multiple contexts without supports in place. These individuals are most often verbal; however, they may have decreased desire to interact socially. Significant problems with organizing and planning often hinder independence (APA, 2013; Masi et al., 2017). The focus of this review will turn to severity level one.

*Characteristics of Individuals within Severity Level One.* Individuals categorized as severity level one have cognitive abilities in the average to above average range ( $\geq 70$ ) and may or may not have an expressive and/or receptive language impairment (Howorth & Raimandi, 2019). The CDC (2014) estimates that nearly half of children with ASD are classified as level one, whereas Maenner et al. (2020) reports that 42% of individuals with ASD do not exhibit a cognitive impairment. Many of these individuals are instructed alongside general education peers. Historically, these individuals, may have been diagnosed with Asperger's Syndrome, mild autism, or high-functioning autism. Presently the term mild autism and high-functioning autism are commonly used in both research and literature.

### *Phenotypic Differences between Males and Females with ASD Severity Level One*

In recent years, multiple studies have compared males and females diagnosed with ASD. Studies of ASD gender differences have typically investigated core autistic symptomology including communication abnormalities, social deficits, and patterns of restrictive and repetitive behaviors (May et al., 2014). Many studies have found that the core criteria of ASD (pervasive deficits in social communication and interaction and patterns of restrictive, repetitive, stereotyped behaviors and interests) remain the same for both genders (Evans et al., 2019; Fulton et al., 2017; Lai et al., 2011; Reinhardt et al., 2015). However, Evans et al. (2019) argued that there is considerable heterogeneity in the symptom presentations between males and females, including a variety of qualitative and quantitative differences (i.e., severity, language, cognitive ability, social, and co-occurring problems). Bullivant et al. (2018) noted that females with autism are deceptive in their clinical presentation as they can present with emotional, social, and behavioral differences compared to males.

While this area of research is growing, many studies have mixed findings regarding phenotypic differences between males and females. This may be for multiple reasons, including studies utilizing individuals with mixed cognitive levels, symptom severity and expression changes during development due to varying demands in social environments, biological (puberty), and psychological factors, and a lack of longitudinal studies, particularly with females with HFASD (May et al., 2014).

### *External Behaviors versus Internal Behaviors*

Research concerning co-existing psychopathology (internal and external behaviors) in both genders also presents with mixed findings. May et al. (2014) found

that elementary-aged males and females diagnosed with ASD have similar ASD symptoms, inattention, aggression/defiant behavior, learning problems, peer relationships, executive functioning, and overall levels of anxiety as reported by parents. Lai et al. (2011) also found that both males and females had similar levels of current co-occurring anxiety, depression, and obsessive-compulsive symptoms.

Despite this, multiple studies have noted differences between genders in the expression of internal and external behaviors. May et al. (2014) found that males exhibited increased external behaviors such as hyperactivity and females exhibited an increased internal behavior concerning social phobia. This study also noted that lower hyperactivity levels in females might contribute to under identification. Holtmann et al. (2007) also found increased internal behaviors in females when compared to males with HFASD as reported by parents in the areas of social, attention, and thought problems.

While a qualitative study of females with HFASD, ages 11 to 55, did not utilize males, subthemes of depression and loneliness were found to be present. Sixteen out of eighteen females interviewed reported suffering from internalized co-morbid conditions such as anxiety, OCD, and depression (Milner et al., 2019).

Lastly, studies by Arnold (2016) and Zucker et al. (2007) both found that females with anorexia exhibit elevated traits of ASD. Bullivant (2018) noted that eating disorders are often caused by a combination of anxiety, sensory sensitivities, and control.

### *Sensory Symptoms*

Sensory integration difficulties including hypo- and hyper-sensitivities to sight, sound, touch, and taste are often present in males and females with ASD. Studies by Gould and Ashton-Smith (2011) and Lai et al. (2011) found that females exhibited

increased lifetime sensory issues when compared to males. In the qualitative study by Milner et al. (2019), 11 out of 18 females (n=16 with a clinical diagnosis of ASD and n=2 self-diagnosis) reported sensory sensitivity playing a large role in life, with the majority of those finding sensory stimulation as overwhelming and debilitating. In the discussion of females with ASD and anorexia, Bullivant (2018) noted that sensory sensitivities often play a large role as many individuals do not like the smell, taste, and texture of food.

### *Restricted, Repetitive Behaviors*

Females with HFASD are often misdiagnosed as they are not considered to have significant patterns of restricted, repetitive behaviors that often exist in males diagnosed with ASD. A study by Superkar and Menon (2015) examined symptom severity in males and females with IQs  $\geq 70$  and used structural imaging data to examine multiple areas of the brain. They found that females exhibit less severe RRBs. A recent study utilizing the Autism Diagnostic Observation Schedule, Second Edition (ADOS-2) (Lord et al., 2012) found that younger, higher functioning females had lower scores in the restrictive and repetitive behavior subcategory in the areas of unusually repetitive interests or stereotyped behaviors (Knutsen et al., 2019).

Multiple studies have found females with ASD often have special interests that are less eccentric or peculiar than male counterparts (Attwood, 2006; Gould & Ashton-Smith, 2011). While these interests differ in quality and intensity compared to neurotypical peers, they often focus on similar topics as same-aged peers and may be less obvious than RRBs of males with ASD (Gould & Ashton-Smith, 2011; Lai & Szatmari, 2020). As the interests appear within the norm, Bullivant (2018) found that RRB in



females are often misinterpreted or dismissed. Lai et al. (2011) also noted that females with HFASD may have fewer stereotyped interests than males with HFASD.

### *Social Communication*

Social communication requires both verbal and non-verbal skills to understand and interact appropriately with others. As with other phenotypic descriptions, research regarding social communication skills in females present with mixed findings.

Burton et al. (2020) noted that a large body of research exists describing female advantages related to the empathetic and prosocial behaviors and nonverbal communication associated with social communication. Lai et al. (2011) also found that females have fewer socio-communication difficulties than males. Sedgewick et al. (2016; 2019) discussed females with ASD as appearing to have overall stronger social motivation as compared to males with ASD.

Multiple studies have found that females have the increased ability to initiate friendships when compared to male counterparts (Lai et al., 2011; Lai et al., 2015). Other studies have found that while females with ASD desire to seek friendships and social interactions, they do exhibit difficulties initiating and maintaining relationships (Kirkovski et al., 2013; Sedgewick et al., 2016). Sedgewick et al. (2016) also reported that males with ASD are less socially motivated than females to seek out friendships and social interactions.

As previously discussed, females with ASD are often socially motivated to initiate social interactions but Cook et al. (2018) and Cridland et al. (2014) found possible sex-specific challenges for females with ASD related to the maintenance of relationships. Studies by Sedgewick et al. (2016) and Kirkovski et al. (2013) found it difficult for

females with ASD to identify and manage conflict within friendships. A study completed by Baldwin and Costley (2016) found that females with ASD appeared more content to be alone than males. They also reported that females with ASD find the demands of social interactions as more burdensome psychologically and emotionally.

Kanfischer et al. (2017) and McVey et al. (2016) suggested that females with ASD find the social nuances of social communication between females more complex than those found in male communication. They also noted that females find it easier to align their interests with male peers.

Lai et al. (2015) found that females with ASD are better able to demonstrate reciprocal conversation than males with ASD. This may be due to increased ability to produce narratives as narratives are an important skill in answering questions and providing information during conversations. In a study of school-aged children, females told stories with increased salient characteristics, including describing characters' intentions more often than males. In addition, they were able to maintain referential focus more often, thus making the story easier for the listener to follow (Conlon et al., 2019).

While females with ASD often exhibit stronger conversation skills than males, Bullivant (2018) cautions against clinicians assuming these skills are not impaired based on one or two conversational exchanges. Females with HFASD often show difficulty maintaining conversation after multiple exchanges and/or when participating in conversations on non-preferred topics.

### *Masking/Camouflaging*

The female with HFASD's ability to exhibit increased social skills is often attributed to their ability to adopt compensatory social behaviors more often than their

male counterparts (Dean et al., 2017). This ability is known as camouflaging or masking and has received increasing amounts of recent research. Many researchers feel that this may be a significant factor as to why females with HFASD are often overlooked, thus complicating the process of gaining a diagnosis (Attwood, 2006; Gould & Ashton-Smith, Lai et al., 2011; Ratto et al., 2018; Tubío-Fungueiriño et al., 2020).

Masking or camouflaging involves conscious, observation of others by females to learn how to act in social settings. A qualitative study by Tierney et al. (2016) reported that females with ASD utilized camouflaging behaviors out of a desire to fit in with neurotypical peers, and to mask feelings of unhappiness and anxiety in social situations.

The female with ASD's ability to camouflage occurs both behaviorally and linguistically and has both helpful and harmful effects. Dean et al. (2017) noted that masking allows females to adopt more social compensatory strategies than males. Lai et al. (2011) suggested that masking and camouflaging can be an effective compensatory strategy and possibly a therapeutic strategy when teaching females with HFASD social skills. Research by Bargiela et al. (2016), Milner et al. (2019), Hull et al. (2017), and Lai et al. (2011) found that females often use the strategy of masking to fit in with others. The studies also discussed the negative effects of masking, such as constant exhaustion, loss of identity, stress, anxiety, and other poor mental health conditions.

#### *Assessment of Autism Spectrum Disorder*

During the last two decades, researchers have focused on developing empirically supported diagnostic measures to aid in the assessment and treatment of communication disorders for individuals with ASD. A review completed by Santhanam and Hewitt (2015) classified assessments of ASD into the following categories: norm- and criterion-

referenced formal tests, observational assessments, language sample analyses, and parent report measures.

Voelker et al., (2000) noted that best practices in assessing children with ASD includes the use of multiple sources of information. Researchers have argued that use of informal protocols to supplement formal testing is important for multiple reasons. One being individuals with ASD exhibit significant differences in cognitive abilities and sensory processing weaknesses (Charman et al., 2005; Luyster et al., 2009).

Additionally, both males and females with HFASD often perform well on formal (normative and criterion-referenced) instruments but have difficulty with processing of social information and carry-over of these skills to situations in daily life (Gomez-Perez et al., 2019, Winner, 2007).

Another important reason to utilize multiple sources of information when evaluating individuals for ASD is that many children who are not identified prior to preschool, often go undiagnosed as their cognitive ability scores are comparable to typically developing peers and are often performing “at grade level.” However, there is a disconnect in their social competencies that may need to be assessed via informal measures (Brock et al., 2006, Rotheram-Fuller et al., 2010).

#### *Normative and Criterion Referenced Formal Assessments*

*Primary Instruments.* There are multiple direct and indirect measurements that are used by diagnosticians to diagnose ASD. A review by Mehling and Tasse (2016) found the Autism Diagnostic Observation Schedule (ADOS) (Lord et al., 1999), Autism Diagnostic Interview-Revised (ADI-R) (Rutter et al., 2003a), Childhood Autism Rating

Scale (CARS) (Schopler et al., 2010), and the Social Responsiveness Scale (SRS) (Constantino & Gruber, 2012) as the primary instruments used when measuring the core symptoms of ASD. Many of these instruments are considered the “gold standard” when assessing ASD.

While these instruments are not typically administered by speech-language pathologists and do not assess functional skills, language levels, cognitive functioning, behavior problems, comorbid psychopathology, or health conditions, they do provide important information regarding ASD symptomology.

*Additional Assessment/Communication Specific Instruments.* Formal norm- and criterion-referenced language tests have proven feasible in assessing the communication abilities of individuals with ASD. A review by Santhanam and Hewitt (2015) found that most studies using formal testing showed that they were successfully administered and produced interpretable results. Although these tests do not provide autism-specific norms, many have been investigated and found valid for individuals with ASD (Bruckner et al., 2007; Charman et al., 2005; Condouris et al., 2003; Reichow et al., 2008).

The review by Santhanam and Hewitt (2015) found the following tests as receiving at least some support in the studies evaluated in the review in regards to the assessment of language and communication of individuals suspected of having ASD: The Mullen Scales of Early Learning (Mullen, 1995), the Clinical Evaluation of Language Fundamentals, Fourth Edition (Semel et al., 2003), the Peabody Picture Vocabulary Test, Fourth Edition (Dunn & Dunn, 2007), the Expressive Vocabulary Test, Second Edition (Williams, 2007), the Reynell Developmental Language Scales-2 - English version (Reynell & Gruber, 1997), the Test of Pragmatic Language (Phelps-

Terasaki & Phelps-Gunn, 1992), and the Comprehensive Assessment of Spoken Language (Carrow- Woolfolk, 1999). It should be noted that since this review, all previously mentioned assessments are currently out of date and have been replaced by a new edition with the exception of the Mullen Scales of Early Learning (Mullen, 1995). The original version of the Mullen Scales of Early Learning is still in use.

*Parent/Caregiver Report Instruments.* Normative data can also be obtained through norm-referenced parent report measures. These reports are available for a variety of age ranges and have positive outcomes to assess multiple skills for individuals with ASD (Santham & Hewitt, 2015).

The review by Santhanam and Hewitt (2015) reported favorable reliability and validity for the use of the MacArthur–Bates Communication Development Inventory for the assessment of early language development (MB-CDI) (Fenson, 2007). The Vineland Adaptive Behavior Scales-II (VABS) (Sparrow et al., 2005) is a caregiver-report-based instrument that covers multiple domains, but studies have found it to be a valid tool for the assessment of ASD regarding the communication and social subscales (Kenworthy et al., 2012; Reichow et al., 2008).

*Multi-Informant Report Instruments.* Multi-informant assessments are recommended as they provide a more accurate picture of the social communication and behavioral challenges that individuals with ASD experience (Jepsen et al., 2012). Multiple studies have found that the use of multi-informant assessments provide a more in-depth view of challenges that children with ASD experience (Jepsen et al., 2012; Macintosh & Dissanayake, 2006; Matson & Nebel-Schwalm, 2007).

In reviewing the literature, findings have ranged from high correlations of agreement to low correlations of agreement between parents and teachers. In a study completed by Constantino et al. (2003) a high degree of correlation between mother, father, and teacher report was found using the SRS, thus suggesting universal agreement in the observation of autism specific traits in naturalistic social settings. In a more recent study also utilizing the SRS, results indicated a statistical difference between parent and teacher ratings (Azad & Mandell, 2016). Teacher ratings were correlated with symptom severity as measured by the ADOS (Lord et al., 1999), whereas parent ratings were not.

Murray et al. (2009) found moderate agreement between parents and teachers using the TRIAD Social Skills Assessment (TSSA) (Stone et al., 2003). However, little agreement was found with specific social skills items. Parents consistently provided higher ratings pertaining to initiating interactions and teachers consistently rated students higher pertaining to responding and maintaining interactions. The two groups did agree on perspective taking and affective understanding.

Multiple studies have found low agreement on parents/teacher rating scales related to ASD symptomology (Jepsen et al., 2012; Kanne et al., 2009, Locke et al., 2014). The study by Locke et al. (2014) found excellent rater-agreement between teachers and paraprofessionals, whereas little agreement between parents and teachers. Studies by Pearson et al. (2012) and Voelker et al. (2000) discussed the level of parent/teacher agreement regarding the difficulties faced by children who are considered higher functioning, thus alluding to the fact that symptom severity may only serve as a moderate indicator of agreement among informants.

## *Informal Assessments*

*Observational Assessments.* Multiple studies support the use of observational assessments to measure language and communication abilities in autism. Observational studies incorporated scripted elicitation protocols to measure inferencing (Dennis et al., 2001), social communication skills in the classroom and home environments (Clifford et al., 2010), communicative intents (Meadan et al., 2012), and gestures (Watson et al., 2013). Halle and Meadan (2007) concluded that structured elicitation increases the chances of observing a behavior while maintaining a naturalistic context.

*Language Sample Analysis.* Studies of both natural or naturalistically elicited language have suggested that use of narrative assessments is a sensitive measure of higher order language and should be utilized with all individuals capable of producing narratives (Santhanam & Hewitt, 2015). Additional studies utilized language samples to study morphosyntactic data (Novogrodsky, 2013), scoring of the Index of Productive Syntax (Condouris et al., 2003; Eigsti et al., 2007; Park et al., 2012), analyze mean length utterance (Eigsti, et al., 2007; Park, et al., 2012), and to analyze conversational data to study pragmatics from a dynamic assessment protocol (Muskett et al., 2012).

*Self-Assessment.* While not reviewed by Santhanam and Hewitt (2015), self-report assessments have also been developed for use with some individuals with ASD. The Camouflaging Autistic Traits Questionnaire (CAT-Q) (Hull et al. 2019) was developed for use with adult males and females with HFASD, to determine levels of self-camouflaging behaviors. While robust psychometric support was found, Hull et al. (2019) noted that further validation is encouraged in more diverse samples and in comparison, with other measures of camouflaging and social skills.



### *Assessment of Females with ASD Severity Level One*

As previously discussed, information about evaluation and standardized measures are based on small numbers of females, therefore leading to imprecise information regarding the differences between males and females with ASD (Kaat et al., 2020). Evans et al. (2019) noted that often females must exhibit more severe symptoms, impairment, or co-occurring deficits to receive a diagnosis of ASD. In addition, many females diagnosed with ASD often have more severe behavioral, emotional, and cognitive deficits compared to males with ASD (Frazier et al., 2014).

In a recent study of social communication and structural language, Burton et al. (2020) found that although females with HFASD have many advantages over males due to the masking phenomenon, they do demonstrate both social and structural language impairments when compared to typically developing peers. Due to the above concerns, many in the ASD community have called for sex-specific revisions to widely used assessment instruments (Constantino & Charman, 2016; Hull et al. 2017, Lai et al., 2015).

#### *Primary Instruments*

Although there are known phenotypic differences between males and females with ASD, some studies have sought to determine if current assessment instruments and procedures are appropriate for both males and females no single sentence paragraphs.

A study completed by Kaat et al. (2020) examined outcomes among sexes using a large database for the ADOS (Lord et al., 1999), ADI-R (Lord et al., 1994), and the SRS (Constantino & Gruber, 2012). Results indicated minimal differences between sexes except males received more severe RRB scores on both the ADOS and ADI-R and girls

received more severe scores on both SRS indices. Although the SRS is a parent rating scale, this study indicates that the ADOS and ADI-R show bias towards the male description of RRB.

Ratto et al. (2018) also studied the ADOS and ADI-R. Males and females were rated similarly on the diagnostic measures overall, but females with higher IQs were less likely to meet criteria on the ADI-R. Females were also found to be significantly more impaired than males on parent-reported autistic traits and adaptive skills. This may be due to increased expectations from parents regarding female social skills as the reported differences are not always apparent on performance-based measures of social-communication skills (Halladay et al. 2015; Kirkovski et al. 2013). A study of individuals without a marked intellectual impairment by McLennan et al. (1993) also noted that the ADI-R revealed males to have more severe autistic symptoms in early social communication development than females. Lai et al. (2011) found strong evidence of behavioral sex differences utilizing the ADOS, while no differences were found in childhood core autistic symptom severity as measured by the ADI-R. The mixed findings indicate that some females with ASD may be missed using these primary instruments. instruments.

#### *Parent/Caregiver Report Instruments*

A recent study by Navarro-Pardo et al. (2021) supports the use of the Social Communication Questionnaire (SCQ) (Rutter et al., 2003b) as a valid instrument used to identify females with ASD, as the score is based on sex. Scores are generated from the assessment of five domains of ASD traits and the authors identified critical sex differences during

validation. Additionally, Evans et al. (2019) reported the SCQ to perform adequately in the assessment and identification of both males and females.

#### *Multi-Informant Report Instruments*

To address the needs of standardized test discrepancies between males and females, researchers and test developers in Sweden have initiated the task of increasing female presence in measurement norming as well as including test items that are more sensitive to the female phenotype. A study completed by Kopp and Gillberg (2011), found that certain test items were more likely to apply to females, thus leading to continued work in creating a revised version of the Autism Spectrum Screening Questionnaire (ASSQ-R).

#### *Future Implications for the Assessment of Females*

##### *Primary Instruments*

In addition to the previously mentioned improvements for the assessment of all individuals with ASD, research is needed to specifically improve the assessment process of females suspected of having ASD. The primary need is to address the sensitivity of primary diagnostic tools and other frequently utilized communication assessments. Ratto et al. (2018) suggests that a broader sampling of autistic females, who may not meet criteria on gold-standard measures, but do meet DSM-5 criteria, would likely yield greater sex differences. Many whose autistic traits may not align with the ADOS and ADI-R, or who may be able to “pass” the ADOS, are excluded from research. In turn, researchers then fail to find sex differences in their studies.

### *Longitudinal Studies*

The lack of longitudinal studies of high-functioning females at risk for ASD is also an additional concern that should be addressed. Most available studies of diagnostic procedures for females utilize data based on individuals who have previously received a diagnosis of ASD (e.g., Evans et al., 2019; Kaat et al., 2020). In turn, researchers are not able to evaluate the sensitivity and specificity of the diagnostic instruments and are only able to treat scores as indices of ASD symptom severity (Kaat et al., 2020). Evans et al. (2019) found that, because existing notions and instruments (including SCQ, ADOS-2, and DSM-5 criteria) are derived from predominately male ASD samples there remains a challenging problem of “the chicken and the egg”. Current available studies are not able to ascertain the extent to which ASD symptoms truly manifest differently in males compared to females. Further research is needed to understand the phenotypic differences among typically and atypically developing females as well as between females and males (Evans et al., 2019; Kaat et al., 2020).

### *Rating Scales*

Addressing the sensitivity of normative assessments should also include improving available rating scales and developing new rating scales that include questions related to the phenotypic differences of females. Lai et al. (2015) found that current diagnostic tools may not be well-suited for evaluating ASD in females. This may lead to a higher rate of false negatives among females as autistic females display greater discrepancies between clinician-rated and self-rated autistic traits and core social-cognitive abilities, with females showing less impairment on clinician ratings. Kaat et al. (2020) found that the discrepant RRB finding on the SRS reflects differences in parental

expectations about the social appropriateness of certain behaviors that are included in the RRB domain of the SRS.

#### *Educator/Clinician Awareness*

A very important concern to be addressed is the training of not only diagnosticians in recognizing and advocating for accurate diagnoses of high-functioning females, but also educators as they are often the first to have interactions with individuals suspected of having ASD. Educators are considered a key source of relevant information used in the diagnostic process (National Institute of Health and Care Excellence, 2017). Haney (2016) noted that it is important to keep in mind that diagnostic criteria are guidelines, at best, and the larger issue may not be whether this criterion is biased, but do professionals have the skills and knowledge to make correct diagnoses. A recent study by Gray et al. (2021) found there to be a considerable gap between the needs of females with ASD and the level of educator understanding.

Educators may be unaware of difficulties females with HFASD face due their use of camouflaging, while family members are able to see these individuals in a variety of contexts and have an increased awareness of these weaknesses (Hull et al., 2017). A review of literature completed by Tomlinson et al. (2020), examined eight studies related to the school experiences of autistic females throughout childhood and adolescence. Differences in staff and parent perspectives were found as one of the key themes. Cook et al. (2018) reports that parental views of their daughters were not taken seriously by school staff. A study interviewing parents of females with ASD and adult participants with ASD found that many felt that there should be additional education for teachers concerning regarding presentation of ASD in females. Parents reported that educators

were unwilling to learn about ASD in females and some concerns reported to educators regarding difficulties their daughters faced in school were dismissed altogether (Jarman & Rayner, 2015). Additional studies by Cridland et al. (2014) and Moyse and Porter (2015) also utilized parental interviews and noted lack of educator understanding regarding the difficulties their daughters faced both academically and socially.

#### *Purpose of the Study*

Rynkiewicz and Lucka (2018) report that on average females present with clinical characteristics of ASD 3.5 years after males and receive a diagnosis five years later than males. As previously discussed, delayed diagnosis and misdiagnosis can have significant negative effects including exhaustion, emotional instability, distress, teasing, bullying, emotional and physical vulnerability during adolescence with sexual partners, and increased unsolicited physical abuse and solicitation (Cridland et al., 2014).

Evans et al. (2019) expounded on the need for a rigorous population-based assessment research in relation to sex/gender to better understand how ASD should be defined and diagnosed in both males and females. Garnett et al. (2013) and Lai et al. (2015) note the lack of an exclusive and systematic empirical measurement related to the female presentation of ASD and Bullivant et al. (2018) discussed that current questionnaires utilized in the assessment of females are geared toward the male brain. Evans et al. (2019) further explained that screening measures are essential to the understanding of sex/gender differences in symptom presentation and for addressing any systematic problems related to referral process and early identification of ASD for children in need of services.

Multi-informant rating scales, questionnaires, and observations are frequently used within educational settings as parents often rely on educators to aid in the evaluation process. Educator understanding of the female phenotype associated with ASD is important to not only the diagnostic process, but also in implementing supports within the educational setting following diagnosis.

While there is some research available examining the educational experiences and perspectives of females with ASD and their families, there is a paucity of research related to knowledge and understanding of females with HFASD from the perspective of educators. The current study aims to identify levels of educator awareness concerning females with HFASD within an elementary school setting with the hope of identifying and providing education if needed, regarding areas of misunderstanding of the female ASD phenotype.

The results of this study will be used to answer the following questions:

- 1) Do elementary school educators recognize phenotypic traits associated with females with HFASD?
- 2) Is there a difference in the recognition of phenotypic traits associated with females with HFASD among the following groups of educators: a) general education teachers, b) special education teachers, and c) support staff?

Based on these questions, the following hypotheses were generated:

- 1) Elementary school teachers will demonstrate a disparity in the recognition of traits associated with females with HFASD in comparison to traits of autism typically associated with males.

- 2) Special Education teachers will exhibit a greater recognition of female characteristics associated with HFASD than general education teachers and support staff.



Chapter III  
METHODOLOGY  
*Research Design*

This study will utilize a self-selected sample and a cross-sectional survey design. The independent variable was the educators. The dependent variable was the survey responses.

*Participants*

*Recruitment and Informed Consent Procedures*

Approval from the Valdosta State University Internal Review Board as well permission from Gwinnett County Public Schools via the Local School Research Form was obtained prior to the initiation of participant enrollment (see Appendices A and B). Three groups of participants were included: general education teachers, special education teachers, and certified support staff. Participants in all groups were selected based on convenience sampling, and each educator was individually invited to participate in the study. Participants were sent an email explaining the study. Individuals were made aware that participation in the study was completely voluntary. By completing the survey, participants consented to participating in the study.

*Participant Criteria*

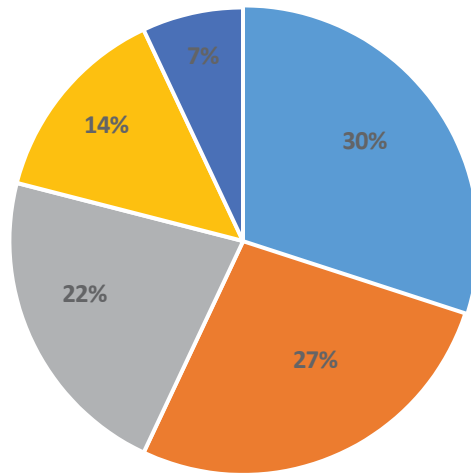
Participants included individuals holding educator and/or administrator certification as defined by the Georgia Professional Standards Commission. Participants were divided into the following groups: general education teachers, special education teachers, and certified support staff. General education teachers were defined as individuals who provide the primary instruction in the general education setting. Special education teachers were defined as individuals providing academic, behavioral, and

social/emotional instruction and support as defined in a student's Individualized Education Plan (IEP). Certified support staff were defined as individuals supporting students participating in general education and special education instruction. Support staff may have included administrators, Early Intervention Program (EIP) teachers, reading recovery teachers, academic coaches, school counselors, school psychologists, physical education teachers, fine arts teachers, science/technology specialists, media specialists, speech-language pathologists, and occupational therapists.

### *School Demographics*

The study took place in an elementary school in Gwinnett County, Georgia. Gwinnett County Public Schools is the largest school district in the state of Georgia with an enrollment of over 180,000 students. The study site serves students in kindergarten through fifth grade and had an enrollment of 999 students at the initiation of the study. The school had 74 certified individuals who either work directly with children or support those who work directly with children.

Demographic information regarding the ethnicity of the student population of the participating school is presented in Figure 1. Demographic information regarding the ethnicity of the certified employee population of the participating school is presented in Figure 2.



■ Caucasian ■ Black/African American ■ Hispanic ■ Asian ■ Multi-Racial

Figure 1

*Demographic percentages regarding ethnicity of student population (n=999) of participating school*

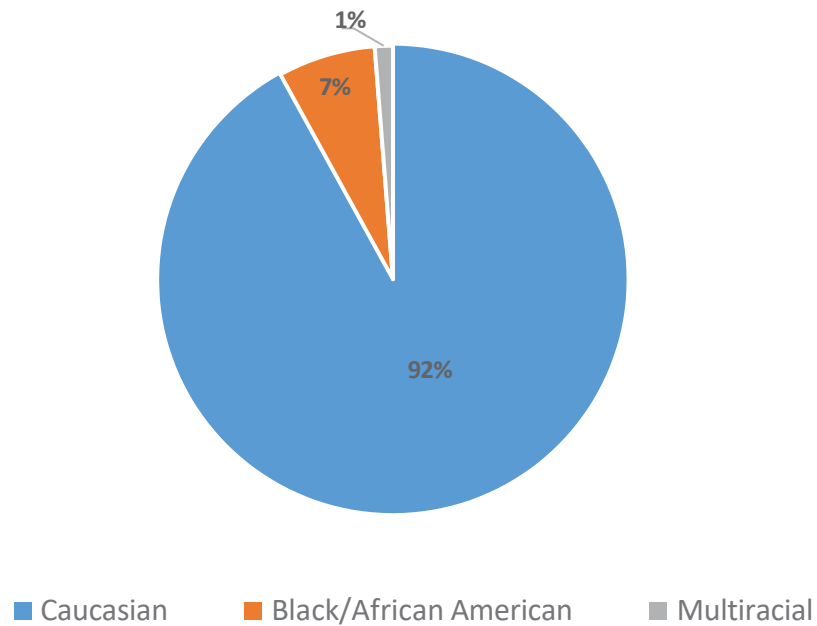


Figure 2

*Demographic percentages regarding ethnicity of certified employee population (n=74) of participating school*

At the initiation of the study, 169 students participated in special education through an IEP. These students had a variety of disabilities as represented through their education eligibility categories. Students may have a primary, secondary, and tertiary eligibility category. Information regarding the primary eligibility areas represented at the study site is presented in Figure 3. Students are served in a variety of locations in the school building and through many models based on level of needs and consideration of the least restrictive environment. Service locations/models range from full inclusion in the general education environment to participation in a small group setting up to 73% of the school day.

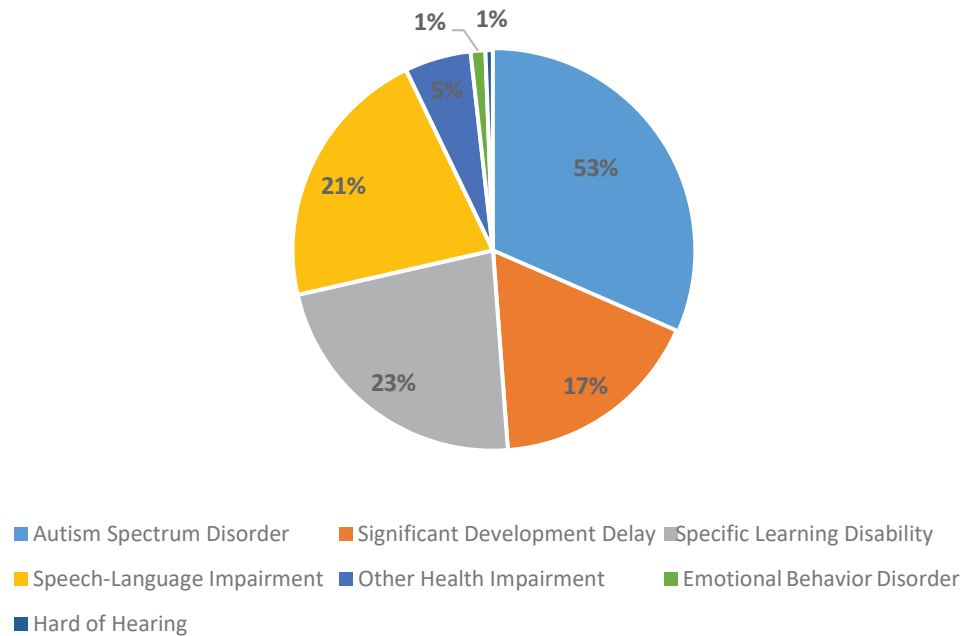


Figure 3

*Demographic information regarding primary special education population (n=169) of participating school*

### *Materials*

A researcher developed dichotomous survey was digitally distributed to eligible participants via the Qualtrics platform. The survey included an agree/disagree format containing 46 statements (see Appendix C). The statements included HFASD characteristics of both males and females. Upon completion of the survey, items were analyzed by the researcher.

### *Statistical Analysis*

First, an accuracy proportion for each item was used to determine overall knowledge level of the participants as a whole. Next, the data were analyzed using a series of *chi-square* goodness of fit analyses to identify overall trends in responses for the

specific survey statements. Analyses, accuracy proportions, and a series of paired sample *t*-tests were used to determine the accuracy of responses between subgroups (general education teachers, special education teachers, and certified support staff). Finally, a one-way ANOVA was conducted to analyze if there were any significant differences among the response accuracies toward each question as a function of group.

## Chapter IV

### RESULTS

The purpose of this study was to identify levels of educator awareness concerning females with HFASD within an elementary school setting. In order to understand if elementary educators recognize phenotypic traits associated with females with HFASD, the results of a dichotomous survey were utilized. The survey included 46 statements related to ASD (see Appendix C). Twenty-nine statements were related to characteristics associated with females with HFASD.

#### *Demographics*

Participant demographics are reported in Table 1. include the total number of participants for each category of educators.

Table 1

#### *Participant totals by educator category*

| Participant               | Total $n=53$ | %   |
|---------------------------|--------------|-----|
| General Education Teacher | 23           | 43% |
| Special Education Teacher | 12           | 23% |
| Certified Support Staff   | 18           | 34% |

#### *Results of the Survey*

Initially, an accuracy proportion for each survey question was calculated for all participants (see Table 2). Percentages of responses for “agree” verses “disagree”

answers were reported. Additionally, the correct answer for each survey item is highlighted. The following question numbers were answered incorrectly by a majority of participants: 34, 39, 40, and 41.

Table 2

*Accuracy Proportions for Survey Answers. Correct answers are indicated by a highlight.*

| <b>Survey Question Number</b> | <b>Behaviors related to HFASD phenotype</b>   | <b>% answered agree</b> | <b>% answered disagree</b> |
|-------------------------------|---|-------------------------|----------------------------|
| <b>1</b>                      | Which of the following best describes your role in the elementary school setting?               | n/a                     | n/a                        |
| <b>2</b>                      | Recognize/identify facial expressions and body language of others                               | 43%                     | 57%                        |
| <b>3</b>                      | Recognize that others have different feelings, ideas, intentions, beliefs, thoughts and desires | 53%                     | 47%                        |
| <b>4</b>                      | Identify others' moods and emotions   | 42%                     | 58%                        |
| <b>5</b>                      | Have an awareness of others' needs/wants  | 34%                     | 66%                        |
| <b>6</b>                      | Initiate social interactions  | 45%                     | 55%                        |
| <b>7</b>                      | Maintain social interactions  | 23%                     | 77%                        |
| <b>8</b>                      | Ask questions appropriately   | 42%                     | 48%                        |
| <b>9</b>                      | Answer questions appropriately  | 76%                     | 24%                        |
| <b>10</b>                     | Understand humor and sarcasm  | 13%                     | 87%                        |
| <b>11</b>                     | Make sympathetic comments toward peers  | 55%                     | 45%                        |
| <b>12</b>                     | Interact/play well with same aged peers   | 25%                     | 75%                        |
| <b>13</b>                     | Exhibit flexible thinking in regard to social situations  | 9%                      | 91%                        |
| <b>14</b>                     | Solve social conflicts with peers   | 6%                      | 94%                        |
| <b>15</b>                     | Have friends  | 66%                     | 34%                        |
| <b>16</b>                     | Obsess over friendships   | 70%                     | 30%                        |
| <b>17</b>                     | Have an intense relationship with a single, close friend  | 79%                     | 21%                        |
| <b>18</b>                     | Socialize and complete tasks independently  | 43%                     | 57%                        |
| <b>19</b>                     | Imitate the actions of others around her  | 83%                     | 17%                        |
| <b>20</b>                     | Join group play (instead of staying on the outside/perimeter)                                   | 40%                     | 60%                        |
| <b>21</b>                     | Shy in social situations  | 89%                     | 11%                        |
| <b>22</b>                     | Prefer to play with younger children  | 74%                     | 26%                        |



|    |  |     |     |
|----|--|-----|-----|
| 23 | Bossy during play  | 57% | 43% |
| 24 | Exhibit appropriate eye contact during conversation  | 23% | 77% |
| 25 | Facial expressions match the situation   | 25% | 75% |
| 26 | Take turns appropriately during conversation   | 32% | 68% |
| 27 | Repair communication breakdowns  | 4%  | 96% |
| 28 | Relay messages in a logical, concise manner  | 38% | 62% |
| 29 | Stay on topic during a conversation  | 34% | 66% |
| 30 | Request help when needed   | 58% | 42% |
| 31 | Understand/respond appropriately to teasing  | 4%  | 96% |
| 32 | Recognize/identify the cause of social problems  | 4%  | 96% |
| 33 | Identify solutions to social problems  | 8%  | 92% |
| 34 | Exhibit appropriate hygiene/grooming skills  | 70% | 30% |
| 35 | Exhibit sensitivity to sight, sound, or touch  | 81% | 19% |
| 36 | Exhibit sensitivity to foods   | 74% | 26% |
| 37 | Appear anxious   | 89% | 11% |
| 38 | Appear depressed   | 51% | 49% |
| 39 | Appear hyperactive   | 57% | 43% |
| 40 | Have unusual restrictive interests/obsessions  | 89% | 11% |
| 41 | Have the same interests as female peers  | 49% | 51% |
| 42 | Have a peer mentor (someone who guides the student through academic and social activities) | 68% | 32% |
| 43 | Control emotions   | 19% | 81% |
| 44 | Change routines easily   | 15% | 85% |
| 45 | Have imaginary friends/pets  | 66% | 34% |
| 46 | Well-behaved in school   | 80% | 20% |

Next, a series of *chi-square* goodness of fit analyses were conducted on the survey response data to identify any overall trends in responses for the specific questions that were asked. Significant trends were revealed for the following questions: 5, 7, 10, 12, 13, 14, 15, 16, 17, 19, 21, 22, 23, 24, 25, 26, 27, 29, 31, 32, 33, 34, 35, 36, 37, 40, 42, 43, and 46. A summary of significant test statistics and trends can be found in Table 3.

Table 3

*Summary of Test Statistics and Trends for Items Specifically Related to Phenotypic**Characteristics of Females with HFASD. Incorrect trends indicated by highlight.*

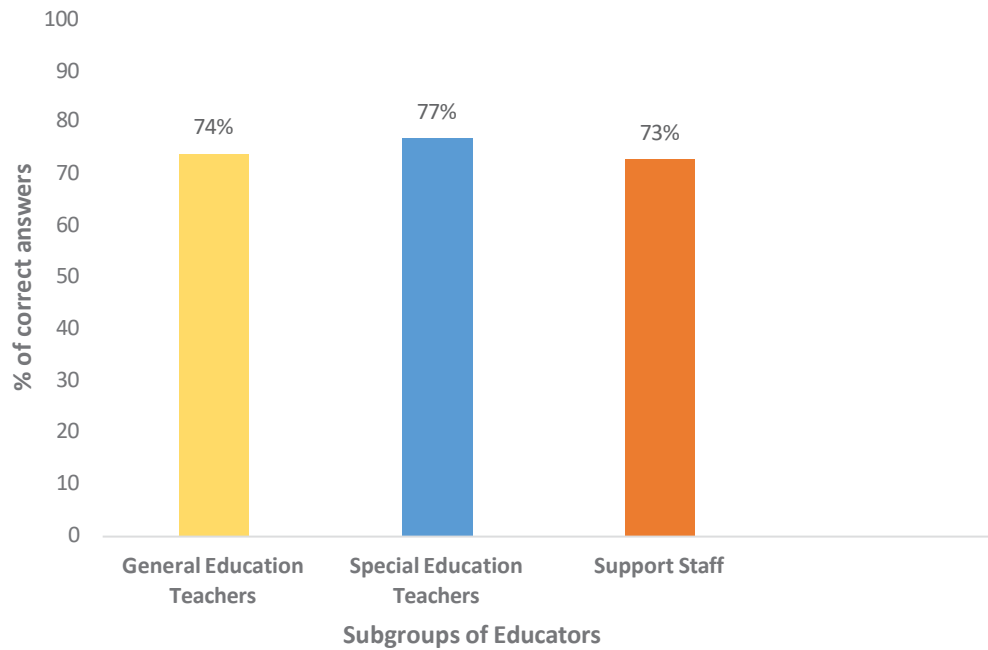
| Survey Question Number | Behaviors related to HFASD                               | X <sup>2</sup> | p-value | Direction  |
|------------------------|--|----------------|---------|--|
| 5                      | Have an awareness of others' needs/wants                 | 5.45           | .02     | disagree   |
| 7                      | Maintain social interactions                             | 15.87          | <.001   | disagree   |
| 10                     | Understand humor and sarcasm                             | 26.70          | <.001   | disagree   |
| 12                     | Interact/play well with same aged peers                  | 9.98           | .002    | disagree   |
| 13                     | Exhibit flexible thinking in regard to social situations | 34.89          | <.001   | disagree   |
| 14                     | Solve social conflicts with peers                        | 41.68          | <.001   | disagree   |
| 15                     | Have friends   | 18.13          | <.001   | agree  |
| 16                     | Obsess over friendships                                  | 8.32           | .004    | agree  |
| 17                     | Have an intense relationship with a single, close friend | 20.55          | <.001   | agree  |
| 19                     | Imitate the actions of others around her                 | 23.11          | <.001   | agree  |
| 21                     | Shy in social situations                                 | 31.72          | <.001   | agree  |
| 22                     | Prefer to play with younger children                     | 11.79          | <.001   | agree  |
| 23                     | Bossy during play  | 13.76          | <.001   | agree  |
| 24                     | Exhibit appropriate eye contact during conversation      | 15.87          | <.001   | disagree   |
| 25                     | Facial expressions match the situation                   | 13.76          | <.001   | disagree   |
| 26                     | Take turns appropriately during conversation             | 6.81           | .009    | disagree   |
| 27                     | Repair communication breakdowns                          | 45.30          | <.001   | disagree   |
| 29                     | Stay on topic during a conversation                      | 5.45           | .20     | disagree   |
| 31                     | Understand/respond appropriately to teasing              | 45.30          | <.001   | disagree   |
| 32                     | Recognize/identify the cause of social problems          | 45.30          | <.001   | disagree   |
| 33                     | Identify solutions to social problems                    | 38.208         | <.001   | disagree   |
| 34                     | Exhibit appropriate hygiene/grooming skills              | 8.32           | .004    | agree<br>*Statistically significant towards incorrect answer |
| 35                     | Exhibit sensitivity to sight, sound, or touch            | 20.55          | <.001   | agree  |
| 36                     | Exhibit sensitivity to foods                             | 11.79          | <.001   | agree  |
| 37                     | Appear anxious   | 31.72          | <.001   | agree  |

|    |  |       |       |  |
|----|--|-------|-------|--|
| 40 | Have unusual restrictive interests/obsessions  | 33.92 | <.001 | agree<br>*Statistically significant towards incorrect answer |
| 42 | Have a peer mentor (someone who guides the student through academic and social activities) | 7.69  | .006  | agree  |
| 43 | Control emotions   | 20.55 | <.001 | disagree   |
| 46 | Well-behaved in school   | 18.13 | <.001 | agree  |

The subsequent statistical analyses were conducted to assess the accuracy of responses that were obtained from all individuals. All responses were scored as correct or incorrect according to current research related characteristics identified as composing the phenotype of females with HFASD. A descriptive analysis revealed the overall accuracy proportion pertaining to survey items related to phenotypic characteristics of females with HFASD for each group to be 75%. Descriptive analyses as a function of group (special education teachers, general education teachers, special education teachers, and support staff) revealed the following accuracy proportions: 77% general education, 74% special education, and 73% support staff (see Figure 4). A series of paired samples *t*-tests revealed no significant differences between the accuracy of responses between the three subgroups.

Figure 4

*Descriptive Analyses of Accuracy Proportions as a Function of Group*



Finally, a one-way ANOVA was conducted to analyze if there were any significant differences among the response accuracies toward each survey statement as a function of group. All statements related to female characteristics yielded no significant differences other than question 45, which focused upon whether females with HFASD were likely to have imaginary friends or pets,  $F(2, 50) = 4.09, p = .02$ . Results revealed that special education teachers answered this question with 33% accuracy whereas general education teachers and support staff answered this question with 77% and 73% accuracy, respectively.

Chapter V  
DISCUSSION  
*Current Research*

Recent research indicates that males are diagnosed with ASD four times as often as females (Baio et al., 2018; Fombonne, 2003; Maenner et al., 2020). Multiple studies have determined that females with ASD, particularly those with IQ's  $\geq 70$ , present differently than males with ASD (Attwood, 2006). Despite these known phenotypic differences, current assessments are developed based on known male characteristics of ASD and are standardized primarily on males (Mussey et al., 2017, Ratto et al., 2018). Disparity in phenotypic representation in both formal and informal assessment measures are thought to contribute in part to the delay or misdiagnosis of females with HFASD (Rynkiewicz & Lucka, 2018).

When evaluating individuals suspected of having ASD, it is imperative to use a comprehensive battery of assessment tools. Without the availability of adequate systematic assessments for females, the use of informal measures such as questionnaires and observations by parents, educators, and clinicians are very important to the evaluation process. Educators are considered extremely important members of the assessment team as they spend large quantities of time with the students. Additionally, they provide valuable insight as they are able to compare students to neurotypical, same-aged peers.

As information regarding the female phenotype of HFASD is relatively new, there is currently a lack of research regarding educator understanding of these individuals. The purpose of this study was to identify levels of educator awareness concerning females with HFASD within an elementary school setting. Information gained would aid in

identifying areas of misunderstanding of the female ASD phenotype and in return allow for educator training to ensure more accurate observation and completion of assessment questionnaires. To better understand elementary educators' awareness of females with HFASD, a closer look at survey answers and group comparisons is necessary.

The first research question asked if elementary school educators were able to recognize phenotypic traits associated with females with HFASD? It was hypothesized that elementary school educators would demonstrate a disparity in the recognition of traits associated with females with HFASD in comparison to traits of autism typically associated with males. Analysis indicated that this hypothesis was not supported as the survey results indicated that educators were aware of characteristics associated with females with HFASD. Twenty-seven out of 29 survey statements pertaining to characteristics of females with HFASD were correctly identified with statistical significance.

A review completed by Tomlinson et al. (2020) included eight studies regarding the school experience of females with ASD. Out of those eight studies, an even smaller number utilized information provided by educators. It should be noted that none of the studies included in the review were considered high quality and delivered mixed results.

The findings of the current study did support research completed by Gray et al. (2021) which investigated the understanding of Special Education Needs Coordinators (SENCOs) in the United Kingdom in 66 educational settings via questionnaire. Those findings indicated that a majority of SENCOs felt "moderately" confident in recognizing girls with possible ASD, however 43% rated their confidence as "low" or "quite low."

The current findings did not support a small qualitative study by Moyse and Porter (2015) which surveyed students, parents, teachers, and SENCos and found a lack of teacher knowledge and awareness of ASD in females even when the students had previously received a diagnosis of ASD. Additional studies completed by Cridland et al. (2014) and Jarman and Rayner (2015) same thing here. It should be noted that teacher interviews were not utilized in either study.

Findings of the present study indicated that educators did not show adequate knowledge regarding the quality of restrictive, repetitive behaviors (RBB) of females. Ninety percent of those surveyed agreed that females with HFASD have unusual, restrictive interests, whereas research shows that this is not the case as interests are often typical and similar to the interests of other peers (Attwood, 2006; Gould & Ashton-Smith, 2011). Similarly, Gray et al. (2021) found that 89% of SENCos reported that unusual interests would be a key marker of ASD in females. However, multiple studies have found that although the restrictive interests may be similar to neurotypical peers, they do appear unusual in that the intensity of the interest is greater (Dean et al., 2017; Gould & Ashton-Smith, 2011; Hiller et al., 2014).

The second area that educators showed a lack of understanding concerns hygiene and grooming skills. Seventy percent of educators agreed that females with HFASD exhibited appropriate hygiene/grooming skills. Research indicates that females do in fact have difficulty with appropriate hygiene and grooming, particularly as they approach adolescence (Cridland et al., 2014, Jamison & Schuttler, 2017). As this survey was distributed to individuals working with children in kindergarten through fifth grade, this

characteristic may not be observed in elementary-aged children as hygiene and grooming are often monitored by parents.

The second research question asked if there was a difference in the recognition of phenotypic traits associated with females with HFASD among the following groups of educators: a) general education teachers, b) special education teachers, and c) support staff? It was hypothesized that special education teachers would exhibit a greater recognition of female characteristics associated with HFASD than general education teachers and support staff. This hypothesis was also not supported by analyses of survey questions.

The findings revealed that special educators, general educators, and support staff all answered questions correctly with similar accuracy. The one exception was that general education teachers and support staff correctly identified that females with HFASD have imaginary pets and friends, while special educators did not recognize this as a trait. Due to a paucity of research, no studies were found that compared general education teacher and special education teacher knowledge of females with HFASD.

#### *Limitations*

The results of this study were limited by multiple factors and only tentative conclusions can be drawn. By limiting the study to a small, self-selected sample size, the external validity does not allow for generalization to other populations of educators (i.e., middle and high school educators). As the educators surveyed were from one elementary school, the results of this study may be limited to schools with similar racial, economic, and special education demographics.



Due to the increased numbers of special education programs and students with a primary special education eligibility area of ASD in the school where the participants were employed, many teachers may have extensive experience with students with ASD. As previously mentioned, 53% of current students with Individualized Education Plans (IEPs) have primary eligibilities of ASD. Additionally, 29 students have a primary special education eligibility of Significant Developmental Delay. A majority of those students exhibit characteristics of ASD and are being served through the ASD program; therefore, similar levels of knowledge of HFASD in both males and females may not be generalized to educators in elementary schools with population and special education program differences.

Additionally, it should be noted that while some survey items were not found to have a statistical difference between answers, many educators did not recognize phenotypic traits of females. For example, 57% of educators agreed that females with HFASD appear hyperactive. May et al. (2014) found that males diagnosed with ASD exhibited external behaviors (i.e., hyperactivity) more often than females. Forty-nine percent of educators disagreed that females with HFASD appear depressed. In the same study by May et al. (2014), it was noted that while males with ASD exhibited increased hyperactivity, females exhibited increased internal behaviors (i.e., social phobias, anxiety, and depression). Lastly, only 49% of educators agreed that females have the same interests as other female peers. As previously noted, Attwood (2006) and Gould & Ashton-Smith (2011) found that females with HFASD exhibit similar interests, although more intense in nature, to their same-aged peers.

### *Recommendations for Future Research*

The need for future studies regarding the assessment and educational experience of females with HFASD is essential for growth in the areas of identification and intervention. First, the refinement of primary or “gold standard” instruments to become more sensitive to both males and females with HFASD is very important, particularly as most educational institutes as well as insurance companies require qualifying scores from one of these instruments to receive services and benefits.

Next, the number of studies conducted in the United States (U.S.) are lacking. In the review by Tomlinson et al. (2020), only two out of the eight included studies published between 2014 and 2018 were conducted in the United States (Dean et al. 2014; Dean et al., 2017). Four studies were conducted in the United Kingdom (U.K.) (Cook et al., 2018; Honeybourne, 2015; Moyse & Porter, 2015; Sedgewick et al., 2016) and two in Australia (Cridland et al., 2014; Jarman and Rayner, 2015).

Both the general population and the prevalence of children diagnosed with ASD in the U.S. is significantly greater than both the U.K. and Australia. The prevalence of ASD in the U.S is 1:44 (CDC, 2018), 1:100 in the U.K (National Health Service, 2020), and 1:70 in Australia (May et al., 2017). As the prevalence of ASD appears to be much greater in the U.S., the lack of research conducted in American school systems concerning the educational experiences of females with HFASD is alarming.

Future studies should also attempt to account for the limitations of the current study. Studies should include educators from multiple schools and districts, both with and without significant numbers of students with ASD eligibilities. Additionally,

inclusion of teachers in middle and upper grades would also provide a better understanding of educator knowledge across all grade levels.

Additionally, future research should also seek to discover educator confidence levels and knowledge in providing post-diagnostic intervention for females with HFASD. Gray et al. (2021) found that 79% of SENCos felt that training in both the identification and support of females diagnosed with ASD would be beneficial. Studies completed by McCulloch and Noonan (2013) and Nolan and Hannah (2019) found significant improvements in staff practices in supporting students with ASD, but these studies were not specific to females. In particular, knowledge of intervention regarding the mental health/emotional needs of these females should be addressed.

Lastly, additional studies of parent perceptions of educators' abilities to identify and support their daughters would be beneficial. The working relationship between school and home is a key component of success for children with disabilities. Limited studies have been conducted researching school-home relationships of females with HFASD.

## Chapter VI

### CONCLUSION

Educators are often called upon to participate in the identification/evaluation process and provide interventions for children with varying disabilities. Until recently, information regarding the cause of disparity in the identification rates between males and females diagnosed with ASD was scarce. As research has recently increased, studies have found that the female ASD phenotype often varies from the male phenotype, particularly in females with average to above average cognitive abilities. Prior research has found that educators are not aware of the phenotypic differences between males and females and often look for the well-known male characteristics related to ASD. This lack of knowledge may hinder educator perceptions during the evaluation process when completing both formal and informal means of assessment.

The purpose of this study was to better understand elementary educator knowledge regarding females with HFASD. The results of this study revealed that elementary educators are aware of characteristics associated with females with HFASD in the elementary school setting. Additionally, the findings indicated that knowledge levels among general education teachers, special education teachers, and support staff were similar.

As there continues to be a paucity of research regarding HFASD and educational experiences, the findings of this study indicate that the knowledge gap regarding phenotypic differences between males and females with HFASD is closing. While there is much to be done to educate others, the information provided by this study is

encouraging for all stakeholders working to provide proper diagnoses and interventions both in and out of the academic setting.

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Appendix A:  
Institutional Review Board Approval



**Institutional Review Board (IRB)**  
**For the Protection of Human Research Participants**  
**PROTOCOL EXEMPTION REPORT**

**Protocol Number:** 04245-2021

**Responsible Researcher(s):** Jessica Peters

**Supervising Faculty:** Dr. Katherine Lamb

**Project Title:** *Educator Awareness Concerning Traits of Females with High Functioning Autism Spectrum Disorder.*

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**INSTITUTIONAL REVIEW BOARD DETERMINATION:**

This research protocol is **exempt** from Institutional Review Board (IRB) oversight under 45 CFR 46.101(b) of the federal regulations **category 2**. If the nature of the research changes such that exemption criteria no longer apply, please consult with the IRB Administrator ([irb@valdosta.edu](mailto:irb@valdosta.edu)) before continuing your research study.

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**ADDITIONAL COMMENTS:**

- *Upon completion of the research study, collected data must be securely maintained (locked file cabinet, password protected computer, etc.) and accessible only by the researcher for a minimum of 3 years. At the end of the required time, collected data must be permanently destroyed.*

*If this box is checked, please submit any documents you revise to the IRB Administrator at [irb@valdosta.edu](mailto:irb@valdosta.edu) to ensure an updated record of your exemption.*

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*Elizabeth Ann Olphie*      11.29.2021  
**application.**

Elizabeth Ann Olphie, IRB Administrator  
[irb@valdosta.edu](mailto:irb@valdosta.edu) or 229-253-2947.

**Thank you for submitting an IRB**

**Please direct questions to**

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*Revised: 06.02.16*

APPENDIX B:  
Local Research Request Form



(Revised 1/4/2021)

LOCAL SCHOOL RESEARCH REQUEST FORM

Name of School: Freeman's Mill Elementary School

Name of Researcher: Jessica Peters

Position or Grade: Speech-Language Pathologist

**A. Research Project**

a. **Title:** Educator Awareness Concerning Traits of Females with High-Functioning Autism Spectrum Disorder

b. **Statement of Problem and research question:** The current study aims to identify levels of educator awareness concerning females with high functioning autism spectrum disorder (HFASD) within an elementary school setting with the hope of identifying and providing education if needed, regarding areas of misunderstanding of the female ASD phenotype. The results of this study will be used to answer the following question: Is there a difference in the recognition of phenotypic traits associated with females with HFASD among the following groups of educators: a) general education teachers, b) special education teachers, and c) support staff?

c. **Subjects or population for the study:** Participants may include administrators, general education classroom teachers, general education support staff, academic coaches education teachers, school counselors, school psychologists, physical education teachers, fine arts teachers, science/technology specialists, media specialists, speech-language pathologists, and occupational therapists.

**d. Reason for doing this research:**

|                                     |  |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | Graduate study at <u>Valdosta</u> State _____ University/College |
| <input type="checkbox"/>            | Publication/Presentation   |
| <input type="checkbox"/>            | Other (please specify) _____                                     |

e. **Dates research will be conducted:** NOV. 2021 to Jan. 2022

B. All research and researchers must a) Protect the rights and welfare of all human subjects, b) Inform students and/ or parents that they have the right not to participate in the study, c) Adhere to board policies and applicable laws which govern the privacy and confidentiality of students records. Researchers requesting to conduct research across our school district

must complete a GCPS Research Proposal to be reviewed by the Gwinnett IRB. Please visit our [GCPS Research & Evaluation website](#) for details and instructions.

- C. This form must be completed by school employees requesting to conduct research only at the school where they work. Co-researchers participating in this request must also be employed at the same school as the researcher. Principals ONLY need to approve/sign Local School Research Requests from their school employees.
- D. This form may also be completed by principals requesting to conduct research only at the school where they work. The assistant superintendent assigned to the principal must approve/sign the request form.
- E. A copy of all Local School Research Requests must be forwarded to the Research & Evaluation Office - ISC for our files. Please send via the information below.

Via Email:

Dr. James Appleton, [James.Appleton@qcpsk12.org](mailto:James.Appleton@qcpsk12.org) & Mrs. Jennifer Rogers,  
[Jennifer.Rogers@qcpsk12.org](mailto:Jennifer.Rogers@qcpsk12.org)



Principal's Signature

11/1/2021

Date of Approval

Assistant Supt. Signature (only if submitted by Principal)

Date of Approval



APPENDIX C: Educator Awareness Concerning Traits of Females with High-  
Functioning Autism Spectrum Disorder Survey

# Educator Awareness Concerning Traits of Females with High-Functioning Autism Spectrum Disorder

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## Start of Block: Default Question Block

You are being asked to participate in a survey research project entitled Educator Awareness Concerning Traits of Females with High Functioning Autism Spectrum Disorder, which is being conducted by Jessica Peters, a student at Valdosta State University. The purpose of the study is seeking to identify levels of educator awareness concerning females with high functioning autism spectrum disorder (HFASD) within an elementary school setting. You will receive no direct benefits for participating in this research study. However, your responses may provide us information about how much educators understand and potentially identify females with high functioning autism spectrum disorder. There are no foreseeable risks involved in participating in this study other than those encountered in day-to-day life. Participation should take approximately 10-15 minutes to complete. The survey responses, and your participation, will be kept confidential. No one, including the researcher, will be able to associate your responses with your identity. Your participation is voluntary. You may choose not to take the survey, to stop responding at any time, or to skip any questions that you do not want to answer. Participants must be at least 18 years of age to participate in this study. Your completion of the survey serves as your voluntary agreement to participate in this research project and your certification that you are 18 or older. You may print a copy of this statement for your records.

Questions regarding the purpose or procedures of the research should be directed to Jessica Peters, ABD, CCC-SLP at [jepeters@valdosta.edu](mailto:jepeters@valdosta.edu). This study has been exempted from Institutional Review Board (IRB) review in accordance with Federal regulations. The IRB, a university committee established by Federal law, is responsible for protecting the rights and welfare of research participants. If you have concerns or questions about your rights as a research participant, you may contact the IRB Administrator at 229-253-2947 or [irb@valdosta.edu](mailto:irb@valdosta.edu).

---

Directions: The following questionnaire is designed to identify your recognition of behaviors that may or may not be associated with females with high functioning autism. High functioning autism is defined as individuals having an intellectual quotient (IQ) within the average to above average range.

Please read each statement and mark “agree” if you think females with high functioning autism are likely to display the characteristic. If you think females with high functioning autism are not likely to display the characteristic mark “disagree.”

---

Q1 Which of the following best describes your role in the elementary school setting?

- general education teacher (1)
- special education teacher (2)
- support staff (i.e., administrator, academic coach, school counselor, school psychologist, speech-language pathologist, occupational therapist, media specialist, ELL teacher, other) (3)

---

Page Break

Q2 Recognize/identify facial expressions and body language of others

- agree (1)
- disagree (2)

Q3 Recognize that others have different feelings, ideas, intentions, beliefs, thoughts and desires

- agree (1)
- disagree (2)

Q4 Identify others' moods and emotions

agree (1)

disagree (2)

---

Q5 Have an awareness of others' needs/wants

agree (1)

disagree (2)

---

Q6 Initiate social interactions

agree (1)

disagree (2)

---

Q7 Maintain social interactions

agree (1)

disagree (2)

---

Q8 Ask questions appropriately

agree (1)

disagree (2)

---

Q9 Answer questions appropriately

agree (1)

disagree (2)

---

Q10 Understand humor and sarcasm

agree (1)

disagree (2)

---

Q11 Make sympathetic comments toward peers

agree (1)

disagree (2)

---

Q12 Interact/play well with same aged peers

agree (1)

disagree (2)

---

Q13 Exhibit flexible thinking in regard to social situations

agree (1)

disagree (2)

---

Q14 Solve social conflicts with peers

agree (1)

disagree (2)

---

Q15 Have friends

agree (1)

disagree (2)

---

Q16 Obsess over friendships

agree (1)

disagree (2)

---

Q17 Have an intense relationship with a single, close friend

agree (1)

disagree (2)

---

Q18 Socialize and complete tasks independently

agree (1)

disagree (2)

---

Q19 Imitate the actions of others around her

agree (1)

disagree (2)

---

Q20 Join group play (instead of staying on the outside/perimeter)

agree (1)

disagree (2)

---

Q21 Shy in social situations

agree (1)

disagree (2)

---

Q22 Prefer to play with younger children

agree (1)

disagree (2)

---

Q23 Bossy during play

agree (1)

disagree (2)

---

Page Break

---

Q24 Exhibit appropriate eye contact during conversation



agree (1)

disagree (2)

---

Q25 Facial expressions match the situation

agree (1)

disagree (2)

---

Q26 Take turns appropriately during conversation

agree (1)

disagree (2)

---

Q27 Repair communication breakdowns

agree (1)

disagree (2)

---

Q28 Relay messages in a logical, concise manner

agree (1)

disagree (2)

---

Q29 Stay on topic during a conversation

agree (1)

disagree (2)

---

Q30 Request help when needed

agree (1)

disagree (2)

---

Q31 Understand/respond appropriately to teasing

agree (1)

disagree (2)

---

Q36 Exhibit sensitivity to foods

agree (1)

disagree (2)

---

Q37 Appear anxious

agree (1)

disagree (2)

---

Q38 Appear depressed

agree (1)

disagree (2)

---

Q39 Appear hyperactive

agree (1)

disagree (2)

---

Q40 Have unusual restrictive interests/obsessions

agree (1)

disagree (2)

---

Q41 Have the same interests as female peers

agree (1)

disagree (2)

---

Q42 Have a peer mentor (someone who guides the student through academic and social activities)

agree (1)

disagree (2)

---

Q43 Control emotions

agree (1)

disagree (2)

---

Q44 Change routines easily

agree (1)

disagree (2)

---

Q45 Have imaginary friends/pets

agree (1)

disagree (2)

---

Q46 Well-behaved in school

agree (1)

disagree (2)

End of Block: Default Question Block

---

Q32 Recognize/identify the cause of social problems

agree (1)

disagree (2)

---

Q33 Identify solutions to social problems

agree (1)

disagree (2)

---

Page Break

---

Q34 Exhibit appropriate hygiene/grooming skills

agree (1)

disagree (2)

---

Q35 Exhibit sensitivity to sight, sound, or touch

agree (1)

disagree (2)

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