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Comparison of cognitive, psychosocial, and adaptive behavior profiles among gifted children with and without Autism Spectrum Disorder

Alissa F. Doobay
University of Iowa

COMPARISON OF COGNITIVE, PSYCHOSOCIAL, AND ADAPTIVE BEHAVIOR PROFILES AMONG GIFTED CHILDREN WITH AND WITHOUT AUTISM SPECTRUM DISORDER

by

Alissa F. Doobay

An Abstract

Of a thesis submitted in partial fulfillment
of the requirements for the Doctor of
Philosophy degree in Psychological and Quantitative Foundations
in the Graduate College of
The University of Iowa

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Thesis Supervisors: Associate Professor Saba Rasheed Ali
Assistant Professor Megan Foley Nicpon

ABSTRACT

The diagnostic category of autism has been extensively investigated over the past 65 years since the condition was first described by Dr. Leo Kanner (1943), making it one of the most validated psychological disorders. Research has examined the characteristics of children with autism spectrum disorder (ASD) across a variety of domains, including diagnostic symptomology, intellectual profiles, adaptive behavior, and psychosocial functioning. However, there exists a paucity of empirical research on intellectually gifted children with ASD. The goal of the current study was to compare the psychometric profiles of gifted youth with and without ASD across the domains of intellectual functioning, psychosocial/behavioral functioning, social skills, and adaptive behavior using an empirical, group study design. It was hypothesized that, in comparison to the group of youth without ASD, the group of youth with ASD would demonstrate equally strong verbal and nonverbal intellectual abilities with relatively poorer processing speed, poorer adaptive functioning skills, more psychosocial/behavior concerns, and poorer social skills. Data from 81 school-age youth who had been identified as intellectually gifted were included in the present study. Forty of the participants in this study met DSM-IV-TR diagnostic criteria for ASD; the remaining 41 participants did not meet diagnostic criteria for an Axis I or Axis II psychological disorder. Statistical analyses included independent-samples *t* tests and split-plot analyses. Results of the current study demonstrate that statistically significant differences exist between gifted youth with and without ASD in the areas of processing speed, adaptive functioning, psychosocial/behavioral functioning, and social skills, despite equivalent verbal and nonverbal intellectual functioning. The current study is unique in that it is the first to examine these domains of functioning and make empirical comparisons of characteristics among gifted individuals with ASD using a group study design. Importantly, this study has significant implications for diagnosis of ASD and will provide an empirical

foundation upon which to develop effective classroom interventions to best meet the unique needs of this twice-exceptional population.

Abstract Approved: _____
Thesis Supervisor

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Title and Department

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Thesis Supervisor

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Title and Department

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Date

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Graduate College
The University of Iowa
Iowa City, Iowa

CERTIFICATE OF APPROVAL

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PH.D. THESIS

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This is to certify that the Ph.D. thesis of

Alissa F. Doobay

has been approved by the Examining Committee
for the thesis requirement for the Doctor of Philosophy
degree in Psychological and Quantitative Foundations at the December 2010
graduation.

Thesis Committee: _____
Saba Rasheed Ali, Thesis Supervisor

_____
Megan Foley Nicpon, Thesis Supervisor

_____
Timothy Ansley

_____
Nicholas Colangelo

_____
William Ming Liu

To Marc, for giving me strength and inspiration, and because you are the most brilliant and compassionate person I know.
To Mom and Dad, for providing me with nurturance, confidence, challenge, and support throughout my life.

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ABSTRACT

The diagnostic category of autism has been extensively investigated over the past 65 years since the condition was first described by Dr. Leo Kanner (1943), making it one of the most validated psychological disorders. Research has examined the characteristics of children with autism spectrum disorder (ASD) across a variety of domains, including diagnostic symptomology, intellectual profiles, adaptive behavior, and psychosocial functioning. However, there exists a paucity of empirical research on intellectually gifted children with ASD. The goal of the current study was to compare the psychometric profiles of gifted youth with and without ASD across the domains of intellectual functioning, psychosocial/behavioral functioning, social skills, and adaptive behavior using an empirical, group study design. It was hypothesized that, in comparison to the group of youth without ASD, the group of youth with ASD would demonstrate equally strong verbal and nonverbal intellectual abilities with relatively poorer processing speed, poorer adaptive functioning skills, more psychosocial/behavior concerns, and poorer social skills. Data from 81 school-age youth who had been identified as intellectually gifted were included in the present study. Forty of the participants in this study met DSM-IV-TR diagnostic criteria for ASD; the remaining 41 participants did not meet diagnostic criteria for an Axis I or Axis II psychological disorder. Statistical analyses included independent-samples *t* tests and split-plot analyses. Results of the current study demonstrate that statistically significant differences exist between gifted youth with and without ASD in the areas of processing speed, adaptive functioning, psychosocial/behavioral functioning, and social skills, despite equivalent verbal and nonverbal intellectual functioning. The current study is unique in that it is the first to examine these domains of functioning and make empirical comparisons of characteristics among gifted individuals with ASD using a group study design. Importantly, this study has significant implications for diagnosis of ASD and will provide an empirical

foundation upon which to develop effective classroom interventions to best meet the unique needs of this twice-exceptional population.

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LIST OF SYMBOLS AND ABBREVIATIONS

α	Alpha: Cronbach's index of internal consistency
AD	Autistic Disorder
ADHD	Attention-Deficit/Hyperactivity Disorder
ADI-R	Autism Diagnostic Interview-Revised
ADOS	Autism Diagnostic Observation Scale
ANOVA	Analysis of Variance
APA	American Psychiatric Association
AS	Asperger Syndrome
ASD	Autism Spectrum Disorder
β	Beta: Standardized coefficient derived from the slope of a regression line representing the strength and direction of an association between two variables
BAP	Broader autism phenotype
BASC-2	Behavior Assessment System for Children, Second Edition
BASC-PRS	Behavior Assessment System for Children, Parent Rating Scale
BASC-SRP	Behavior Assessment System for Children, Self-Report of Personality
BASC-TRS	Behavior Assessment System for Children, Teacher Rating Scale
BBC-ACC	Connie Belin & Jacqueline N. Blank International Center for Gifted Education and Talent Development Assessment and Counseling Clinic
COPDD	Childhood Onset Pervasive Developmental Disorder: diagnosis contained in the DSM-III

df	Degrees of freedom: number of values free to vary after certain restrictions have been placed on data
DSM-III	Diagnostic and Statistical Manual of Mental Disorders, Third Edition
DSM-III-R	Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition
DSM-IV-TR	Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition, Text Revision
F	Fisher's *F* Ratio: A ratio of two variances
FSIQ	Full Scale Intelligence Quotient: composite score comprised of all core subtests
GAI	General Ability Index: Wechsler intelligence scale composite score comprised of the core verbal and perceptual reasoning subtests
HFA	High-functioning autism: autism and measured IQ > 70
ICD-10	International Classification of Diseases, 10^{th} Edition
IQ	Intelligence quotient
LFA	Low-functioning autism: autism and measured IQ < 70
M	Mean: the sum of a set of values divided by the number of values in the set
MANOVAs	Multivariate Analysis of Variance
MR	Mental Retardation
N	Statistical notation for sample size
NAGC	National Association for Gifted Children
NLD	Nonverbal Learning Disorder

η_p^2	Partial eta-squared: the proportion of total variability attributable to a particular factor; measure of effect size
OCD	Obsessive-Compulsive Disorder
ODD	Oppositional Defiant Disorder
p	Probability of obtaining the observed value or a more extreme value if the null hypothesis is true
PDD	Pervasive Developmental Disorder
PDD-NOS	Pervasive Developmental Disorder, Not Otherwise Specified
PIQ	Performance Intelligence Quotient: WAIS-III composite score comprised of the core performance and processing speed subtests
POI	Perceptual Organization Index: WAIS-III index score comprised of the core performance subtests
PRI	Perceptual Reasoning Index: WISC-IV index score comprised of the core perceptual reasoning subtests
PSI	Processing Speed Index: Wechsler intelligence scale index score comprised of the core processing speed subtests
SD	A statistical measure of variability in a data set; the square root of the variance
SSRS	Social Skills Rating System
t	Computed value of a *t* test demonstrating distance from the mean
U.S.	United States
Vineland-II	Vineland Adaptive Behavior Scales, Second Edition

VCI	Verbal Comprehension Index: Wechsler intelligence scale index score comprised of the core verbal subtests
VIQ	Verbal Intelligence Quotient: WAIS-III composite score comprised of the core verbal and working memory subtests
WAIS-R	Wechsler Adult Intelligence Scale, Revised
WAIS-III	Wechsler Adult Intelligence Scale, Third Edition
WHO	World Health Organization
WISC-IV	Wechsler Intelligence Scale for Children, Fourth Edition
WMI	Working Memory Index: Wechsler intelligence scale index score comprised of core working memory subtests

CHAPTER I

INTRODUCTION

Leo Kanner first introduced the concept of autism in his 1943 description of 11 children who presented with a unique constellation of characteristics. His observations revealed that these children had profound impairments in social interaction and communication, as well as stereotyped and repetitive patterns of behavior (Kanner, 1943). While the children in Kanner's study represented a wide range of intellectual abilities, most were found to have significant cognitive deficits and delays in language development. In fact, it is currently acknowledged that approximately 75% of individuals with autism also present with Mental Retardation (MR). As a result, many have come to distinguish those individuals who have autism and intellectual functioning above the MR range with the term high-functioning autism (HFA). Since Kanner's seminal description of this unique population of individuals, research in the field of autism has exploded making it one of the most studied and best validated psychiatric disorders (Buitelaar, Van der Gaag, Klin, & Volkmar, 1999).

At the same time that Kanner was conducting his early research on autism, an Austrian physician by the name of Hans Asperger published a case study of four individuals who also presented with impairments in social interaction and repetitive behaviors much like those described by Kanner (Asperger, 1991, 1944; Wing, 1981). However, Asperger's group was different in that they were found to have average to above average intellectual abilities and, at times, precocious language development (Wing, 1981). Unfortunately, Asperger's work remained widely unknown to English-

speaking audiences until Lorna Wing (1981) first described his research and coined the term “Asperger’s Syndrome.”

In more recent years, much of the research on autism and Asperger Syndrome (AS) has focused on the similarities and differences between the two disorders and has resulted in a debate as to whether or not they are distinct disorders or simply different manifestations of the same disorder (e.g., Eisenmajer et al., 1996; Ghaziuddin & Mountain-Kimchi, 2004; Manjiviona & Prior, 1999; Mayes & Calhoun, 2004; Szatmari, Archer, Fisman, Streiner, & Wilson, 1995). Given this debate and the widespread agreement that these disorders appear to represent a continuum of features marked by social impairment, many researchers have come to use the term autism spectrum disorders (ASDs) to refer to individuals with either of these two conditions. The diagnosis of Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS) is also considered part of the autism spectrum. This debate has led to a surge of research on the characteristics and unique needs of those individuals who present with ASD and average to above average cognitive functioning. Gradually, a few investigators have begun to examine those individuals at the far end of the intellectual distribution—those with ASD and intellectual abilities in the gifted range. However, research on this population remains relatively scarce and is limited mainly to the field of gifted education.

Researchers within the field of gifted education have described the similarities between intellectually gifted individuals and those with ASD (Gallagher & Gallagher, 2002; Little, 2002; Lovecky, 2004; Neihart, 2000; Webb et al., 2005). These similarities include excellent memory abilities, precocious language development, early academic skills, asynchronous development, intense interests, social difficulties, and

hypersensitivity to sensory stimuli. The identification of these similarities has led to controversy and confusion regarding diagnosis. Some authors report that many gifted children are currently being misdiagnosed with a psychological disorder, including ASD, due to difficulties that are sometimes associated with giftedness, such as lack of similar peers and an understimulating academic environment (Lovecky; Webb et al.). They further report that gifted children are equally likely to be missed for diagnosis. These authors indicate that symptomology of psychological disorders may be misattributed to the "quirkiness" sometimes seen in gifted children. Other children are reportedly missed for diagnosis because their gifts allow them to compensate for or mask their disabilities, thus causing them to appear average overall (Huber, 2007; Little; McCoach, Kehle, Bray, & Siegle, 2001).

The field of gifted education has come to refer to individuals who evidence intellectual gifts as well as disabilities as "twice exceptional" (Assouline, Foley Nicpon, & Huber, 2006; Assouline, Foley Nicpon, & Doobay, 2009; Foley Nicpon, Assouline, Amend, & Schuler, in press; Little, 2001). Twice exceptional learners have unique needs—needs that are different from other gifted children or children with disabilities—that require appropriate evaluation and intervention to promote a productive academic career and healthy psychosocial adjustment. Research has demonstrated the importance of making an accurate diagnosis in order to provide suitable programs and services to meet children's needs in areas of giftedness and disability. Substantial empirical research has yet to be conducted on the specific twice exceptional population of children who are gifted and have ASD. Preliminary studies in this area have begun to highlight the characteristics and needs of gifted individuals with ASD (e.g., Assouline et al., 2006;

Gallagher & Gallagher, 2002; Little, 2001; Neihart, 2000), but further empirical research is greatly needed in order to develop a better understanding of this unique population with the hope of developing effective interventions.

Overview of the Present Study

The purpose of the present study is to provide an empirical account of the characteristics of gifted youth with ASD, characteristics of gifted youth without ASD, and comparisons between the two groups across domains of intellectual functioning, adaptive functioning, psychosocial/behavioral functioning, and social skills functioning utilizing a group study design. Chapter 1 includes a brief overview of the study, its purpose, and definitions. Chapter 2 is an extensive review of the literature on ASDs, including the characteristics of these disorders, their proposed etiologies, common comorbid conditions, and the current diagnostic controversy. This is followed by a review of the literature on intellectual functioning, psychosocial functioning, and adaptive behavior in the ASD population. A review of the literature on giftedness, focusing on the definition and common characteristics of individuals identified as gifted, as well as how these coincide with the characteristics of individuals with high functioning ASDs, is also provided. Finally, a review of the extant literature on twice exceptionality is presented with a specific focus on gifted individuals with ASD.

As noted above, there is currently little empirical research that has examined the characteristics of gifted individuals with ASD and how they differ from gifted individuals without ASD. A study by Huber (2007) provided comprehensive descriptions of the characteristics of ten gifted children with ASD across the domains of intellectual functioning, academic abilities, motor skills, developmental history, comorbid diagnoses,

educational histories, ASD symptomology, adaptive functioning, and psychosocial/behavioral functioning utilizing a multiple case study design. Assouline, Foley Nicpon, and Doobay (2009) compared two gifted girls—one with ASD and one without ASD—across the domains of intellectual functioning, academic abilities, neuropsychological functioning, ASD symptomology, adaptive functioning, and psychosocial behavioral functioning. A study by Foley Nicpon, Doobay, and Assouline (2010) examined the psychosocial functioning of gifted youth with ASD as measured by the Behavior Assessment System for Children, Second Edition. These three articles were important contributions to the current literature as the first to empirically address the characteristics of gifted children with ASD and how they compare to the characteristics of gifted children without ASD. However, the field is still lacking empirical investigation of these issues, particularly a comparison of gifted youth with and without ASD utilizing a group study design.

The current study was designed to address this gap in the literature. Study methods and results are described in detail in Chapters 3 and 4, respectively. Briefly, the inclusion of a comparison group of intellectually gifted children without ASD in the present study is believed to aid in defining crucial diagnostic elements of ASD within the gifted population. Finally, implications, limitations, and future directions are discussed in Chapter 5. The results of this investigation have significant implications for diagnosis of ASD in gifted populations in that they provide an empirical basis for the development of effective classroom interventions for this twice exceptional population in order to meet the unique needs associated with ASD and giftedness.

Definitions

Autism Spectrum Disorder (ASD): The term autism spectrum disorder describes a group of disorders that share similar characteristics including Autistic Disorder; Asperger Syndrome; and Pervasive Developmental Disorder, Not Otherwise Specified. The disorders subsumed under ASD are characterized by marked and enduring impairments in various aspects of social interaction, communication, play and imagination, and repetitive or restricted interests or behaviors.

Autistic Disorder: DSM-IV-TR diagnostic criteria (2000; see Appendix A) will be used to define Autistic Disorder, also referred to as autism.

Asperger's Disorder: DSM-IV-TR diagnostic criteria (2000; see Appendix A) are used to define Asperger's Disorder. The term Asperger Syndrome (AS) is used in this study to reflect the current terminology most commonly used in the research literature and in applied settings.

Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS): DSM-IV-TR diagnostic criteria (2000; see Appendix A) are used to define PDD-NOS.

Giftedness: For the purposes of this study, giftedness is defined as having an intelligence quotient (IQ) score in the *Very Superior* range (i.e., 130 and above) on an individually administered intelligence test. Participants between the ages of six and fifteen years were required to achieve a score of 130 or higher when calculated at the 95% confidence level for the Verbal Comprehension Index (VCI), the Perceptual Reasoning Index (PRI), or the General Ability Index (GAI) on the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV). Participants between the ages of 16 and 18 were required to achieve a score of 130 or higher when calculated at the 95%

confidence level for the Verbal Comprehension Index (VCI) or the Perceptual Organization Index (POI) on the Wechsler Adult Intelligence Scale, Third Edition (WAIS-III). The WAIS-III does not allow for the calculation of a GAI.

Defining giftedness in terms of IQ scores is consistent with both the autism and the gifted education literature (see Lovecky, 2004; McCoach et al., 2001). Within the autism literature, cognitive ability is almost exclusively discussed in terms of IQ scores, and cognitive functioning has been defined based on the degree of deviation from the mean. For example, the definition of mental retardation includes a measured IQ of two or more standard deviations below the mean. Similarly, the definition of giftedness in the present study includes a measured IQ of two or more standard deviations above the mean. Within the gifted education literature, the Marland Report (1972; see Appendix B) established a federal definition of giftedness that included intellectual ability in the top 3% to 5% as measured by intelligence tests. The National Association of Gifted Children (2008) further delineated the top 1% to 2% of the population as being "profoundly gifted." The present study uses the more conservative estimate of intellectual giftedness by including youth with measured IQ at the top 2% of the population.

Twice Exceptional: The National Association of Gifted Children (NAGC) uses the term twice exceptional to refer to individuals who are both intellectually gifted and have special learning needs due to difficulties associated with a Learning Disability, Attention-Deficit/Hyperactivity Disorder, or an Autism Spectrum Disorder (Assouline & Foley Nicpon, 2009).

CHAPTER II

REVIEW OF THE LITERATURE

Literature on Autism Spectrum Disorders

Autistic Disorder (AD), Asperger Syndrome (AS), and Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS) are pervasive developmental disorders that share similar diagnostic features. Many researchers have acknowledged that these disorders comprise a continuum referred to as autism spectrum disorders (ASDs). As a whole, the ASDs are characterized by "marked and enduring impairments" in various aspects of social interaction, communication, play and imagination, and repetitive or restricted interests or behaviors (Klin, McPartland, & Volkmar, 2005, p. 88). Each of the disorders comprising ASD will be discussed in detail below. Two additional disorders fall under the category of pervasive developmental disorders, Rett's Disorder and Childhood Disintegrative Disorder, but they are not subsumed under ASD and thus will not be discussed further.

Autistic Disorder

The condition known as Autistic Disorder, or commonly referred to as autism, was originally described by Kanner in 1943. Kanner observed the children in his study as each displaying an "extreme autistic aloneness" that appeared from birth or very early in life and generally closed them off from the outside world (Kanner, 1943, p. 242). He described them as "oblivious" to others, "aloof," "happiest when alone," "acting almost as if hypnotized," and "self-sufficient" (Kanner, 1943, p. 242). In essence, he portrayed these children as living entirely within their own shells and concluded that "intrusions" from the outside world were the cause of the problems reported by their parents, such as

tantruming, emotional oversensitivity, ritualistic behavior, communication difficulties, and even feeding problems (Kanner). Kanner named this disorder “early infantile autism” in order to characterize the severe social deficits present in individuals with this condition (Wing, 2005).

The term “autism” was actually borrowed from a Swiss psychiatrist, Eugen Bleuler, who first introduced the term in 1911 (Volkmar & Klin, 2005). This term was derived from the Greek word “autos” which means “self” (Merriam-Webster’s Collegiate Dictionary, 2003). While this term was originally used to describe the type of idiosyncratic, self-centered disturbance seen in schizophrenia, which can be viewed as a withdrawal of oneself from the reality of the social world, Kanner adopted this word to describe his population of socially impotent children (Volkmar & Klin; Wing, 2005). However, the presumption that autism was related to childhood schizophrenia remained for several decades (Wing).

Clinical Features

In addition to the fundamental impairment in social interaction described above, Kanner (1943) observed several other striking behavioral features in the participants of his study. These children reportedly ignored other people completely and were apparently uninterested in communication. When they did interact with others, they rarely looked at people’s faces and they often focused on parts of people rather than the person as a whole. For example, one child was noted to get mad at a doctor’s foot because it was on top of a desired object—he pushed the foot and was angry at it, but evidenced no realization that the foot belonged to the doctor (Kanner).

Kanner (1943) reported that all of the children either began to speak at an "unusual age" or did not acquire language abilities. In fact, some of the children were originally thought to be deaf. These children generally presented with delays in language acquisition, and they largely failed to use language for the purpose of communication. Kanner noted that their speech was oftentimes echolalic, both immediate and delayed. For example, one boy in the study reportedly said "don't throw the dog off the balcony" every day, which was something his mother had said to him years earlier about a toy dog (Kanner, 1943, p. 227). This statement had no communicative value. Another child was noted to only speak in phrases that had previously been spoken to him and he was recorded as saying "I'll give it to you" when he wanted the physician to give him a toy (Kanner, 1943, p. 237). In this case, the boy was repeating a statement he had heard previously while receiving a desired item. Other children responded to questions by repeating the question that was asked of them. Personal pronouns appeared to be particularly difficult for these children, with many of them making pronominal reversals and speaking of the self in second or third person. Kanner's participants had an equally difficult time with receptive language, which was characterized by a rigid literalness in the interpretation of the meaning of words and phrases. For example, one boy corrected his father for talking about pictures hanging "on" the wall because the boy's understanding of the word "on" meant "on top" which did not coincide with his father's meaning (Kanner, 1943, p. 239). Several of the children were also noted to be unable to comply with even simple demands.

Kanner described his participants as having an "anxiously obsessive desire for the maintenance of sameness" (Kanner, 1943, p. 245). These children became immensely

upset if any changes were made to their routines, the spatial arrangement of their immediate environment, or any other order to which they were accustomed. They preferred routine and repetition and were often noted to carry out rituals, such as counting or humming. As a result, they were also noted to be very limited in variety of spontaneous activity. Similarly, these children were frequently scared of loud noises and/or moving objects, which Kanner described as an "intrusion" to the child's aloneness (Kanner, 1943, p. 245).

Finally, Kanner (1943) had some interesting observations about the cognitive abilities of his participants. Several of the children had excellent rote memory abilities. Some of the children had been trained by their parents to recite lengthy poems or songs, titles and composers of classical music, botanic classifications, and so on. Despite their apparent language deficits, these children were able to remember and parrot this information years later. Kanner also commented that some of the children had exceptional vocabularies. Overall, Kanner took these abilities, in addition to their facial expressions—which to Kanner appeared intelligent—to mean that the children in his study had "good cognitive potential" and that perhaps their intellectual difficulties were motivational in nature (Kanner).

Since Kanner's original study, additional research on the features of autism has corroborated many of the characteristics reported by Kanner. A study by Prior and colleagues (1998) examined the developmental histories of individuals diagnosed with AD, AS, or PDD-NOS. The cluster of characteristics they found to be most associated with a majority of the AD sample included a lack of awareness of others, lack of greeting behavior, making embarrassing remarks in public, lack of reciprocal play, lack of

pointing to objects of interest, difficulty responding to instructions, echolalia, having overly literal understanding of language, oversensitivity to sensory experience, preferences for sameness of environment and routines, and a restricted pattern of interests (Prior et al., 1998).

Similarly, Szatmari and colleagues (1995) investigated how children with AD, AS, and PDD-NOS differed across the domains of adaptive behavior, communication, socialization, activities of daily living, and cognitive skills. Significant features of the AD group included a lack of social intentionality, social reciprocity, affection, friendship, and comfort-seeking behavior, as well as having abnormal greeting behavior and showing limited pleasure and excitement, social communication, social play, and imitation (Szatmari et al.). Children in the AD group were also noted to have unusual preoccupations, rituals, and resistance to change (Szatmari, et al.).

Wing and Gould (1979) conducted a large epidemiological study of children with symptoms of autism in England. Results of their study indicated consistent impairments in social interaction and communication and the presence of a narrow, repetitive range of activities or interests. They referred to this constellation of symptoms as the triad of impairments. Furthermore, they conceptualized social impairments in the following ways: (1) aloofness or indifference; (2) passive acceptance of social approaches from others; and (3) active-but-odd social approaches (Wing & Gould). Possible social impairments in children with HFA have been described to include failure to establish a joint attention on a topic of communication; failure to take into account a listener's feelings or social norms; and an exclusive reliance on limited conversation topics, verbal expressions, or repeating the words of another (Carter, Davis, Klin, & Volkmar, 2005).

In considering the characteristics reported in these studies, in combination with Kanner's original paper, there are consistent reports of social interaction deficits, impaired linguistic abilities, and a rigid preference for routines or repetitive behaviors. This pattern of impairments and behavior is mirrored in the diagnostic criteria for AD as delineated in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR; American Psychiatric Association [APA], 2000). The full criteria can be found in Appendix A and will be described in more detail under the subheading "Diagnostic Confusion."

Prevalence and Incidence Rates

Prevalence is defined as the proportion of individuals in a population who have a certain diagnosis at a specific point in time (Honda, Shimizu, Imai, & Nitto, 2005). Incidence refers to the number of new cases of a disorder that emerge during a specified period of time (Honda et al.). Finally, cumulative incidence is the number of new cases of a disorder that accumulate during a defined time period (Honda et al.). While it is important to monitor prevalence and incidence rates over time to determine whether population changes occur, this has proved to be relatively difficult for epidemiologists tracking ASDs. Currently, there is widespread disagreement about the incidence and prevalence of ASDs. This is largely related to methodological issues in epidemiological studies as well as difficulties with differentiating pervasive developmental disorder (PDD) diagnoses (Honda et al.). Best estimates of the prevalence of ASDs presently range from 36.4 per 10,000 to 60 per 10,000 (Fombonne, 2005); however, the Center for Disease Control recently reported the prevalence of ASDs to be as high as 1 in 110 children (Autism and Developmental Disabilities Monitoring Network, 2009). An

examination of prevalence estimates for AD alone range from 0.7 per 10,000 individuals to 72.6 per 10,000 individuals, with a median prevalence rate of 12.7 per 10,000 individuals from surveys conducted between 1994 and 2004 (Fombonne). The mean proportion of individuals with high-functioning autism (HFA), a term coined by DeMyer Hingten, and Jackson in 1981 to refer to individuals with autism and an intelligence quotient (IQ) greater than 70, was 29.6% (Attwood, 2003; Fombonne). The mean male to female ratio was 4.3 males to 1 female (Fombonne). However, this varied by intellectual level; the mean prevalence rate was 1.95 males to 1 female for individuals with moderate to severe MR and 5.5 males to 1 female in children with average intellectual functioning (Fombonne).

The mean cumulative incidence rate of AD over the course of 5 years was 27.2 per 10,000 individuals (Honda et al., 2005). This broke down into a cumulative incidence rate of 38.4 per 10,000 for males and 15.5 per 10,000 for females, or a male to female ratio of 2.5 males to 1 female. Approximately 25 percent of the sample was found to be high functioning. Again, the male to female ratio was found to increase as IQ increased, with a ratio of 2.3 males to 1 female for those with an IQ greater than 70 and 5.3 males to 1 female for IQ scores greater than 85.

Asperger Syndrome

In 1944, Hans Asperger, a pediatrician who was also interested in special education, published a case study on the unusual social, communicative, and behavioral characteristics of four children (Asperger, 1991; Klin, McPartland, et al., 2005). He named this disorder “autistic psychopathy” because he viewed the condition as a personality disorder with deficits in socialization as its defining feature (Klin,

McPartland, et al.; Wing, 1981). While he acknowledged that the features of his disorder were very similar to those described by Kanner, he strongly felt that the two were distinct (Wing). More specifically, he viewed Kanner's infantile autism as a psychotic disorder, while he, as mentioned above, felt that autistic psychopathy was a personality trait. Furthermore, Asperger believed that the disorder he described could not be recognized in infancy, and that its features usually did not become apparent until after the third year of life. He originally believed autistic psychopathy was exclusive to boys, but eventually revised his position to say that it is more common in boys, but can occur in girls as well (Wing).

Clinical Features

Asperger described the participants of his study as manifesting atypical development and behavior across a number of domains. Asperger stated that the most obvious characteristic of this disorder is the profound impairment in the ability to interact socially with others (Wing, 1981). He felt that they lacked the ability to understand and use socially appropriate rules of interaction, which seemed to come naturally to most kids. For example, they appeared awkward or inappropriate in their use of speech, gestures, posture, movement, eye contact, proximity to others during communication, and even in understanding appropriate dress for the context. By adolescence, many of these individuals appeared to become aware of their social ineptitudes and evidenced the desire to change, but did not possess the skills to do so. As a result, they became oversensitive to criticism and, at times, developed symptoms of depression or anxiety (Wing). Their understanding and demonstration of affect was also noted as atypical. Asperger described them as having poor empathy, a tendency to intellectualize their affective experiences,

and as lacking an intuitive understanding of the feelings of others (Klin, McPartland, et al., 2005).

In the area of language development, Asperger noted that most of the children acquired speech on time, often before learning to walk (Wing, 1981). He also noted that their grammar was appropriately developed and that they often acquired large vocabularies. However, they had difficulty with pronouns, at least at a young age, which was characterized by speaking of the self in second or third person (Wing). Pedantic speech, lengthy monologues on restricted topics of interest, one-sidedness, failing to convey a coherent message, repeating oneself, the use of neologisms (i.e., a fabricated word that only has meaning to the person who uses it), and difficulty with comprehension of subtle humor was also common characteristics of the children's speech (Klin, McPartland, et al., 2005; Wing). Nonverbal communication was also reported to be impaired (Wing). The children were noted to use very little facial expression except when they were experiencing strong emotions, such as anger. They were also described as having monotonous vocal intonation and absent or clumsy gestures. Comprehension of the nonverbal communication of others was reportedly lacking (Wing).

Asperger noted that his participants engaged in repetitive activities and were resistant to change (Wing, 1981). They tended to enjoy watching spinning objects more so than a typically developing child would, and they reportedly formed unusually strong attachments to inanimate objects or possessions. Asperger found these children to become unhappy when away from familiar environments (Wing). These children also developed egocentric preoccupations with unusual and circumscribed interests about which they spent a great deal of time and energy amassing facts and information to the

exclusion of other activities (Klin, McPartland, et al., 2005; Wing). Some of the focused interests reported in Asperger's sample included astronomy, history of steam engines, geology, genealogy of royalty, bus schedules, and prehistoric monsters (Wing). The children had the tendency to absorb every fact they could learn about their topic of interest and to discuss the interest at length. Sometimes their understanding in these areas appeared quite precocious as they were able to acquire vast amounts of knowledge in an area due to their excellent rote memory abilities (Wing).

Asperger's participants were also described as having a number of motor coordination difficulties. As mentioned above, he reported that many children were able to speak before they could walk, suggesting that gross motor development may have been somewhat delayed (Wing, 1981). In general, they were depicted as having clumsy gross motor movements, a lack of coordination, odd posture and gait, and poor body awareness (Klin, McPartland, et al., 2005; Wing). Some were noted to display stereotyped movements (Wing). Graphomotor difficulties, which led to school problems in writing tasks, were also reported as a common feature in this population (Wing). Asperger believed these characteristics to be continuous throughout the lifespan and as unchanged by environmental conditions or experience (Wing).

Despite Asperger's comprehensive account of this new disorder, and his familiarity with Kanner's work, his research did not become well-known in English-speaking countries until Lorna Wing published a summary and extension of his original paper in 1981 (Klin, McPartland, et al., 2005; Klin, Volkmar, et al., 2000). Wing also renamed the condition "Asperger's Syndrome" due to a concern that the term "psychopathy" might connote sociopathic behavior (Klin, McPartland, et al.). Wing

conducted her own research on a population of 34 children and adults with characteristics consistent with those described by Asperger, but she found some impairments in the early development of these individuals which did not coincide with Asperger's claim that symptoms were not present until after the third year of life (Volkmar & Klin, 2000; Wing). Consequently, she proposed the following modifications to Asperger's description of the disorder: development within the first couple years of life is significant for (1) lack of normal interest and pleasure in the company of other people which is usually present from birth; (2) babbling is impoverished in either quality or quantity; (3) lack of sharing of interest with others, such as through pointing; (4) lack of an intense drive for communication with others; (5) lack of imaginative play or development of only one or two restricted forms of repetitive play that is repeatedly enacted; and (6) despite good development of grammar and vocabulary, abnormal content of speech that may be impoverished in nature or consist mainly of parroted statements that were previously heard or read (Volkmar & Klin; Klin, McPartland, et al.; Wing). Wing disagreed with Asperger's speculation that these children frequently learned to talk before learning to walk (Volkmar & Klin; Wing). She also believed that the disorder could be associated with mild MR (Volkmar & Klin; Wing).

Much of the research published on AS since Wing introduced the concept to English-speaking audiences has focused on how the diagnosis relates to and differs from the diagnosis of autism. Eisenmajer and colleagues (1996) examined how clinicians made a differential diagnosis between AS and HFA by conducting regression analyses to determine which clinical features best predicted the diagnosis. Those individuals who received the diagnosis of AS were characterized as desiring friendship and as having the

ability to engage with others, but continued to display social impairments through the use of repetitive speech and questioning, lack of turn-taking in conversation, monotonous speech, long-windedness, and pedantic use of speech. They were described as having eye contact avoidance and echolalia, but to a lesser extent than seen in individuals with AD. Finally, the authors noted that individuals with AS evidenced a strong desire to collect facts consistent with their areas of interest (Eisenmajer et al.).

Additional studies have reiterated the desire for friendship (Prior et al., 1998), one-sided communication or lack of turn-taking (Prior et al.; Szatmari et al., 1995), and specialized interests or skills (Prior et al.; Szatmari et al.). Further examination of this population has included reports of sensory disturbance (Prior et al.), rigidity or inflexibility (Henderson, 2001; Prior et al.), and problems with pragmatics of conversation (Szatmari et al.). Henderson reported characteristics of this population as including behavior that is rule-governed, an amorphous sense of time, difficulty with expression and interpretation of social and emotional cues, problems with attention, problems with perspective taking, and overly literal thinking.

Klin, McPartland, et al. (2005) provided a comprehensive description of the clinical features associated with AS in a chapter of the *Handbook of Autism and Pervasive Developmental Disorders* (Volkmar, Paul, Klin, & Cohen, 2005). They reported that individuals with AS do not present with significant delays in the acquisition of language, cognitive development, or adaptive behavior. In contrast, early language acquisition may be precocious, but advanced vocabulary may be restricted to areas of special interest. Parents often report that, even early in life, speech is pedantic and overly formal in word choice, tone of voice, and phrasing. The social impairments associated

with AS are usually not evident during the early years within the home environment, but may become apparent when the child is expected to interact with same-age peers. In these situations, children with AS may approach others in awkward or inappropriate ways, and may, for example, speak too loudly or become upset when others do not want to play by their rules (Klin, McPartland, et al.).

The development of intense, highly focused interests usually begins during the preschool years (Klin, McPartland, et al., 2005). Oftentimes, children of this age become fascinated by numbers or letters which may lead to precocious reading abilities. Socially, children with AS are often described as socially isolated but not socially withdrawn; they desire friendships but often fail due to their inappropriate and eccentric patterns of relating to others, as well as their insensitivity for the feelings and intentions of others. These children are often unable to appropriately interpret and respond to affective expressions of others. Their rigid reliance on rules of behavior and social conventions, which corresponds with their inability to interact intuitively in social situations, leads them to appear socially naïve and insensitive (Klin, McPartland, et al.).

Klin, McPartland, et al. (2005) delineate 3 aspects of communication in individuals with AS that are of clinical interest. First, there is poor prosody in their speech and intonation patterns often do not match the communicative intention of the words. Abnormalities may also exist in the rate, fluency, and volume of speech. Second, speech may appear incoherent due to its tangential or circumstantial nature. Similarly, individuals with AS may fail to provide a context for their comments to the listener, change the topic without warning, and fail to suppress verbal expression of their internal dialogue. Third, the communication patterns of individuals with AS can be described as

verbose. They may talk at length about an area of interest, oblivious to the nonverbal communication of their listener who may be bored or may wish to interject a comment, and this monologue may never result in a point or conclusion (Klin, McPartland et al., 2005).

As described previously, individuals with AS become consumed with a specific topic of interest, about which they gain a great deal of information and enjoy regurgitating this information to others (Klin, McPartland, et al., 2005). Although they may gain knowledge through researching this area, this behavior often interferes with learning more generally because all of the child's attention and motivation is absorbed in his or her area of interest. Furthermore, it impedes their ability to participate in reciprocal interactions with others because their interest dominates the conversation (Klin, McPartland, et al.).

Klin, McPartland, et al. (2005) also acknowledged the motor difficulties originally described by Asperger. These difficulties may include a delay in attaining developmental milestones in the motor domain, such as riding a bike or catching a ball. They may also appear awkward and poorly coordinated in their gait patterns and posture. These motor impairments may also affect their handwriting skills as well as their visual-motor functioning (Klin, McPartland, et al.).

Overall, the available literature on AS presents a fairly consistent picture of the characteristics associated with AS. Similar to autism, individuals with AS evidence significant impairments in social functioning. Despite normal language acquisition and good vocabulary knowledge, they also present with unique difficulties in both expressive and receptive language. Finally, individuals with AS present with intense, restricted

interests which may impact their ability to learn as well as further interfere with their ability to relate with others. The DSM-IV-TR diagnostic criteria for AS, which can be found in Appendix A, require impairments in social interaction and evidence of restricted repetitive and stereotyped patterns of behavior (APA, 2000). However, there is no requirement for any type of language impairment (APA). In fact, the diagnostic criteria for AS specifically states that there shall not be a significant delay in language (i.e., single words by age 2, phrases by age 3), but this does not appear to capture the same type of linguistic or communicative impairments described above (APA). Finally, one aspect of the DSM-IV-TR criteria for AS that had been somewhat controversial is the requirement that a person does not meet the criteria for AD in order to receive the diagnosis of AS (APA). It has been argued that this requirement makes the diagnosis of AS nearly impossible, and the most children with AS meet the criteria of AD at some point in their life (Eisenmajer et al., 1996; Klin, Pauls, Schultz, & Volkmar., 2005; Prior et al., 1998).

Prevalence Rates

The prevalence rate for all non-autistic PDDs (i.e., AS & PDD-NOS) is estimated at 20.8 per 10,000 individuals (Fombonne, 2005). While very little epidemiological research has been conducted on AS to date, partially due to the lack of consensus in diagnosis, the estimated prevalence ranges from 0.6 per 10,000 individuals to 48.4 per 10,000 individuals (Klin, McPartland, et al., 2005). Fombonne reported that the current extrapolated prevalence rate is 4.3 per 10,000 individuals. Again, little research has examined the male to female ratio in AS, but a tentative estimate of 9 to 10 males per 1 female exists (Gillberg, 1989). However, Kopp and Gillberg (1992) posited that this is an

underestimate of the number of females with AS or HFA due to the lack of recognition of these disorders in girls. They propose that girls with AS or HFA may present a different phenotype of the disorder than boys, with the characteristic awkward social skills marked by "clinginess" and imitation as opposed to aloofness, an inability to read and understand facial expressions, a tendency to treat people as objects, and a relative lack of aggressive behavior in comparison with boys with AS or HFA (Kopp & Gillberg). In their study, they found that girls who clearly met the criteria for ASD, albeit presented somewhat differently from boys, repeatedly failed to receive a diagnosis from trained clinicians and, consequently, were older upon finally receiving the diagnosis (Kopp & Gillberg).

Pervasive Developmental Disorder, Not Otherwise Specified

Pervasive Developmental Disorder, not otherwise specified (PDD-NOS) is not a specific diagnosis, but rather a diagnostic category for individuals who demonstrate significant impairments in social interaction such as those seen in AD and AS, but do not meet the restrictive criteria for either of those diagnoses either due to severity or scope of symptomology (Towbin, 2005). In general, this diagnosis should be viewed as conceptual in nature (Towbin). Overall, this category is poorly defined, extremely heterogeneous, and has received scant research attention (Klin, Volkmar, & Sparrow, 2000).

Clinical Features

As stated, individuals with the diagnosis of PDD-NOS exhibit social difficulties similar to those seen in AD or AS (Towbin, 2005). They may also demonstrate various impairments in communication, emotional regulation, cognitive abilities, and may demonstrate restricted repetitive and stereotyped interests and behaviors (Klin, Volkmar, et al., 2000; Towbin). However, they do not meet the full criteria for AS or AD either

because of an atypical, complex, or less severe presentation of symptoms (Towbin). These deficits are apparent within the first few years of life (Towbin).

One study specifically examined the characteristics of individuals diagnosed with PDD-NOS and how they differ from those diagnosed with AD, AS, and non-PDD conditions. Buitelaar and colleagues (1999) lamented that this "catch-all" category is being overused by clinicians who are unsure how to classify children with mild social deficits, and suggested that it may be diagnosed more frequently that AD. In order to gain a better understanding of the use of this diagnostic category, they re-analyzed the data from the DSM-IV field trial for AD. The sample included a total of 977 individuals: 205 with AD, 80 with PDD-NOS, 174 with other PDDs, and 80 with language disorders. Results of this study confirmed previous claims that the category of PDD-NOS appears to be a less severe variant of AD, with impairments in social interaction as the primary concern. It was also found to be an extremely heterogeneous category. Eighty percent of individuals with PDD-NOS evidenced onset of the disorder prior to age 3. Fewer individuals with PDD-NOS had impairments in communication than those diagnosed with AD. Buitelaar et al. described the prototypical individual with PDD-NOS as presenting with early onset of impairments in social interaction or atypical language development and continuing to evidence problems with social relationships into childhood. In Prior et al.'s (1998) cluster analysis of PDD subtypes, they confirmed that those individuals who received the diagnosis of PDD-NOS were generally less impaired than those diagnosed with AD or AS.

Overall, the little research that has examined the characteristics of individuals diagnosed with PDD-NOS supports that it is a heterogeneous category for individuals

presenting with social impairments, and possibly other symptoms of AD or AS, but who fail to meet the more restrictive criteria of these disorders either in severity or scope. This conclusion is generally consistent with the DSM-IV-TR criteria for this disorder (see Appendix A), which requires significant impairments in reciprocal social interaction and either impairment in communication or the presence of stereotyped behaviors or interests (APA, 2000).

Prevalence Rates

As reported previously, the prevalence of PDD-NOS is currently believed to be higher than that of AD (Buitelaar et al., 1999; Towbin, 2005). A conservative estimate for the prevalence of PDD-NOS is 15 per 10,000 individuals (Towbin). No information regarding incidence rates or sex ratios was found.

Etiology of Autism Spectrum Disorders

Currently, there is no known, unitary cause for autism or autism spectrum disorders (Tsatsanis, 2005). Kanner believed that autism was an inborn disorder in which children were innately lacking in motivation for social interaction (Volkmar & Klin, 2005). He did not believe that environmental or parenting factors influenced the development of this disorder (Volkmar & Klin). Asperger concurred with this view and added that the development of AS was not related to social class or level of education (Wing, 1981). While some theorists in the mid-twentieth century proposed a connection between cold parent-child relationships and autism (e.g., Bettelheim, 1967), current research supports the early position made by Kanner and Asperger that biology, not parenting, is the major determinant for the disorder (Volkmar & Klin). Research also indicates that ASD is unrelated to social class, as posited by Asperger, nor is it related to

race or immigrant status (Fombonne, 2005). Family studies strongly support the presence of a genetic predisposition to ASD and related features (Folstein & Santangelo, 2000). Furthermore, neurofunctional models of ASD are currently exploring the role of amygdala and thalamus in the development of the disorder (Schulz, Romanski, & Tsatsanis, 2000).

Genetic Transmission

Research into the patterns of inheritance of ASDs indicates that these disorders cluster together and share a common biological etiology (Folstein & Santangelo, 2000). Early research into the heritability of autism and ASDs found that the family members of an individual with ASD not only had a higher likelihood of being diagnosed with ASD, but also tended to have multiple family members who had milder autism-like syndromes (Folstein & Santangelo). This phenomenon came to be known as a the broader autism phenotype (BAP) and included traits such as preference for solitary activities, having few friends, rigidity, a strong preference for sameness, resistance to change, abnormalities in social communication, and executive functioning deficits (Folstein & Santangelo). BAP features are found much more commonly in the parents and siblings of individuals with ASD than in the general population (Folstein & Santangelo). Similarly, the descriptions Kanner (1943) provided for the parents of his participants are consistent with the BAP hypothesis. Several of the parents, especially fathers, were noted to be obsessive in nature, somewhat socially withdrawn or isolated, and emotionally sensitive or anxious, and some had atypical language development (Kanner). He described the father of one of his participants as resembling the child “physically,” “meticulous,” “hard-working,” and noted that, “when he walks down the street, he is so absorbed in thinking that he sees

nothing and nobody and cannot remember anything about the walk" (Kanner, 1943, pp. 218-219). Asperger also remarked on the apparent familial transmission of the disorder, and reported that ASD traits were found in the parents or relative of nearly each case of AS he had seen (Klin, McPartland, et al., 2005).

Folstein and Santangelo (2000) propose a genetic link between ASD and BAP. They estimate the prevalence of ASDs and BAP should increase in families of individuals with ASD, with a proposed rate of 4 per 10,000 individuals for AD, 4 in 1,000 individuals for AS, and 4 in 100 individuals for BAP. A large study by Volkmar, Klin, and Pauls (1998) found that 14% of fathers, 4% of mothers, and 3.5% of siblings of children with ASD were diagnosed with AD or AS, while a much larger proportion of first-degree family members (46%) displayed characteristics of BAP. They suggested that this provided evidence for the genetic link between ASD subtypes and BAP (Volkmar et al., 1998).

Conclusion

Researchers generally agree that ASDs and broader patterns of milder variants of ASD symptomology aggregate in families. ASD clearly contains a heritable component, which has been well documented since Kanner's and Asperger's original studies. However, the manner of genetic transmission of ASD is still largely unknown. Current experts in this area believe the heritable component to be complex, involving multiple gene interactions (Folstein & Santangelo, 2000). Continued research in this area will hopefully provide helpful insights into the etiology and nature of ASDs.

Disagreement in the Diagnosis of Autism Spectrum Disorders

Currently, one of the most heated debates in the ASD literature relates to differential diagnosis between ASD subtypes. Since 1980, when the diagnosis of autism was first formally included in the Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM-III; APA), there has been a considerable amount of confusion about ASD diagnostic labels. Since that time, researchers and clinicians have been faced with ever-changing diagnostic labels and criteria. This has led to significant problems with regard to research on ASD since studies cannot be compared across times due to the inclusion of different diagnostic concepts and criteria. Clinicians have also struggled to keep up with the frequent changes to the diagnostic system, which has resulted in the adoption of various, inconsistent methods of differential diagnosis within the field. This confusion has a negative impact on the families of children with ASD who are receiving multiple diagnoses depending on the training and discipline of the clinician and finding inconsistent information when trying to learn more about their diagnosis. This confusion is compounded by the current disagreement among researchers as to the validity of the present diagnostic criteria and whether ASD subtypes exist or simply represent mild variations within the same disorder. One solution that is being employed by some researchers is to bypass this debate altogether by conducting research on ASD as a whole rather than differentiating into the various subtypes. This has proved to be an acceptable approach in the field given the widespread agreement that these disorders are more similar than different and appear to represent a continuum of impairments in social, communicative, and behavioral functioning (e.g., Foley Nicpon, Assouline, Amend, & Schuler, in press; Huber, 2007; Klin, McPartland, et al., 2005; Kuschner, Bennetto, &

Yost, 2007; Loveland & Tunali-Kotoski, 2005; Prior et al., 1998; Sturm, Fernell, & Gillberg, 2004; Wing, 2005; Woodbury-Smith, Klin, & Volkmar, 2005).

Progression of DSM

Major themes in the conceptualization of autism as a diagnostic concept are reflected in the revisions of the DSM (published by APA), which provides the guiding principles for making diagnostic decisions for clinicians and researchers in the fields of psychology and psychiatry. Autism did not achieve official recognition as a distinct disorder, unrelated to childhood schizophrenia, until the publication of the third edition of the DSM in 1980 (Volkmar & Klin, 2005). Research on autism since that time has led to changes in the diagnostic entity with each major revision of the DSM. These revisions have attempted to address major challenges in the diagnosis of autism including whether to specify age of onset, changes in symptoms presentation across developmental stages and cognitive abilities, and classification of atypical or milder cases of the disorder (Huber, 2007).

DSM-III. The DSM-III (APA, 1980) first introduced the term "Pervasive Developmental Disorder" as a general category. This category included the diagnoses of infantile autism, residual infantile autism, childhood onset pervasive developmental disorder (COPDD), and residual COPDD. Infantile autism was described as having an onset prior to 30 months of age, whereas COPDD had onset after 30 months of age. The use of onset criteria for differential diagnosis was not supported by research (Huber, 2007). The diagnostic criteria for both disorders included: (1) social impairment, (2) language impairment, (3) resistance to change or unusual attachment to objects; and (4) absence of symptoms of schizophrenia (Wing, 2005). Descriptions provided by the DSM-

III did not address developmental variation in the disorder. Furthermore, the use of the term “infantile” gave the impression that this disorder was restricted to chronologically or developmentally young individuals. The residual diagnoses were used to denote the current lack of symptomology in children who at one time met the criteria for infantile autism or COPDD, further suggesting that autism was a condition seen in only very young children. The diagnosis of “atypical PDD” was also created for use with children who demonstrated a subthreshold presentation of infantile autism or COPDD.

DSM-III-R. The publication of the revised edition of the DSM-III (DSM-III-R; APA, 1987) included significant changes to the diagnostic criteria for autism. In order to replace the view that autism could only be diagnosed in very young children with the new understanding that it can occur at all ages, as well as to emphasize current clinical presentation in diagnostic decision-making, the authors of the DSM-III-R removed the residual diagnostic categories and replaced the name “infantile autism” with “autistic disorder” (Huber, 2007). Additionally, the age of onset criteria were dropped from the diagnostic criteria, while the other three major domains of dysfunction were maintained in this version. Other changes included elimination of the COPDD category and, in accordance with the DSM convention of attaching “not otherwise specified” to a disorder to denote atypical or subthreshold cases of the disorder, the diagnosis of Pervasive-Developmental Disorder, Not Otherwise Specified was created. The DSM-III-R further facilitated improved understanding and accurate diagnosis of this disorder by including a broader conceptualization of autism. More specifically, 16 criteria were described, of which the child needed to meet 8 (with a specified distribution across the three areas if dysfunction) in order to receive the diagnoses, and specific examples of each criterion

were provided. Unfortunately, this broader definition led to overdiagnosis of autism in individuals with low cognitive ability and underdiagnosis in individuals with higher cognitive functioning (Volkmar & Klin, 2005).

DSM-IV. Extensive research, literature review, and field trials were conducted prior to the publication of the fourth edition of the DSM (DSM-IV; APA, 1994) in order to ensure the diagnostic criteria were grounded in empirical findings. As a result of this research, which found that the age of onset criteria significantly improved the specificity and sensitivity of the diagnosis, specification of symptoms being present prior to 36 months of age were included in the diagnostic criteria of AD (Volkmar & Klin, 2005). Research also indicated that giving greater emphasis to social impairment (over communication impairment and restricted repetitive behaviors) reduced the overdiagnosis of individuals with low cognitive abilities, thus the modified criteria required the individual to meet 6 criteria for autism: 2 criteria related to social impairment, 1 criterion related to communication impairments, and 1 criterion related to restricted interests or repetitive behaviors (Volkmar & Klin).

The biggest change in the DSM-IV in relation to ASDs was the inclusion of a new diagnosis, “Asperger’s Disorder,” (also referred to as “Asperger Syndrome” [AS]) under the PDD category. This change occurred following Lorna Wing’s introduction of Hans Asperger’s research to English-speaking nations in 1981. The diagnostic criteria provided by the DSM-IV for AS required the individual to meet two (of four) criteria for social impairment, one (of four) criterion for restricted repetitive or stereotyped interests or behaviors, and required the absence of significant delays in language or cognitive development. Atypical cases of AS (or AD) were to be given the diagnosis of PDD-NOS.

Table 2.1

Progression of the DSM

DSM Edition	Year	Diagnoses
DSM-III	1980	Infantile Autism (onset before 30 months)
		Residual Infantile Autism (no longer meet criteria)
		Childhood Onset PDD (onset after 30 months)
		Residual Childhood Onset PDD (no longer meet criteria)
DSM-III-R	1987	Autistic Disorder (replaced Infantile Autism)
		PDD-NOS (replaced Childhood Onset PDD)
DSM-IV	1994	Autistic Disorder (onset before 36 months)
		Asperger's Disorder (no delays in language or cognition)
		PDD-NOS
DSM-IV-TR	2000	Autistic Disorder (expanded definition)
		Asperger's Disorder (expanded definition)
		PDD NOS (required social deficits)
DSM-V	2013	Autism Spectrum Disorder (replaces previous diagnoses)

DSM-IV-TR. The diagnostic criteria for ASDs in the text revision of the DSM-IV (DSM-IV-TR; APA, 2000) were largely unchanged from the previous edition. In an attempt clarify the differential diagnosis of AD and AS, the description of the disorder was significantly expanded. The actual diagnostic criteria were not changed for either disorder. The description of PDD-NOS was also revised in order to require the presence of significant deficits in reciprocal social interaction in addition to either deficits in

communication or the presence of stereotyped behaviors or interests. Previous criteria for PDD-NOS only required significant impairments in 1 of the 3 domains, so this revision served to make impairments in social interaction the defining feature of each of the 3 disorders described above.

DSM-V. Authors of the DSM-V, which is expected to be published in 2013, are proposing major changes in the diagnosis of ASD (APA, 2010b). Similar to the strategy currently employed by many researchers, the authors of the DSM-V propose simplifying the category into one diagnostic label of Autism Spectrum Disorder rather than continuing with the individual diagnoses of Autistic Disorder, Asperger Disorder, and Pervasive Developmental Disorder Not Otherwise Specified (APA, 2010a). Rationale for these proposed changes includes current evidence that ASD is distinct from typical development and nonspectrum disorders, but that distinctions between individual diagnoses subsumed under ASD have been inconsistent and variable over time. Further, the authors posit that because autism is defined by a common set of behaviors, it is best classified under a single diagnosis with specifiers to indicate severity, verbal ability, associated features, etc. Under the proposed criteria for ASD, diagnosis would require an individual to meet 3 (of 3) criteria related to deficits in social communication and social interaction; 2 (of 3) criteria related to restricted, repetitive patterns of behavior, interests, and activities; and symptoms must be present in early childhood (APA, 2010a). Therefore, in addition to combining the existing ASD diagnoses into one diagnosis, the proposed changes would also combine the previous categories of deficits in communication and deficits in social interaction into one criterion. The authors also

explain that communication and social behavior cannot reliably be separated and deficits in language development are neither universal nor unique to ASDs (APA, 2010a).

Methods of Differential Diagnosis

Current confusion about differential diagnosis between the 3 subtypes of ASD has led some researchers and clinicians to develop their own criteria. Four major approaches will be discussed. These include the DSM/Language development approach, the cognitive abilities profile approach, the prototypical symptoms approach, and the spectrum approach.

DSM/Language development approach. Examination of the current DSM criteria suggests that the major distinction between AS and AD is the onset of the disorder. For children without cognitive delays (i.e., HFA and AS), language development appears to be the major criterion on which to base the diagnosis. As a result, the first, and perhaps most widely used approach to differential diagnosis is the DSM/Language development approach. Using this method, individuals who have typical language development (i.e., single words by age 2, meaningful phrases by age 3) receive the diagnosis of AS, while those who demonstrate a delay in language acquisition are diagnosed with AD (Klin, Pauls, et al., 2005). However, since a significant delay in language is not required for the diagnosis of AD (lack of make-believe or imitative play could meet the communication impairment criteria), this approach cannot always differentiate between HFA and AS (APA, 2000; Klin, Pauls, et al.).

Cognitive profile approach. The cognitive profile approach can be divided into two subsystems of differential diagnosis: overall cognitive abilities and pattern of verbal versus nonverbal abilities. In the first approach, differential diagnosis is based on whether

the individual has intellectual functioning above or below the MR range. Because some individuals view AS as essentially autism with average to above average intellectual abilities, choosing to diagnose AS over AD may be based solely on and IQ score greater than 70. Consequently, individuals who have features of ASD but an IQ less than 70 would receive the diagnosis of AD. This approach is certainly inaccurate given that substantial research, including Kanner's original paper, demonstrates that AD can exist across the full continuum of intellectual abilities (Kanner, 1943; Volkmar & Klin, 2005).

Another common method for differential diagnosis suggests that differential diagnosis can be made through examination of one's cognitive or neuropsychological profile with special attention given to the differences between the individual's verbal and nonverbal or performance abilities (Huber, 2007; Klin, Pauls, et al., 2005). Some authors have argued that individuals with AS demonstrate a specific cognitive profile significant for relative strengths in verbal skills in combination with relative deficits in nonverbal skills such as those seen in individuals with nonverbal learning disorder (NLD), while the reverse pattern is proposed for individuals with AD (e.g., Ehlers et al., 1997; Ghaziuddin & Mountain-Kimchi, 2004; Klin, Volkmar, Sparrow, Cicchetti, & Rourke, 1995; Kuschner et al., 2007; Lincoln, Courchesne, Kilman, Elmasian, & Allen, 1988; Volkmar & Klin, 2005). Other researchers have argued that these cognitive profile patterns have not been found consistently, individuals with AS or AD can show relative strengths in either the verbal or nonverbal domain, and individuals with AS or AD can demonstrate equal cognitive profiles (e.g., Barnhill, Hagiwara, Myles, & Simpson, 2000; Huber, 2007; Miller & Ozonoff, 2000; Siegel, Minshew, & Goldstein, 1996; Szatmari, Tuff, Finlayson, & Bartolucci, 1990). The cognitive profile approach has not been found to differentiate

between AS and PDD-NOS (Klin, Pauls, et al., 2005). Overall, there is significant disagreement regarding the "typical" cognitive profile in AS and AD, or even if one exists. It appears that differential diagnoses should not be made based on this approach until a consensus is reached.

Prototypical symptoms approach. The prototypical symptoms approach uses differences in the descriptions of individuals with AS versus AD as criteria for differential diagnosis. Klin, Pauls, and colleagues (2005) examined the narrative text in the DSM-IV-TR (APA, 2000) and the International Classification of Diseases, 10th Edition (ICD-10; World Health Organization [WHO], 1992) that accompany the diagnostic criteria for AS and AD for specific features that would distinguish the two disorders. For example, they made distinctions between children who isolate themselves (AD) versus those who seek out others but in a socially inappropriate manner (AS); and also between those whose language was delayed or echolalic (AD) and those whose language development was either adequate or precocious but may have had difficulties in the communicative use of language (AS; Klin, Pauls, et al., 2005). They also included within their diagnostic system for AS the requirements for one-sided verbosity and presence of factual, circumscribed interests that impede the ability to learn and engage in reciprocal social conversation. The authors concluded that this approach to differential diagnosis provided the most appropriate distribution of individuals with AD, AS, and PDD-NOS (Klin, Pauls, et al., 2005). While this may indicate a potential means for differential diagnosis, others have argued that these minor differences in presentation provide evidence for the spectrum approach (Leekem, Libby, Wing, Gould, & Gillberg, 2000).

Spectrum approach. Given the current confusion and difficulties regarding differential diagnosis for this group of very similar disorders, many researchers have decided that differential diagnosis may not be appropriate. Instead, these individuals have come to view autism as a disorder that that occurs along a continuum of severity, with various levels of social, behavioral, and cognitive impairments (e.g., Leekam et al., 2000; Prior et al., 1998). In this view, the social impairments and behavioral problems associated with autism, HFA, and AS are considered to be of the same general nature, but they are seen as varying in degree of severity across developmental and cognitive abilities. For example, it has been suggested that differentiating individuals with lower cognitive abilities versus higher cognitive abilities is redundant because those who meet criteria for MR should receive the diagnosis of MR as a comorbid disorder (Volkmar & Klin, 2005). The spectrum approach is consistent with the overlap in DSM-IV-TR diagnostic criteria for these disorders. Proponents of this approach use the term "autism spectrum disorder" to describe the family of diagnoses which lie along this continuum: autism, high-functioning autism, Asperger Syndrome, and PDD-NOS. Overall, autism spectrum disorders are characterized by an enduring pattern of significant impairments within the domains of social interaction, play and imagination, and a restricted range of behaviors and interests that exist along a continuum of severity depending on cognitive functioning (Klin, McPartland, et al., 2005).

Conclusion

Researchers and clinicians have been creative in response to the confusion and disagreement regarding differential diagnostic criteria for ASDs. This has resulted in the use of several different approaches to differential diagnosis which, according to research,

will lead to very different diagnostic conclusions (Klin, Pauls, et al., 2005). Therefore, clinicians and researchers appear justified in using the autism spectrum approach to conceptualize impairments and develop interventions for individuals presenting with ASD.

Assessment of Autism Spectrum Disorders

One area in which researchers in the field of ASD agree is in the importance of conducting comprehensive assessments as the basis for diagnostic decisions, although this may not yet be common practice among clinicians (e.g., Barnhill, Hagiwara, Myles, & Simpson, 2000; Klin, McPartland, et al., 2005; Klin, Sparrow, Marans, Carter, & Volkmar, 2000; Siegel, et al., 1996). Research suggests that comprehensive evaluations of ASD should include a thorough developmental and medical history, family history, previous evaluations, psychological evaluation (intellectual functioning, neuropsychological functioning, academic achievement, adaptive functioning, assessment of personality/behavioral concerns, etc.), assessment of communication abilities, and consideration of differential diagnoses (Assouline, Foley Nicpon, & Doobay, 2009; Klin, McPartland, et al.; Klin, Sparrow, et al.). Assessment of diagnostic symptomology associated with ASD, such as through the Autism Diagnostic Interview-Revised (ADI-R; Rutter, Le Couteur, & Lord, 2003) and the Autism Diagnostic Observation Scale (ADOS; Lord, Rutter, DiLavore, & Risi, 2003) as well as assessment of Adaptive Functioning, such as through the Vineland Adaptive Behavior Scales, Second edition (Vineland-II; Sparrow, Cicchetti, & Balla, 2005) has proven especially important in accurate diagnosis (Assouline et al.; Huber, 2007; Tomanik, Pearson, Loveland, Lane, & Shaw, 2007). While intellectual functioning is also important to assess in order to gain a

comprehensive picture of an individual's level of functioning and prognosis, preliminary research suggests that intellectual profiles may not differentiate individuals with and without ASDs (Assouline et al.; Barnhill, Hagiwara, Myles, & Simpson, 2000). In summary, the importance of completing a comprehensive evaluation for diagnoses of ASD has been well-documented and should be implemented in clinical practice.

Intellectual Functioning in Autism Spectrum Disorders

Significant research has been conducted on the intellectual functioning in ASD populations. The focus of these studies has varied over time, with early studies examining "savant" abilities or "splinter" skills in individuals with otherwise low cognitive functioning. More recently, as interest in higher functioning ASD populations has increased, research on intellectual functioning has focused on cognitive differences between ASD subtypes. Research has also begun to examine general areas of cognitive strength and weakness both within and across ASD subtypes. One area of research within ASD populations that has been seriously neglected is the functioning of intellectually gifted individuals with ASD. Several studies have included individuals with cognitive abilities within the gifted range, but research that has examined this special population in isolation is extremely scarce.

Early Views

Despite Kanner's original position that individuals with autism appeared cognitively able and his attribution of their uneven cognitive profiles to motivational problems, most early researchers in autism believed it to be associated with MR. It is now widely accepted that approximately 75% of individuals with autism do have associated cognitive deficits and overall intellectual functioning within the MR range (e.g., Lincoln

et al., 1988). Since most individuals with autism were viewed as having significant cognitive disabilities, descriptions of individuals with autism who had exceptional, highly specialized skills were well documented and highly publicized. The term “savant” has been used to describe those individuals who demonstrate a marked difference between their general intellectual abilities and a specific area of advanced skill (Huber, 2007). Bölte and Poutska (2004) described savant syndrome as “a phenomenon of grave cognitive, mental, or sensory disability paired with an outstanding capacity in a circumscribed domain of intellectual or artistic function” (p. 121). The term savant has also been used to describe splinter skills which are intra-individual strengths that represent a specific area of average functioning in relation to overall low cognitive abilities (Huber). While prevalence studies of savant abilities in autism have not been conducted to date, Treffert (2000) estimated that 1 in 10 individuals with autism may present with some degree of savant ability.

Interestingly, research on savant abilities was the first link between the fields of autism and giftedness. Some researchers have examined savant syndrome in an attempt to gain a better understanding of talent development. Miller (2005) proposed that comparing savant abilities to special skills in non-impaired individuals could be used to deconstruct exceptional skills and elucidate factors that could be used for talent development purposes. While Miller’s research found some similarities between the skills used by individuals with savant syndrome and those with special skills but unimpaired cognitive abilities, the overall conclusion was that skill expression in individuals with savant syndrome is generally idiosyncratic.

Intellectual Profiles

The field of ASD typically uses achieved IQ on the most recent edition of the Wechsler Scales as the operational definition of intelligence (Huber, 2007; Wechsler, 2003). This approach is well-accepted in the field, as is evidenced by the following statement from Klin, Saulnier, Tsatsanis, and Volkmar (2005):

> Among the various intelligence batteries currently in use, the age-proven Wechsler scales . . . provide the standards for the testing of intelligence in terms of psychometric properties, standardization procedures, and extent of research. Whenever possible, these batteries should be used because they provide valid measures across a large number of relevant constructs and yield profiles that can be readily transferred into intervention objectives. The Wechsler scales' division into various factor scores can be particularly helpful in the interpretation of profiles of children with ASD given the typical performance scatter found in these children's protocols. (p. 788)

Much of the research on intelligence in ASD examines the Full Scale Intelligence Quotient (FSIQ) as well as the Verbal Intelligence Quotient (VIQ) and Performance Intelligence Quotient (PIQ) from the Wechsler Scales (e.g., Barnhill, Hagiwara, Myles, & Simpson, 2000; Lincoln et al., 1988; Mayes & Calhoun, 2003b, 2004; Ozonoff, South, & Miller, 2000; Strum, Fernell, & Gillberg, 2004). The use of intelligence testing in autism research has demonstrated that a majority of individuals with this diagnosis present with varying levels of mental retardation (Volkmar & Klin, 2005). However, this research has also confirmed Kanner's (1943) early hypothesis that intellectual functioning in individuals with ASD spans across the full range, from profound mental retardation to very superior abilities (Tsatsanis, 2005). As a result, researchers within this field adopted the term high-functioning autism (HFA) to describe individuals with *relatively* higher intellectual functioning, which is usually defined as IQ > 70 in most research (Tsatsanis). Similarly, low-functioning autism (LFA) refers to individuals with ASD and IQ < 70

(Tsatsanis). In other words, HFA is distinguished from LFA solely by the lack of concurrent cognitive delays.

Significant research into the cognitive profiles of individuals with ASD has also resulted from the hypothesis that these profiles can differentiate AS from HFA. An extensive history of the research on cognitive profiles in autism (including FSIQ, VIQ, PIQ, and subtest profiles) can be found in Lincoln, Allen, and Kilman (1995). In general, early research on cognitive profiles in autism indicated relative strengths in nonverbal abilities over verbal abilities (i.e., PIQ > VIQ), which appears consistent with the developmental delays in language acquisition and development seen in autism (Huber, 2007; Lincoln et al., 1995). Lincoln and colleagues (1988) examined WISC-R intellectual profiles in children between the ages of 8 and 12 who were diagnosed with autism (N = 13), receptive developmental dysphasia (n = 12), oppositional defiant disorder (n = 10), and dysthymia (n = 12). Results of this study indicated significant relative deficits in VIQ in comparison to PIQ for the autism group, with a mean PIQ – VIQ difference of approximately 24 points. This pattern of performance was not found in the remaining 3 clinical samples, and thus was believed to be specific to the diagnosis of autism. However, the mean FSIQ for the autism sample was 68.53, which does not generally meet the cutoff score for HFA. More recent research has suggested that while the PIQ > VIQ pattern may hold true for younger and lower functioning children with autism, which generally consists of children with very significant language impairments, this profile may not be consistent with older and higher functioning individuals with autism (Ghaziuddin & Mountain-Kimchi, 2004; Mayes & Calhoun, 2003a, 2003b, 2004; Siegel et al., 1996).

Siegel and colleagues (1996) examined WISC-R and WAIS-R profiles in 81 individuals diagnosed with HFA (FSIQ and VIQ > 70); individuals meeting criteria for AS were excluded from this study. Mean FSIQ for the children with HFA (N = 45) was 96.02, with FSIQ scores ranging from 72 to 131 and VIQ ranging from 72 to 136. Mean FSIQ for the adults with HFA (N = 36) was 91.69, with FSIQ scores ranging from 70-136 and VIQ ranging from 70-148. Therefore, a wide range of intellectual functioning in HFA participants was reported. Overall, results indicated no differences in mean FSIQ, VIQ, or PIQ for either the adult or child sample. In fact, there was a slight, but non-significant trend for VIQ to be greater than PIQ in the adult HFA sample. The authors suggested that the lack of difference between verbal and nonverbal abilities in their sample may be a result of the overall level of cognitive functioning in their group (i.e., HFA) and that the "prototypical" PIQ > VIQ pattern may be exclusive to lower functioning individuals with autism (Siegel et al.).

Within the AS literature, some researchers have posited that individuals with AS show a very specific cognitive profile with relative strengths in verbal over nonverbal abilities (i.e., Ehlers et al., 1997; Ghaziuddin & Mountain-Kimchi, 2004; Klin et al., 1995; Kuschner et al., 2007; Ozonoff et al., 2000). While Asperger (1944) did not report on cognitive profiles in his original paper, Wing's (1981) description of Asperger's work included 6 vignettes of individuals with Asperger Syndrome, 4 of which demonstrated relatively better performance on verbal as compared to nonverbal tasks.

A study by Klin and colleagues (1995) investigated the validity of the diagnosis of AS through an examination of neuropsychological profiles of individuals with this diagnosis in comparison with individuals diagnosed with HFA. Forty-six individuals

were blindly provided a diagnosis of HFA or AS based on clinical case histories. The two groups were found to be comparable in age and overall intellectual functioning, but differed significantly in the intellectual profile. The authors described the pattern of cognitive abilities in AS as consistent with the profile seen in the neuropsychological disorder known as NLD, which is characterized by significantly higher VIQ than PIQ performance. More specifically, 18 of 21 participants with AS met the NLD profile whereas only 1 of 19 participants with HFA met the NLD profile (Klin et al., 1995.). While these results strongly support a trend for relative strengths in VIQ over PIQ in AS, this profile was not found in all participants.

Similarly, a study by Ghaziuddin and Mountain-Kimchi (2004) sought to describe the typical cognitive profile in individuals with AS and to compare this profile with that found in a sample of individuals with HFA. In this study, 22 males with AS and 12 males with HFA were administered either the WISC-III or WAIS-R. Overall, the results of this study support the VIQ > PIQ profile in AS with an average VIQ – PIQ split of 10.82 points; no significant split was found in the HFA sample. In the AS sample, 82% demonstrated this profile; however, this difference was only found to be significant (i.e., split of 10 points or greater) in 45% of the cases. Within the HFA group, 50% demonstrated the VIQ > PIQ profile, but this difference was significant in only 25% of the sample. The authors concluded that this study supported the hypothesis that VIQ is higher than PIQ in AS, but noted that the significantly variability in profiles for both the AS and HFA groups limit the diagnostic utility of intellectual profiles in differentiating these two disorders (Ghaziuddin & Mountain-Kimchi).

Other researchers have failed to find this pattern of intellectual functioning in their samples and have disputed the claim that the NLD cognitive profile is characteristic of AS (i.e., Huber, 2007; Manjiviona & Prior, 1999; Reitzel & Szatmari, 2003; Szatmari et al., 1990). For example, both Manjiviona and Prior (1999) and Szatmari et al. (1990) sought to examine the neuropsychological profiles of individuals with AS in comparison to those with HFA. The resulting cognitive profiles from both of these studies failed to differentiate HFA and AS (Manjiviona & Prior; Szatmari et al.). Absolutely no differences were found between AS and HFA in terms of VIQ and PIQ; however, Manjiviona & Prior reported that the AS group had a significantly higher mean FSIQ than the HFA group; no differences in FSIQ were reported by Szatmari et al.

Overall, the support for specific cognitive profiles in AS and HFA is currently mixed. Some research indicates that individuals with AD demonstrate a profile of higher nonverbal functioning relative to verbal functioning (PIQ > VIQ; e.g., Lincoln et al., 1988). However, more current research suggests that while some individuals may demonstrate this profile, it is not found consistently, especially in older and higher functioning populations (e.g., Siegel et al., 1996). There has been somewhat stronger support for the evidence of a prototypical profile in AS with relatively higher performance in verbal over nonverbal domains (VIQ > PIQ; e.g., Ghaziuddin & Mountain-Kimchi, 2004; Klin et al., 1995); however, research within this area has also been inconsistent. Even within the studies cited above, which claim to provide support for the VIQ > PIQ profile, this pattern was not universally found within their sample of individuals with AS. For example, approximately 55% of the participants with AS in the Ghaziuddin and Mountain-Kimchi study did not demonstrate a statistically significant

VIQ – PIQ split. Several other studies have failed to find any significant differences between the intellectual profiles of individuals with HFA versus AS (e.g., Manjiviona & Prior, 1999; Szatmari et al., 1990), providing further evidence that the presence of "prototypical" intellectual profiles in autism and AS are not consistently supported in the literature.

Patterns of Wechsler Subtest Performance

In addition to examining patterns of intellectual functioning across the domains of verbal and nonverbal abilities, researchers have examined performance across Wechsler subtests for areas of relative strength and weakness in ASD. One of the most consistent findings has been a relative strength on the Block Design subtest for individuals with ASD, especially those diagnosed with AD (e.g., Barnhill, Hagiwara, Myles, & Simpson, 2000; Ehlers et al., 1997; Ghaziuddin & Mountain-Kimchi, 2004; Lincoln et al., 1988; Ozonoff et al., 2000; Siegel et al., 1996). The Block Design subtest requires individuals to construct geometric figures presented in a two-dimensional picture using three-dimensional red-and-white blocks; it is considered a good measure of concept formation (Sattler, 2001). Relative weaknesses have consistently been reported on the Coding (Barnhill, Hagiwara, Myles, & Simpson; Ehlers et al., 2000; Ozonoff et al.; Mayes & Calhoun, 2003b) and Comprehension subtests (Barnhill, Hagiwara, Myles, & Simpson; Lincoln et al.; Mayes & Calhoun, 2003b; Siegel et al.). The Coding subtest is a paper-and-pencil task of processing speed and visual-motor coordination which requires individuals to quickly pair and draw symbols with a corresponding symbol or number (Sattler). The Comprehension subtest is a verbal measure of social knowledge and judgment which consists of questions regarding everyday situations or activities (Sattler).

It is somewhat intuitive that individuals with ASD would find this subtest relatively more difficult given its emphasis on social and moral judgment. Overall, these areas of relative strength and weakness have been supported fairly consistently in the ASD research; however, individual differences in subtest scatter have been noted (e.g., Siegel et al.).

Intellectually Gifted

To date, nearly all research on ASD has been focused either on individuals with cognitive abilities falling within the MR range, or individuals deemed "high functioning" with mean intellectual functioning in the average range. However, as pointed out by Kanner (1943) in his original study, autism can occur along the full spectrum of intellectual abilities. Some research has attempted to control for this fact by including individuals with a wide range of intellectual abilities within their studies. For example, Mayes and Calhoun (2003a) included in their sample 164 children with ASD who had FSIQs ranging from 14 to 143 in order to examine the effects of ability and age on functioning. However, the mean FSIQ in this sample was 75 (Mayes & Calhoun, 2003a). Similarly, Siegel et al. (1996) examined the intellectual profiles of individuals with HFA; participant FSIQs ranged from 72-131 in the child sample with mean FSIQ of 96.02. In general, the mean FSIQ scores for research on high functioning ASD falls within the Average, or even Low Average range of intellectual functioning. Furthermore, despite including a few individuals with superior or very superior intellectual functioning within these samples, reports of frequency or explicit discussion of the characteristics of these individuals are, without fail, missing from these studies. This lack of attention to the specific characteristics and needs of individuals with superior or very superior intellectual

abilities greatly limits the generalizability of the current research in the field of ASD to individuals who can be described as intellectually gifted.

The field of gifted education has provided some insights into the unique characteristics and needs of this population, but these insights have typically been based on experience with the population in the role of teacher or parent, or in some cases, single-case design studies. For example, the mother of a child with AS described some of the challenges her child had faced as an individual with AS and high cognitive abilities as well as his positive experience with participation in gifted programming (Klin, Volkmar, et al., 2000; pp. 441-447). Another parent described the difficulties she faced in receiving supplemental services for her child with AS due to his apparent high intellectual abilities (Klin, Volkmar, et al., 2000; pp. 454-462).

Huber (2007) conducted an in-depth examination of the clinical characteristics of gifted individuals with ASD across the domains of intellectual functioning, academic abilities, motor skills, developmental history, comorbid diagnoses, educational histories, ASD symptomology, adaptive functioning, and psychosocial/behavioral functioning utilizing a multiple case study design. Her study included 10 individuals with a diagnosis of ASD (6 with HFA, 2 with AS, 2 with PDD-NOS) and an IQ of 130 or higher. Within the area of intellectual functioning, Huber reported that performance was highly variable both within and between participants across WISC-IV index and subtest scores. Half of the participants demonstrated significant discrepancies between verbal and nonverbal reasoning abilities. However, the results of this study did not support profile differences for those diagnosed with AS versus those diagnosed with HFA; 2 individuals with HFA had VCI > PRI, 3 individuals with HFA had PRI > VCI, no differences were found

between the VCI and PRI in individuals with AS. There was a trend for relatively higher scores within the Verbal Comprehension Index (VCI) and Perceptual Reasoning Index (PRI), with relatively lower scores in the Working Memory Index (WMI) and Processing Speed Index (PSI). Relative weaknesses were found for the subtests of Coding and Digit Span; Comprehension was a relative weakness for only 3 of the 10 cases. No areas of relative strength across participants were found due to variability in subtest performance across participants. Overall, the most robust finding in terms of cognitive functioning in this study was the lack of "prototypical" AS (VIQ > PIQ) and AD (PIQ > VIQ) profiles (Huber).

A recent case study by Assouline et al. (2009) examined profile differences between 2 profoundly intellectually gifted (IQ > 3 standard deviation above the mean) girls, one who met diagnostic criteria for ASD and one who had mild social difficulties but clearly did not meet criteria for ASD. These girls were compared across domains of intellectual functioning, academic abilities, neuropsychological functioning, developmental and educational history, ASD symptomology, adaptive functioning, and psychosocial/behavioral functioning. The two girls were found to be remarkably similar across WISC-IV index scores with both girls achieving VCI, PRI, and WMI scores well into the Very Superior range. The only significant difference found within the domain of intellectual functioning was in the Processing Speed Index, on which the girl with ASD performed relatively poorer, although her score still fell within the High Average range (Assouline et al.).

While the studies conducted by Huber (2007) and Assouline et al. (2009) significantly contribute to the literature by providing empirical information on individuals

with ASD and very superior intellectual abilities, the relative lack of research on this population continues to be a major limitation to the field of autism research. To date, no empirical, group design studies have been conducted to evaluate individuals with ASD in combination with superior to very superior intellectual abilities. This type of research is crucial to enhance understanding about the unique characteristics and needs of this population of individuals.

Conclusion

Interest in the intellectual features present in ASD has been prevalent since research in ASD first began. While Kanner (1943) noted that autism could occur across the spectrum of intellectual functioning, most early research focused on individuals with intellectual abilities in the MR range. Since approximately 75% of individuals with autism have MR, this appears justifiable. Early interest in higher intellectual abilities began with the finding that some individuals with ASD presented with very focused savant or "splinter" skills. Since that time, research has concentrated on the intellectual profiles of individuals with autism across the intellectual continuum, including LFA, HFA, and AS. Some researchers theorized specific profiles of cognitive abilities. More specifically, some suggested that individuals with autism present with higher nonverbal than verbal abilities, while the opposite profile has been suggested for AS. These "prototypical" profiles have not been supported consistently by the research, but controversy in this area continues. Examination of Wechsler subtest performance indicates that individuals with ASD generally show a relative strength on Block Design and relative weaknesses in Coding and Comprehension. Finally, it is noted that the field of autism has generally neglected research into the characteristics of gifted individuals

with ASD. While a few case studies have begun to examine the unique features of this population, this is currently an area significantly lacking in research.

Psychosocial Functioning in Autism Spectrum Disorders

Impairment in social interaction is a core feature of ASD, as was clearly articulated by Kanner (1943). For example, Kanner illustrated the extreme social withdrawal seen in autism through his observation of one young boy: "The most impressive thing is his detachment and his inaccessibility. He walks as if he is in a shadow, lives in a world of his own where he cannot be reached. No sense of relationship to persons" (Kanner, 1943, p. 236). He noted that most of his participants preferred to be alone, did not play with peers, demonstrated a preference for objects over people, and lacked an intention to communicate in their speech (Kanner). These observations led contemporary researchers to more closely examine these qualitative differences in social interaction through empirical investigation of the nature and potential causes of these impairments, as well as how they manifest themselves and increase susceptibility for further psychological dysfunction. Some key areas of research into the psychosocial aspects of autism include assessment of significant psychological and behavioral concerns as measured by rating scales, and comorbid psychological disorders.

Psychological Functioning

One approach to assessing psychosocial adjustment in children is through self-, parent-, and teacher- report measures of behavioral, emotional, and adaptive functioning. The Behavior Assessment System for Children, Second Edition (BASC-2; Reynolds & Kamphaus, 2004) is specifically designed to examine both positive (adaptive) and negative (clinical) aspects of personality and psychosocial functioning (Barnhill,

Hagiwara, Myles, Simpson, Brick, et al., 2000). This multidimensional measure can be used with children ages 4 through 18 and includes a self rating scale (SRP), parent rating scale (PRS), and teacher rating scale (TRS; Reynolds & Kamphaus). Results are reported as T-scores (mean = 50, standard deviation = 10) and are qualified as either "within normal limits," "at risk," or "clinically significant" depending on the level of elevation of each dimension (Reynolds & Kamphaus). Overall, the BASC-2 demonstrates strong psychometric properties (Reynolds & Kamphaus).

While the BASC-2 was designed for use with children presenting with a wide range of behavioral or emotional concerns, the manual also provides normative data for specific clinical samples of children, including those with Pervasive Developmental Disorders (PDD; including Asperger Syndrome and Autistic Disorder; Reynolds & Kamphaus, 2004). Normative data are provided separately for children and adolescents (Reynolds & Kamphaus). Children diagnosed with PDD who completed the BASC-SRP demonstrated elevated levels of social stress; adolescents with PDD who completed the BASC-SRP reported elevated levels of social stress, atypicality, and sense of inadequacy (Reynolds & Kamphaus). The profile differences between children and adolescents appear to demonstrate an increased level of awareness and insight into one's "differentness" as one matures from childhood to adolescence, which is consistent with the findings of Loveland and Tunali-Kotoski (2005). Responses provided by parents of both children and adolescents with PDD on the BASC-PRS evidenced similar elevations, with major concerns for both groups reported in the areas of atypicality, withdrawal, adaptability, social skills, and functional communication (Reynolds & Kamphaus). Similarly, responses provided by teachers of children and adolescents with PDD on the

BASC-PRS evidenced a profile identical to that of the BASC-PRS, with major concerns noted in the areas of atypicality, withdrawal, adaptability, social skills, and functional communication (Reynolds & Kamphaus). Overall, parents and teachers clearly view similar behavioral and emotional concerns in children and adolescents diagnosed with PDD, and these concerns are largely related to social behavior and adaptive functioning. Similarly, adolescents with PDD appear to have some degree of self-awareness about their social difficulties, while children with PDD simply report that they are unsatisfied with their social relationships without acknowledgment of their contribution to these social concerns.

Barnhill, Hagiwara, Myles, Simpson, Brick, et al. (2000) examined BASC profiles of children and adolescents with AS by comparing SRP, PRS, and TRS responses. Participants included 20 children and adolescents, as well as their parents and their teachers; children and adolescents ranged in age from 6 to 16 years and had IQ scores ranging from 66-133 (mean IQ = 97.94). No significant concerns were reported on the BASC-SRP possibly indicating that the child and adolescent participants in this study lacked awareness of their emotional and behavioral problems. The PRS resulted in an externalizing problems composite within the clinically significant range, with clinically significant elevations on the hyperactivity and atypicality subscales. The PRS internalizing problems composite and adaptive skills composite fell within the at-risk range; the aggression, depression, attention problems, withdrawal, adaptability, leadership, and social skills subscales also fell within the at-risk range. Finally, the TRS did not result in any clinically significant scales, but the behavioral symptoms composite and internalizing problems composite both fell within the at-risk range, as did the

subscales of anxiety, depression, attention problems, atypicality, and withdrawal. Overall, parents and teachers reported widespread concerns about the psychosocial functioning of children and adolescents with AS, with both groups noting problems in the areas of atypicality, withdrawal, depression, and attention problems; however, teachers appeared to perceive fewer, less significant problems than parents (Barnhill, Hagiwara, Myles, Simpson, Brick, et al., 2000).

In a recent study, Foley Nicpon, Doobay, and Assouline (2010) compared self-report, parent-report, and teacher-report ratings on the BASC-2 of 38 children and 14 adolescents identified as intellectually gifted and diagnosed with ASD. No elevations were found on the self-report measure, which is consistent with previous findings that youth with ASD tend to underreport psychosocial symptoms in comparison to their parents and teachers (Barnhill et al., 2000). Parents in this study endorsed clinically significant elevations in the areas of atypicality, attention problems, depression, hyperactivity, withdrawal, activities of daily living, adaptability, and social skills subscales. Teacher responses resulted in clinically significant elevations in atypicality, depression, withdrawal, and adaptability. Results of this study further indicated that parents and teachers of adolescents reported greater adaptability and fewer symptoms of atypicality than parents and teachers of children, suggesting possible improvements in these areas of psychosocial functioning as youth age and mature (Foley Nicpon et al., in press).

A measure that specifically addresses multidimensional aspects of social skill functioning is the Social Skills Rating System (SSRS; Gresham & Elliot, 1990). The SSRS includes self, parent, and teacher rating scales which provide a broad assessment of

social behavior in the areas of cooperation, assertiveness, responsibility, and self-control; problem behaviors that may impede the development of social skills—including externalizing symptoms, internalizing symptoms, and hyperactivity—are also assessed (Gresham & Elliot). Responses are indicated in terms of frequency of specific behaviors. Composite scale scores are reported as standard scores (mean = 100; standard deviation = 15). This measure can be used with children who are in preschool through 12th grade, and separate norms are provided for preschool, elementary (Kindergarten through grade 6), and secondary (grades 7 through 12) populations (Gresham & Elliot). The SSRS has demonstrates good reliability and validity (Gresham & Elliot).

Very few studies have examined the SSRS profiles for youth with ASD. Macintosh and Dissanayake (2006) used the SSRS to examine the similarities and differences in social functioning and problem behaviors among children with HFA and AS, and how these two groups compare with a group of typically developing children. Participants included 20 children with HFA, 19 children with AS, and 17 typically developing children. Overall, both teachers and parents reported significant concerns about the social skills of children with ASD; no differences were found between AS and HFA on any of the measures. Results of the SSRS Teacher Report indicate that children in the typically developing sample were viewed as having significantly better social skills across the areas of Cooperation, Assertion, and Self-Control than children in either the HFA or AS groups. Results of the SSRS Parent Report suggest that typically developing children are viewed as having better social skills in the areas of cooperation and assertiveness than both the HFA and AS groups, as well as better self-control than the HFA group. Both teachers and parents rated children with AS and HFA as having more

significant internalizing behavior problems and hyperactivity than typically developing children, but differences were not found between the two ASD groups (Macintosh & Dissanayake).

Comorbid Disorders

ASD has been found to be associated with a variety of other psychiatric and developmental disorders. Many symptoms of ASD may overlap with other conditions, such as repetitive behavior that is seen in ASD and Obsessive-Compulsive Disorder (OCD), in which case differential diagnosis can be difficult (Volkmar & Klin, 2005). In other cases, there appears to be a high degree of comorbidity between ASD and other disorders, such as depression. Mental retardation clearly has a high rate of comorbidity with autism, and should be diagnosed when present (Volkmar & Klin). Some behavioral problems commonly associated with ASD include hyperactivity, obsessive-compulsive behaviors, self-injury, stereotypy, and tics (Volkmar & Klin). Attention problems and impulsivity are frequently seen in individuals with ASD, but whether Attention-Deficit/Hyperactivity Disorder (ADHD) should be diagnosed separately is currently being debated (Tantam, 2003; Volkmar & Klin). Clinically significant difficulties with anxiety and depression seem most prevalent in older, higher functioning individuals who have some insight into their inability to effectively relate to others despite a desire to do so (Bellini, 2004; Koegel, 2007; Tantam; Volkmar & Klin; Wing, 1981). Additional diagnoses that have been found to co-occur with or appear like ASD include Tourette's Syndrome, developmental coordination disorder, developmental language disorders (e.g., Semantic Pragmatic Language Disorder), specific learning disorders (e.g., written expression, reading comprehension, mathematical reasoning), nonverbal learning

disorder, sensory integration disorder, anorexia nervosa, generalized anxiety disorder, panic disorder, specific phobia, major depressive disorder, bipolar disorder, oppositional defiant disorder, schizophrenia, schizoid personality disorder, and schizotypal personality disorder (Attwood, 2007; Lovecky, 2004; Thede & Coolidge, 2007; Wing, 2005). Overall, individuals with ASD often present with a complex constellation of symptoms that may include characteristics of other psychiatric disorders and, at times, may warrant diagnoses of comorbid conditions.

Adaptive Functioning in Autism Spectrum Disorders

Adaptive behavior refers to "a person's capacity for conversing with and understanding others, for taking care of one's health, grooming and domestic chores, participating in group and community activities, as well as interacting with others and developing relationships among many other skills necessary to successfully navigate the social world" (Klin et al., 2007, pp. 748-749). Assessment of adaptive behavior is important in the evaluation and diagnosis of ASD given the significant deficits in adaptive functioning that are associated with this spectrum of disorders (Carter et al., 1998). The most frequently used measure of adaptive functioning is the Vineland Adaptive Behavior Scales, Second Edition (Vineland-II; Sparrow, Cicchetti, & Balla, 2005). The Vineland-II can be administered to primary caregivers either in survey form or as a semistructured interview in order to assess four areas of adaptive behavior: communication, daily living skills, socialization, and motor skills; a maladaptive behavior composite which assesses problematic behaviors that may interfere with an individual's functioning is also included (Sparrow et al.). The Vineland-II demonstrates strong psychometric properties (Sparrow et al.). Overall, the Vineland-II has been shown

to be sensitive to the impairments seen in ASD and can quantify an individual's social deficits (Carter et al.).

While little research to date has examined the adaptive functioning of individuals with high functioning ASD, extant research has demonstrated that individuals with ASD have much poorer overall adaptive functioning than would be expected for their IQ, and the discrepancy between adaptive functioning and IQ may be more significant in individuals with higher functioning ASD (e.g., Assouline et al., 2009; Bölte & Poustka, 2002; Klin et al., 2007; Saulnier & Klin, 2007; Tomanik et al., 2007). For example, Klin et al. (2007) examined adaptive functioning in two groups of high functioning children with ASD and found Daily Living skills to be 1 to 2 standard deviations below the mean, Communication skills 1.5 to 2 standard deviations below the mean, and Socialization skills 2 to 3 standard deviations below the mean. In general, individuals with ASD demonstrate greatest weaknesses within the Socialization domain on the Vineland-II, with intermediate skills in the Communication domain, and relatively stronger abilities in the Daily Living Skills domain; however, all adaptive functioning scores are typically below average in this population (Assouline et al.; Bölte & Poustka; Carter et al., 1998; Klin et al., 2007; Tomanik et al.). Furthermore, adaptive behavior scores have been shown to decrease with age in individuals with ASD indicating a failure to develop adaptive skills at a rate commensurate with typically developing peers as well as with gains in chronological age (Carter et al.; Klin et al., 2007; Tomanik et al.). This Vineland-II profile has been found in individuals with AS and HFA and studies have not been able to differentiate these two diagnoses based on Vineland-II results (Saulnier & Klin). Overall, the significant impairments in adaptive functioning, especially in the area of

socialization, found in individuals with ASD make it a diagnostically significant measure across levels of intellectual functioning (Assouline et al.).

Summary of Literature on Autism Spectrum Disorders

Autism has gained significant research attention over the past several decades, beginning with Kanner's description of 11 children with autistic features in 1943. Early research focused mainly on low functioning children with autism, but much attention has been given to higher functioning ASD since Wing (1981) published her review and extension of Asperger's (1944) original study. Research on higher functioning ASD populations has resulted in diagnostic confusion and controversy about whether HFA and AS are distinct disorders, with many researchers concluding that it is currently best to consider these disorders as part of a spectrum. The term autism spectrum disorder is currently used to describe individuals diagnosed with Autistic Disorder (low or high functioning), Asperger Syndrome, or PDD-NOS. Evaluation of ASD requires a comprehensive assessment including developmental and family history, psychological evaluation (intellectual functioning, neuropsychological functioning, academic achievement, adaptive functioning, assessment of personality/behavioral concerns), assessment of communication abilities, and consideration of differential diagnoses.

Research into intellectual functioning in ASD has changed in focus over time, with early interest in individuals with MR and savant or splinter abilities, and now a stronger interest in individuals with approximately average intellectual abilities. Intellectual profiles in ASD have been shown to be quite variable, with some studies supporting the prototypical AD (PIQ > VIQ) and AS (VIQ > PIQ) profiles, and other studies finding contradictory results. Research has generally shown relative strengths on

the Wechsler Block Design Subtest, and relative weaknesses on the Coding and Comprehension subtests. Research into psychosocial functioning in gifted children with ASD has repeatedly demonstrated significant deficits in social skills functioning and adaptive behavior. Additionally, children generally appeared unaware of these deficits, although it appears that higher functioning individuals with ASD may became aware of these difficulties during adolescence which could lead to clinically significant levels of depression or anxiety. A number of developmental and psychiatric conditions have been shown to co-occur with or appear like ASD, including ADHD, OCD, Tourette's Syndrome, Oppositional Defiant Disorder (ODD), and NLD, to name a few. Finally, significant deficits in adaptive functioning are consistently associated with ASD as measured by the Vineland Adaptive Behavior Scales, Second Edition (Vineland-II). Individuals with AS are found to have significantly lower Vineland-II scores than expected for their age and intellectual ability, with weakest performance in the Socialization domain.

Literature on Giftedness

A majority of the research in the area of giftedness comes from the field of gifted education; therefore, it is generally written by and for educators and parents. As a result, a majority of the empirical research in this field is focused on educational aspects of giftedness. Empirical investigation into more specific aspects of giftedness, including psychological functioning of this population and the concept of twice exceptionality, which refers to individuals who have high intellectual ability in combination with a disability (Assouline, Foley Nicpon, & Huber, 2006; Assouline et al., 2009; Foley Nicpon et al., in press, Little, 2001), is significantly lacking. This is especially true for

gifted individuals with ASD (Assouline et al., 2009; Huber, 2007, Neihart, 2000). Instead, the literature in this area is frequently in the form of observations by parents and/or educators, reviews of existing literature, and single case studies. One possible reason for the paucity of empirical research on special populations of gifted children is the negative connotation that has been associated with the word "giftedness." For example, research on giftedness has been described as elitist; it is argued that gifted children are already at an advantage and do not have special needs (e.g., Bain, Bliss, Choate, & Brown, 2007; Gordon, Lewandowski, & Keiser, 1999; Howley, 1986; Sapon-Shevin, 1994; Sternberg, 1996). However, it has been widely documented that some gifted children do have specific needs that must be addressed, and that the longstanding assumptions about this population as being entirely self-sufficient has prevented these students, especially those who also present with disabilities, from gaining the attention they require (Feldhusen & Kroll, 1991; Fiedler, Lange, & Winebrenner, 2002; Kunkel, Chapa, Patterson, & Walling, 1992; Little, 2001; Robinson, Zigler, & Gallagher, 2000).

Definition of Giftedness

The term giftedness has proved to be a relatively difficult concept to define, and has been subject to some controversy. In general, giftedness is a broad term that describes a diverse group of children who, by the definition provided by the National Association for Gifted Children (NAGC, 2008), "show, or have the potential for showing, an exceptional level of performance" in the areas of general intellectual ability, specific academic aptitude, creative thinking, leadership ability, and/or visual or performing arts. The NAGC further defines gifted children as those in the upper 3% to 5% of the intellectual distribution, and with the uppermost 1% to 2% being designated "profoundly

gifted." Winner (1996) defined giftedness in terms of precocity, a tendency to "march to the beat of a different drummer," and a "rage" to learn. Philosophical definitions consider the interaction of cognition (thought), conation (motivation), and emotion (intensity; Lovecky, 2004). Perhaps the most famous definition of giftedness was that included in the U.S. Department of Education Marland Report, published in 1972 (see Appendix B). In addition to providing a formal definition of giftedness, of which the components are still reflected in current definitions, the Marland Report also articulated the importance of identifying and providing specialized services for gifted and talented individuals and indicated the failure to do so could put these children at risk of psychological harm (Marland, 1972). In practice, determination of intellectual giftedness is often achieved, in part, through the use of a standardized measure of intelligence, such as the Wechsler or Stanford-Binet assessment batteries, with a cut-off score in the superior to very superior range (i.e., IQ of 120 or 130 and above; see Lovecky, 2004; McCoach, Kehle, Bray, & Siegle, 2001). This follows from the longstanding relationship between the concept of giftedness and high intellectual ability, which has been described in the field of gifted education (Assouline et al., 2009; Marland). Further support for this method of identifying gifted youth comes from the field of special education where the use of intellectual assessment, in combination with an evaluation of more specific academic abilities, is a well established and accepted practice for identification of students with learning difficulties (Feldhusen & Jarwan, 1993).

Characteristics of Giftedness

While little empirical work has examined the prototypical characteristics of gifted children, theoretical accounts of these characteristics are predominant within the field of

gifted education. According to this literature, indications of giftedness are frequently seen early in life, even as early as infancy, and these characteristics change over the course of development (Lovecky, 2004). Precocious language development, reading, and memory abilities are often reported in very young gifted children, although some gifted youth do not differ developmentally from same age peers during these early years. During the preschool years (ages 3 to 5 years), gifted children have been noted for their intense curiosity and imagination. They may demonstrate early mastery of basic academic skills, sophisticated understanding of concepts, and may require significant attention from parents and educators. In childhood (ages 6 through 12), gifted individuals have been described as having superior attention, persistence, curiosity, intrinsic motivation, a love of learning, and a desire for challenge. Interest in collecting objects or knowledge is typical of this period. They frequently surpass their peers across academic domains. However, gifted children may also become discouraged during this time due to difficulty finding peers with whom they relate and lack of academic challenge. During adolescence, gifted individuals may have the opportunity to participate in a number of gifted/accelerative educational activities both within and outside of the classroom, which may further their love of learning and acquisition of knowledge. However, other gifted adolescents may evidence underachievement and/or social maladjustment during this time by giving up, tuning out, or becoming a behavior problem in the classroom (Lovecky).

Additional traits have been attributed to gifted individuals based on observations and theoretical accounts of this population. These include early physical development, advanced vocabulary and grammatical abilities, analytical and complex thinking skills,

divergent thinking, long attention spans, unusually strong memory abilities, and good concentration and persistence (Lovecky, 2004). These students have been described as showing a “passion” for learning, the ability to learn quickly and easily, and as showing a variety of interests and knowledge within areas of interest. An intelligent sense of humor, creativity, and a vivid imagination have also been reported. Finally, some research has indicated that gifted children experience emotional intensity which leads to early concerns about fairness and justice, and also a sense of initiative, perfectionism, independence, and nonconformity. Authors have proposed that these children may be at risk for oversensitivity, difficulty finding satisfying peer relationships, feelings of alienation, a high need for intellectual stimulation, and difficulty with socialized role expectations (Lovecky; Webb et al., 2005). It is now believed that most gifted children do not demonstrate “global giftedness,” and difficulties arising from their asynchronous development, which refers to the substantial intra-individual variation in the development of abilities (i.e., across intellectual, emotional, social, creative, and moral domains) often seen in gifted youth, have also been found to lead to emotional distress (Lovecky; Webb et al.). However, the literature indicates that, as a group, gifted children are no more or less likely than their peers to suffer social or emotional difficulties (Gross, 2002; Lehman & Erdwins, 1981; Martin, Burns, & Shonlau, 2010; Neihart, 2002; Reis & Renzulli, 2004; Rost, & Czeschlik, 2004; Touq, Kamal, & Fada, 1998; Vialle, Heaven, & Ciarrochi, 2007; Webb et al.). Given the number of characteristics that have been described in the literature, it should be noted that few gifted children evidence all of these characteristics.

Psychosocial Functioning in Gifted Youth

Research on the psychosocial, emotional, and behavioral functioning of gifted youth suggests that this population is generally as well adjusted as their same-age peers (Gross, 2002; Lehman & Erdwins, 1981; Martin et al., 2010; Neihart, 2002; Reis & Renzulli, 2004; Rost & Czeschlik, 1994; Touq et al., 1998; Vialle et al., 2007; Webb et al. 2005). For example, Rost and Czeschlik compared the psychosocial adjustment of 50 10-year-old youth who were identified as intellectually gifted with 50 10-year-old youth with average intelligence. The authors found no significant differences between the two groups on self ratings, parent ratings, and teacher ratings of social behavior, behavioral problems, or emotionality stability; they concluded that gifted youth demonstrated similar social and emotional adjustment as youth with average cognitive abilities (Rost & Czeschlik).

Additional studies in this area even suggest that gifted youth may demonstrate better psychosocial adjustment than their peers (Lehman & Erdwins, 1981; Sayler & Brookshire, 1993; Touq et al., 1998; Vialle, et al., 2007). Touq and colleagues investigated the relationship between intellectual, social, and personality variables of 297 gifted tenth grade students. Statistically significant differences were found between gifted youth and typical peers in the areas of cognitive ability, achievement, psychosocial adjustment, behavior, and social skills, indicating that gifted youth demonstrated better overall functioning in all areas assessed (Touq et al.). Sayler and Brookshire examined the effects of academic acceleration on gifted youth through comparisons of three groups of eighth grade students: (1) gifted students who entered school early or were accelerated one or more years, (2) students enrolled in gifted education courses, and (3) eighth grade

students with average cognitive abilities. Results indicated that both groups of gifted youth demonstrated better emotional development, had better perceptions of social relationships, and had fewer behavioral problems than their typical peers (Sayler & Brookshire).

While the majority of evidence suggests that gifted youth, as a whole, are well-adjusted, several researchers in gifted education stress that these youth do still face challenges that can lead to significant levels of psychosocial distress (Peterson, Duncan, & Canady, 2009; Reis & Renzulli, 2004; Vialle et al., 2007). At the very least, these youth experience many of the same life stressors and challenges and their typically-developing peers, including loss of loved ones, physical or mental illness, changes to the family structure, and interpersonal disputes (Peterson et al.). In addition, gifted youth also rate academic achievement, college preparation, self and others' high expectations, and involvement in many activities as significantly stressful (Peterson et al.). However, the participants in the Peterson et al. study continued to demonstrate high academic and psychosocial functioning despite reporting these concerns. Other research suggests that difficulties related to uneven development, having different abilities than peers, underachievement, perfectionism, and a mismatch between ability level and educational environment can lead to psychosocial stress in gifted youth (Reis & Renzulli, 2004). In addition, a minority of gifted students may face additional challenges due to being twice exceptional and having specific learning or social-emotional needs (Reis & Renzulli). However, a majority of youth who do face additional life stressors or difficulties related to their social or educational environment continue to demonstrate adjustment similar to

that of their same-age peers, especially when their educational needs are met appropriately (Peterson et al.; Reis & Renzulli; Vialle et al.).

Current knowledge about the psychosocial adjustment of gifted youth is summarized in a recent meta-analysis. Martin, Burns, and Shonlau (2010) found 9 empirical studies from the past 25 years that specifically examined indicators of mental health in gifted youth. Overall, results of this meta-analysis indicates that gifted youth have the same or lower risk for depression, anxiety, and suicidal idea when compared to their same-age peers. Specifically, gifted males were found to exhibit significantly lower levels of anxiety than typical peers, while gifted females were found to have slightly higher rates of anxiety than typical peers; no differences in depression or suicidal ideation were found between groups (Martin et al., 2010). Taken together, the current literature suggests that gifted youth experience the same levels of psychosocial stress as their peers and, in general, gifted youth demonstrate the same or somewhat better levels of adjustment in comparison to their peers.

Overlap Between Characteristics of Giftedness and ASD

Several scholars in the field of gifted education have described a number of similarities between the characteristics of gifted children and children with ASD. Four main areas of overlap have been identified: cognitive profiles, special interests, social difficulties, and sensory hypersensitivity (Gallagher & Gallagher, 2002; Little, 2002; Lovecky, 2004; Neihart, 2000; Webb et al., 2005). More specifically, both groups have been noted to demonstrate excellent memory abilities; precocious language development; early reading, spelling, writing, and mathematical abilities; talent in the areas of math and science; and asynchronous development (Little; Lovecky; Neihart; Webb et al.). Both

gifted children and children with ASD are likely to become absorbed in areas of special interest and amass a great deal of information within those areas, and this behavior has been linked to attention problems (Gallagher & Gallagher; Little; Lovecky; Neihart; Webb et al.). Additionally, both groups have been described as having a tendency to talk or ask questions incessantly, speak in an overly intellectualized manner, provide lengthy and elaborate responses to questions, become concerned with issues of fairness and justice, and have difficulty adjusting to change; each of these behaviors may lead to difficulties with peer interactions or social isolation (Gallagher & Gallagher; Little; Lovecky; Neihart; Webb et al.). Finally, both groups have been described as having hypersensitivity to sensory stimuli such as noise, light, smell, texture, and flavor (Little; Neihart; Webb et al.).

These similarities have caused difficulty in differentiating behaviors associated with giftedness versus those associated with ASD in gifted children, which has subsequently led to problems of *misdiagnosis* and *missed diagnosis*. According to Webb et al. (2005), one of the current modern tragedies is the tendency for gifted individuals to be given unwarranted diagnoses for psychological disorders simply due to their "symptoms" of giftedness. In other words, characteristics of these individuals are being inaccurately perceived as maladaptive, causing these individuals to be misdiagnosed with behavioral, emotional, or psychiatric disorders (Neihart, 2000). Assouline et al. (2009) referred to these individuals as "Type B gifted students" who are characterized with high cognitive ability but also some behaviors that may be indicative of social-emotional difficulty. However, these concerns are typically the result of an under-stimulating academic environment or difficulties with finding similar peers rather than a true

psychological disorder, and these characteristics may put gifted children at risk for misdiagnosis. By misdiagnosing a child, appropriate interventions (i.e., academic acceleration, peer groups) likely will not be provided, and thus the true problem will not be addressed (Assouline et al., 2009). Possible misdiagnoses in gifted children include ADHD, depression, anxiety, OCD, and Asperger Syndrome (Lovecky, 2004; Webb et al.). However, this information is based on theoretical accounts of giftedness from clinical experience rather than empirical research, and thus empirical substantiation of this information is needed.

Alternatively, theoretical accounts and clinical observations indicate that some gifted individuals do experience clinically significant behavioral, emotional, or psychiatric problems, but are not given a diagnosis because their symptoms or "quirks" are attributed to their giftedness (Webb et al., 2005). Little (2002) suggested that gifted children with ASD are often overlooked because they appear "almost normal." Importantly, these individuals are being missed diagnostically, and are therefore not receiving appropriate services and interventions for their disabilities (Assouline et al., 2009). Assouline and colleagues referred to these twice exceptional individuals as "Type C gifted students," indicating that the difficulties experienced by these individuals are not a consequence of high cognitive functioning in combination with low intellectual stimulation, but rather represent a true disability in need of intervention by an expert who understands the unique needs of individuals presenting with both high cognitive abilities and significant disabilities. Some authors suggest that, at times, these missed diagnoses may be a result of a gifted individual's ability to "mask" or compensate for his or her disability with high intellectual functioning (Huber, 2007; Little, 2002; McCoach et al.,

2001). Similarly, it has been proposed that an individual's disability may mask his or her giftedness when a very significant disability, such as ASD, is present (Baum, Cooper, & Neu, 2001; Huber; McCoach et al.; Pledgie, 2001). In either scenario, the individual's disabilities and gifts are believed to essentially cancel each other out, leading the child to appear average overall, and thus making appropriate diagnosis difficult (Lovett & Lewandowski, 2006; McCoach et al). However, Lovett and Lewandowski (2006) argue that masking is not a true phenomenon in this population and note that the "masking hypothesis" (p. 516) has not received empirical support.

Concerns about accurate diagnosis of gifted individuals with ASD are reported in both the gifted education and autism literature. Empirical studies have documented that high functioning individuals with ASD are generally diagnosed much later than lower functioning individuals (Cederlund & Gillberg, 2004; Howlin & Asgharian, 1999; Mayes & Calhoun, 2003c). This research has also indicated that many high functioning individuals with ASD often receive misdiagnoses of learning disabilities, ADHD, OCD, or other conditions matching a specific aspect of the child's presentation prior to receiving the accurate diagnosis of AS (Cederlund & Gillberg; Gilchrist et al., 2001; Webb et al., 2005). In a sample of 20 males with AS, Gilchrist et al. reported that diagnosis of AS was made relatively late (100% after 5 years, 40% after 10 years), and that most children had multiple contacts with professionals and had received a variety of diagnoses prior to that of AS. The importance of accurate diagnosis in higher functioning individuals with ASD has been stressed due to the high likelihood that the difficult behaviors and impairments associated with ASD will be interpreted as intentional misbehavior in bright individuals, and appropriate interventions and services will not be

provided (Howlin & Asgharian; Huber). Because of the amount of overlap seen between characteristics of gifted children and those with ASD and the current diagnostic confusion, Gallagher and Gallagher (2002) emphasized the importance of diagnosing ASD only when the diagnostic behaviors occur together and are extreme in nature.

As described above, accurate diagnosis of ASD follows a comprehensive diagnostic evaluation. For gifted children with characteristics of ASD, special attention needs to be given to the ways in which gifted children with and without ASD have been shown to differ. While empirical research in this area is currently lacking, the available literature suggests that these two groups differ across a number of dimensions (Henderson, 2001; Gallagher & Gallagher, 2002; Little, 2002; Lovecky, 2004; Neihart, 2000; Webb et al., 2005). First, higher functioning children with ASD often evidence pedantic or seamless speech (i.e., seamlessly blend knowledge, personal accounts, and autobiographical illustrations), and have been described as "little professors," while gifted students evidence typical speech (Gallagher & Gallagher; Little; Neihart; Safran, 2000). Children with ASD may also show a discrepancy between their excellent memory abilities and relatively poorer language comprehension when compared with typically developing gifted children (Little). The rigidity and obsessive fixation on specific topics or activities that is characteristic of children with ASD is not present in gifted children who do not have ASD (Neihart; Webb et al.). These behaviors are qualitatively different from the ability of gifted children to maintain focus and a high level of concentration on a specific, meaningful learning activity over extended periods of time (Little). Furthermore, the focused interests seen in gifted children are more likely to be productive and contribute to a successful future than are the idiosyncratic focused interests seen in ASD

(Lovecky). In the area of social awareness, both groups have been described as having some difficulties in interacting with peers, but the type of social problems are qualitatively very different. More specifically, gifted children may be introverted and demonstrate emotional intensity (Henderson), but unlike children with ASD, they have insight into these social concerns, are able to understand reciprocal aspects of social interactions, have the ability to take others' perspectives, and demonstrate a capacity for empathy (Gallagher & Gallagher; Little; Neihart; Webb et al.). Children with ASD are often unaware of their social deficits, demonstrate inappropriate affective expression and have difficulty interpreting emotional expression of others (Little; Neihart; Webb et al.). Another difference that has been described in the literature is the tendency for children with ASD to have significant difficulties with attention as a result of distraction from internal stimuli, while gifted children who have been shown to have attention concerns are typically distracted by stimuli in the external environment (Neihart). Quality of humor has been proposed as another dimension in which these two groups differ, with high functioning children with ASD often having the ability to excel with puns while struggling with the social reciprocity that underlies humor; they often do not laugh at or understand the jokes of others (Neihart). Difficulties with humor are not seen in gifted children (Neihart). Finally, empirical research has demonstrated that children with ASD have much poorer adaptive functioning than typically developing children, which highlights the importance of assessing this domain in diagnostic evaluations of gifted individuals who are suspected of having ASD (Tomanik et al., 2007).

Literature on Twice Exceptionality

As defined above, an individual who is found to have a disability in combination with high intellectual functioning is described as being *twice exceptional* (Assouline, Foley Nicpon, & Huber, 2006; Assouline et al., 2009; Foley Nicpon et al., in press, Little, 2001). Interest in this population of individuals began with the work of Whitmore and Maker (1985) who discussed gifted individuals with a range of disabilities, as well as that of Fox, Brody, and Tobin (1983) who specifically investigated the intersection of giftedness and learning disabilities. Twice exceptionality is a broad term that includes children with high cognitive ability who also possess a learning, emotional, physical, sensory, or developmental disability (Assouline et al., 2006). For example, gifted children with ADHD or learning disabilities are frequently cited in the twice exceptional literature (Lovecky, 2004). These children are often accused of being underachievers or lazy because their combination of gifts and disabilities are perplexing to parents and educators, and they are rarely identified for gifted education programs because professionals tend to dwell on their disabilities at the expense of their gifts (Assouline et al., 2006; Donnelly & Altman, 1994; Little) or because of identification practices that focus on global giftedness (Little). As a result, those children who do receive services to address their disability needs rarely have their gifted needs addressed (Gallagher & Gallagher, 2002; Little).

While the concept of twice exceptionality has been around since the 1980s, it was not until the 1990s that researchers in the field of gifted education acknowledged that autism and giftedness could co-exist (Donnelly & Altman, 1994). However, this acknowledgement has not led to empirical research into the characteristics and needs of

these individuals. Despite Kanner's (1943) description of individuals with autism who had high cognitive functioning, very little is currently known about this unique twice exceptional population. Several papers on this population have been published in the gifted education literature with a goal of making the needs of these children more salient to educators (e.g., Assouline et al., 2006; Gallagher & Gallagher, 2002; Little, 2001; Neihart, 2000). These papers tend to be similar in that they describe the overlapping characteristics between giftedness and ASD which lead to diagnostic difficulties, illustrate some of the unique needs of this population through clinical vignettes, and emphasize the importance of implementing appropriate services for these children within academic settings (Assouline et al.; Gallagher & Gallagher; Little; Neihart).

Within the past year, three empirical investigations of gifted children with ASD using psychometrically sound measures have emerged in the literature. Huber (2007) examined the diverse characteristics of 10 school-age children with ASD and intellectual functioning in the superior to very superior range using a case study design. Similarly, Assouline et al. (2009) conducted a case study that compared the characteristics of two profoundly gifted girls, one with and one without ASD. Foley Nicpon, Doobay, and Assouline (2010) utilized a group study design to examine parent, teacher, and self-perceptions of psychosocial functioning of gifted youth with ASD on the BASC-2. While these studies did not specifically examine each of the proposed characteristics of gifted children with ASD, results of these studies generally support the presence of many of these characteristics in this population. However, none of the characteristics were reported universally across participants. Several of the participants were described as having precocious language development and academic skills, but rote memory abilities

were actually an area of weakness for some individuals rather than a strength as theoretical accounts predicted. However, these memory deficits may have been related to attention difficulties, which have been proposed to exist in individuals with ASD (Henderson, 2001; Strum et al., 2004). Consistent with the literature on asynchronous development in gifted children with ASD, several individuals demonstrated large intra-individual differences in abilities across measures, and adaptive behavior was shown to be significantly lower than cognitive abilities. Behaviorally, participants in these two studies supported theoretical claims that gifted children with ASD evidence idiosyncratic areas of very intense interest; difficulty adjusting to change; sensory hypersensitivity; and verbose, overly intellectualized speech. Within the social domain, these studies provided empirical support for the presence of poor social interaction skills, social isolation, lack of insight into one's role in his or her social difficulties, and deficits in emotional expression and understanding. Finally, the results of these two empirical case studies concurred with the findings of Gilchrist et al. (2001) that bright individuals with ASD tend receive the diagnosis relatively later in childhood and have formerly received diagnoses for a number of other psychiatric conditions (i.e., ADHD, OCD, etc.).

In addition to providing empirical support for several characteristics of gifted children with ASD that have been suggested in the literature, these studies also point to the importance of appropriately assessing and intervening with children's disabilities as well as their gifts. The information provided by these studies, as a result of being the first to empirically investigate the unique features and needs of this population, prove to be valuable additions to the literature. However, to date, no empirical research has been conducted on this population utilizing a group design. This is certainly an area that needs

to be examined in order for the field to develop a better understanding of this population to aid in the development of appropriate interventions to meet their full range of needs.

Summary of Literature on Giftedness

The field of gifted education recently has begun to examine the unique needs of gifted children with ASD. Authors in this field have delineated the similarities between gifted individuals and those with ASD, and have discussed the resulting confusion with diagnosis. Many gifted children are currently being misdiagnosed with a psychological disorder due to difficulties associated with giftedness, such as lack of similar peers and an understimulating academic environment. At the same time, gifted children are being missed for diagnosis due to a misperception that their "quirkiness" is simply a part of being gifted, or because their gifts mask their disabilities. These twice exceptional learners have unique needs that must be evaluated and addressed to promote a productive academic career and healthy psychosocial adjustment. Research within this area points to the importance of making an accurate diagnosis in order to provide appropriate programs and services to meet children's needs in areas of giftedness and disability. The specific twice exceptional population of children who are gifted and have ASD has yet to receive substantial empirical research. Preliminary studies in this area have begun to shed light on the characteristics and needs of gifted individuals with ASD, but further empirical research is greatly needed in order for practitioners and educators to intervene effectively with this population.

Conclusion

Since Kanner first introduced the concept in 1943, the field of autism has gained significant research attention, making it one of the most studied and empirically validated

psychiatric disorders (Buitelaar et al., 1999). However, the inclusion of the Asperger Syndrome in the DSM-IV (APA, 1994) has led to much controversy over the characteristics and differential diagnosis of high functioning autism and Asperger Syndrome. This has led many investigators to adopt the term autism spectrum disorder (ASD) to refer to individuals with Autistic disorder, Asperger Syndrome, and PDD-NOS, which are each characterized by marked impairments in social interaction, play and imagination, and a restricted range of behaviors and interests (Klin, McPartland, et al., 2005). Although differences in opinion exist regarding differential diagnosis of ASDs, the field is largely in agreement about the importance of conducting a comprehensive evaluation to diagnose ASD.

Early research in intellectual functioning of ASD focused mainly on individuals with cognitive functioning within the range of Mental Retardation (MR), but interest into higher functioning ASD populations, with intellectual functioning above the MR range, has recently developed. Researchers have sought to determine prototypical intellectual profiles on the Wechsler intellectual batteries, but a consensus has yet to be reached. Studies to date suggest that individuals with ASD vary greatly in their intellectual performance. Currently, only two empirical studies have examined the cognitive profiles of gifted individuals with ASD, and both of these studies utilized a case study design; thus, research in this area is significantly lacking. Research into the psychosocial functioning of individuals with ASD consistently indicates deficits in social skills functioning and adaptive behavior, and these deficits are greater than would be expected based on intellectual functioning. Many comorbid diagnoses are found to exist within this population as well.

The characteristics of gifted individuals with ASD are beginning to be investigated by researchers in the field of gifted education. Because of the overlap between characteristics of giftedness and those seen in high functioning children with ASD, problems of misdiagnosis and missed diagnosis are widespread. The term “twice exceptional” has been used to describe individuals who are both gifted and have a disability, including those with ASD. Most of the literature in this area, to date, is based on theory and classroom observations rather than empirical investigations. Researchers within the field agree on the importance of accurate diagnosis and intervention for these youth to address their needs associated with both giftedness and ASD because of the potential for academic underachievement and psychosocial maladjustment. Therefore, it is crucial that more extensive empirical research on this population be conducted to guide assessment and intervention for these youth.

Contribution of Present Study

The current study adds to the knowledge base on gifted children with ASD by having conducted an empirical, group design study examining the unique characteristics of gifted children with ASD. Additionally, this study allowed for the comparison of psychometric profiles of gifted children with and without ASD. The two groups of gifted individuals, those with and without ASD, were compared across the domains of intellectual functioning, psychosocial/behavioral functioning, social skills, and adaptive behavior. This study is unique in that it is the first to examine these domains of functioning in gifted individuals with ASD using a group study design, as well as the first to make empirical comparisons of characteristics of gifted children with and without ASD using a group study design. Furthermore, this study has significant implications for

diagnosis of ASD in gifted populations. The inclusion of a control group of intellectually gifted children without ASD aids in defining crucial diagnostic elements of ASD within the gifted population. Finally, the results of this study provide an empirical foundation upon which to begin research on effective interventions for this twice exceptional population within the classroom in order to best meet the unique needs associated with ASD and giftedness.

Research Questions and Hypotheses of Present Study

Results of the present study allow an examination of the characteristics of gifted children without ASD and gifted children with ASD across the domains of intellectual ability, adaptive functioning, psychosocial/behavioral functioning, and social skills. More importantly, the present study answers the primary research question as follows: how do intellectually gifted youth with and without ASD compare across the domains of intellectual functioning, adaptive functioning, psychosocial/behavioral functioning, and social skills? These questions were examined via evaluation of each of these domains using standardized assessment tools. This study is largely exploratory in nature due to it being the first to examine differences between gifted youth with and without ASD in the domains described using an empirical, group study design. However, the following hypotheses were posited for each research question based on the existing literature:

Question 1: How do gifted youth with and without ASD differ in the domain of intellectual functioning (as measured by the WISC-IV or WAIS-III)?

Hypothesis 1: Based on the limited empirical literature that has examined cognitive functioning in gifted youth, it was hypothesized that the youth in this study would demonstrate generally above average to superior cognitive functioning in the

domains assessed (e.g., verbal comprehension, perceptual reasoning, working memory, and processing speed). The literature on cognitive profiles in youth with high functioning ASD suggests processing speed to be an area of relative weakness. Specifically, several studies found youth with ASD demonstrate a relative weakness on the Coding subtest, one of two subtests comprising the PSI (Barnhill et al., 2000; Ehlers et al., 2000; Ozonoff et al., 2000; Mayes & Calhoun, 2003b). Furthermore, the two studies that have examined intellectual profiles in gifted youth with ASD have found the PSI to be significantly lower than the other index scores (Assouline et al., 2009; Huber, 2007). Therefore, it was hypothesized that the participants in the ASD group of this study would show a similar weakness on the PSI, with a mean score in the Average to Below Average range. Because inclusion criteria for the study required a verbal or nonverbal index within the Very Superior range on the WISC-IV or WAIS-III, no differences between groups were hypothesized in these areas.

Question 2: How do gifted youth with and without ASD differ in the domain of adaptive functioning (as measured by the Vineland-II)?

Hypothesis 2: There is no evidence in the existing literature to suggest that gifted youth without ASD have deficits in adaptive functioning. However, existing literature on youth with ASD indicates that this population demonstrates significant deficits in adaptive functioning, regardless of intellectual ability (e.g., Assouline et al., 2009; Bölte & Poustka, 2002; Klin et al., 2007; Saulnier & Klin, 2007; Tomanik et al., 2007). Estimates of adaptive functioning are 1 to 3 standard deviations below the mean, with greatest weaknesses in the area of socialization (Klin et al., 2007). Therefore, it was hypothesized that the gifted youth with ASD in this study would demonstrate deficits in

adaptive functioning with scores falling 1 to 2 standard deviations below the mean; greatest deficits were hypothesized to be within the Socialization domain. Furthermore, it was hypothesized that gifted youth without ASD would have significantly higher scores on all Vineland-II domains than gifted youth with ASD, and that the largest difference would be in the domain of Socialization.

Question 3: How do gifted youth with and without ASD differ in the domain of psychosocial/behavioral functioning (as measured by the BASC-2)?

Hypothesis 3: The existing literature on gifted youth suggests that, as a group, gifted children are no more likely than their peers to suffer social or emotional difficulties (Gross, 2002; Lehman & Erdwins, 1981; Neihart, 2002; Rost, & Czeschlik, 2004; Touq, Kamal, & Fada, 1998; Vialle, Heaven, & Ciarrochi, 2007; Webb et al. 2005). Therefore, mean psychosocial/behavior functioning for this group is expected to be rated as within the Average to Above Average range. Studies on psychosocial functioning using the BASC-2 in youth with ASD indicate that few youth endorse significant concerns, but some self-report elevations in social stress, atypicality and sense of inadequacy (Reynolds & Kamphaus). Parents and teachers report concerns in the areas of atypicality, withdrawal, adaptability, social skills, and functional communication (Reynolds & Kamphaus, 2004). Based on this information, it was hypothesized that youth with ASD would endorse concerns in the areas of social stress, atypicality, and sense of inadequacy, and that their parents and teachers would endorse concerns in the areas of atypicality, withdrawal, adaptability, social skills, and functional communication. Consequently, the overall hypothesis for expected differences between gifted youth with and without ASD in the domain of social/behavioral functioning was as follows: the group of youth with

ASD would have significantly more elevations on the BASC-2 than the group of youth without ASD, particularly in the areas of social stress, atypicality, and sense of inadequacy on the self-report form and in the areas of atypicality, withdrawal, adaptability, social skills, and functional communication on the parent- and teacher-report forms.

Question 4: How do gifted youth with and without ASD differ in the domain of social skills functioning (as measured by the SSRS)?

Hypothesis 4: Social skills deficits have not consistently been found to be associated with intellectual giftedness via empirical investigation (Gross, 2002; Lehman & Erdwins, 1981; Neihart, 2002; Rost, & Czeschlik, 2004; Touq, Kamal, & Fada, 1998; Vialle, Heaven, & Ciarrochi, 2007; Webb et al. 2005). Therefore, mean social skills functioning for this group is expected to be rated as within the Average range. However, gifted youth with ASD were hypothesized to demonstrate significant deficits in social skills on the basis that impairment in social functioning is central to the diagnostic criteria for AD, AS, and PDD-NOS, as well as previous findings of social skills deficits using the SSRS with youth with ASD (APA, 2000; Macintosh & Dissanayake, 2006). Overall, it was hypothesized that the group of youth with ASD would demonstrate significantly greater social skills difficulties, as measured by the SSRS, than the group of youth without ASD on the basis that deficits in social functioning is a hallmark of ASD (APA, 2000; Macintosh & Dissanayake, 2006).

CHAPTER III

METHODOLOGY

Participants

Data from 81 school-age youth who had been identified as intellectually gifted were included in the present study. Intellectual giftedness was defined as achieving a score in the Very Superior Range with a Standard Score of 130 or above (within the 95% confidence interval) on the verbal or nonverbal index score of a standardized intelligence test. A score of 130 indicates intellectual ability at two standard deviations above the mean and represents functioning at or above the 98th percentile. Forty of the participants in this study also met DSM-IV-TR diagnostic criteria for an autism spectrum disorder (ASD); the remaining 41 participants did not meet diagnostic criteria for an Axis I or Axis II psychological disorder. All participants were between 5 and 17 years of age (kindergarten through grade twelve).

Participants in this study had previously completed a psychoeducational evaluation at the University of Iowa Connie Belin & Jacqueline N. Blank International Center for Gifted Education and Talent Development Assessment and Counseling Clinic (BBC-ACC). The mission of the BBC is to enhance the field of gifted education and talent development through research, training, and program development. The BBC-ACC serves to identify gifted learners and assess special learning needs through the provision of clinical, outreach, and consultation services to gifted youth, their families, and schools. The BBC-ACC is located in Iowa City, Iowa, and therefore primarily serves families within the state of Iowa. To provide a context for comparing the demographic distribution of the study participants, the following is a brief description of the demographic

distribution of the state of Iowa. In 2009, 93.9% of Iowa residents identified their racial/ethnic background as “White,” of whom 4.4% identified as Hispanic (State Data Center of Iowa, 2010). The percentage of Iowa residents identifying themselves as racial minorities in 2009 is as follows: 2.8% African American, 0.4% American Indian or Alaska Native, 1.7% Asian, and 1.1% indicated 2 or more races (State Data Center of Iowa).

As part of their evaluation through the BBC-ACC, all participants in the present study had previously completed the Wechsler Intelligence Scales and the Behavior Assessment System for Children either as part of a previous research study (Javits Grant Research Study of Twice-Exceptional Students; IRB #200512765) or through a parent or teacher referred private clinic evaluation. In addition, participants diagnosed with an ASD (e.g., Autistic Disorder; Asperger Syndrome; or Pervasive Developmental Disorder, Not Otherwise Specified) had previously completed a comprehensive diagnostic evaluation with a licensed psychologist trained in autism diagnosis. The comprehensive evaluation included measures of cognitive, academic, neuropsychological, adaptive, and psychosocial functioning, in addition to a thorough developmental history gained through the Autism Diagnostic Interview-Revised (ADI-R), and an evaluation of current symptomology through the Autism Observation Schedule (ADOS). ASD diagnoses were made in accordance with DSM-IV-TR diagnostic criteria (see Appendix A) and accompanying diagnostic guidelines. Standardized testing for each participant was completed by BBC-ACC staff including licensed clinical psychologists, a certified school psychologist, and advanced doctoral students (including the researcher).

Participants of this study met the following inclusion criteria. All participants had previously completed the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV) or the Wechsler Adult Intelligence Scale, Third Edition (WAIS-III) and the Behavior Assessment System for Children, Second Edition (BASC-2). Second, participants achieved a Standard Score of 130 or above (within the 95% confidence interval) in either the Verbal Comprehension Index, Perceptual Reasoning Index/Perceptual Organization Index, or the General Ability Index on the WISC-IV or WAIS-III. Third, participants in the ASD group were previously determined to meet DSM-IV-TR diagnostic criteria for Autistic Disorder; Asperger Syndrome; or Pervasive Developmental Disorder, Not Otherwise Specified following a comprehensive evaluation from a licensed psychologist research and clinically certified in autism assessment at the BBC-ACC. Finally, participants in the non-ASD group could not have been diagnosed with a DSM-IV-TR Axis I or Axis II psychological disorder.

Procedure

Parents of individuals who met the inclusion criteria for the present study based on their files at the BBC-ACC were sent an informational packet about the current study through the United States postal service. This packet included a cover letter explaining the current study and the IRB approved informed consent and assent documents. Once consent and assent for participation were obtained, participants were mailed the Social Skills Rating Scale – Parent Form and Student Form, as well as the Vineland Adaptive Behavior Scales – Second Edition, if it was not completed during the initial evaluation. Participants were provided a self-addressed, stamped envelope in which to return the completed forms. Of the 87 (41 ASD, 46 NonASD) participants contacted to participate

in the present study, 47 (22 ASD, 25 NonASD) completed the consent form and additional measures. In addition, 5 participants from the NonASD group were eliminated from the study due to a large amount of missing data.

In order to increase the total number of participants included in the present study, the IRB approved the use of a secondary data analysis in which all individuals who met inclusion criteria for the present study based on data contained in the BBC-ACC database could be included in the statistical analyses without completing the procedures described above. Participants included as part of the secondary analysis did not complete the SSRS Parent Form or Student Form. Participants in the non-ASD group that were included in the secondary analysis did not complete the Vineland-II. This resulted in the final total of 81 study participants (40 ASD, 41 NonASD).

The researcher accessed the assessment data from the BBC-ACC database with the permission of the Megan Foley Nicpon, Ph.D., Administrator for the BBC-ACC, Susan Assouline, Ph.D., Associate Director of the BBC, and Nicholas Colangelo, Ph.D., Director of the Belin-Blank Center. Relevant data from each participant's case file were de-identified and an identification number was randomly assigned to each participant. The data were entered into an electronic database.

Measures

Behavior Assessment System for Children, Second Edition

The Behavior Assessment System for Children, Second Edition (BASC-2) is designed to evaluate behavior and self-perceptions of individuals aged 2 through 25 years using a multimethod, multidimensional format (Reynolds & Kamphaus, 2004). It was specifically developed to "facilitate differential diagnosis of a variety of emotional and

behavioral disorders" (Reynolds & Kamphaus, p. 1). The components of the BASC-2 that were used in the present study include the Self-Report of Personality (SRP), Parent Rating Scale (PRS), and Teacher Rating Scale (TRS). For the SRP, the child responds true/false or based on a 4-point frequency scale (never = 1, sometimes = 2, often = 3, almost always = 4) on items tapping his or her emotions and self-perceptions. The SRP yields five composite scores, including School Problems, Internalizing Problems, Inattention/Hyperactivity, Personal Adjustment, and an overall composite called the Emotional Symptoms Index. The SRP yields the following clinical subscales: Anxiety, Attention Problems, Attitude to School, Attitude to Teachers, Atypicality, Depression, Hyperactivity, Locus of Control, Sensation Seeking, Sense of Inadequacy, Social Stress, and Somatization. The SRP yields the following adaptive subscales: Interpersonal Relations, Relations with Parents, Self-Esteem, and Self-Reliance. The Emotional Symptoms Index, Personal Adjustment Index, and all of the clinical and adaptive subscales were included in the present study.

The BASC-2 PRS measures adaptive and problem behaviors in the community and home, which the parent rates on a 4-point frequency scale (never = 1, sometimes = 2, often = 3, almost always = 4). The ratings yield scores in three domains: Internalizing Problems, Externalizing Problems, and Adaptive Skills. A Behavioral Symptoms Index score is also provided, which indicates the overall level of problem behaviors. The PRS yields the following clinical subscales: Aggression, Anxiety, Attention Problems, Atypicality, Conduct Problems, Depression, Hyperactivity, Somatization, and Withdrawal. The PRS yields the following adaptive subscales: Adaptability, Activities of Daily Living, Functional Communication, Leadership, and Social Skills. The Behavioral

Symptoms Index, Adaptive Skills Index, and all of the clinical and adaptive subscales were included in the present study.

The TRS measures adaptive and problem behaviors within the classroom, which the teacher rates on a 4-point frequency scale (never = 1, sometimes = 2, often = 3, almost always = 4). It is very similar to the PRS; however, the TRS also includes a School Problems composite and ratings of learning problems and study skills, and it does not include the Daily Living Skills scale. The TRS yields the following clinical subscales: Aggression, Anxiety, Attention Problems, Atypicality, Conduct Problems, Depression, Hyperactivity, Learning Problems, Somatization, and Withdrawal. The TRS yields the following adaptive subscales: Adaptability, Functional Communication, Leadership, Social Skills, and Study Skills. The Behavioral Symptoms Index, Adaptive Skills Index, and all of the clinical and adaptive subscales were included in the present study.

Item development for the BASC-2 was based on reviews of other available behavior-rating scales and consultations with students, teachers, and clinicians experienced with children's behavior problems. Final item selection and factor analysis were based on the responses of more than 2,000 participants for each of the forms (SRP, PRS, and TRS). Normative data for both the general and clinical groups came from these samples. The general and clinical norms are reported separately for gender and age and are reportedly demographically representative of the U.S. population in the areas of race, parent education, geographic region, and clinical or special education classification. The clinical norm samples were drawn from special education classrooms, community mental health centers, and university-based clinic settings.

Reliability measures for the SRP, PRS, and TRS suggest good internal consistency for both scale and composite scores and excellent test-retest reliability (greater than .80). The validity of the SRP, PRS, and TRS is supported by the results of factor analyses consistent with scale composition, strong correlations with other instruments which assess emotional and behavioral symptoms in children, and consistency between the results of this measure and the clinical diagnoses of the child being assessed.

Social Skills Rating System

The Social Skills Rating System (SSRS) provides a broad assessment of social behaviors in youth in kindergarten through 12th grade within the domains of Cooperation, Assertion, Responsibility, Empathy, and Self-Control (Gresham & Elliott, 1990). Scores from these domains are summed to generate a Social Skills Scale. A Problem Behaviors Scale is also provided with three subscales: Externalizing Problems, Internalizing Problems, and Hyperactivity. The Social Skills Scale and Problem Behaviors Scale were included in the present study. The components of the SSRS used in the present study include the Student Form and Parent Form. Both components involve responders to indicate the frequency of specific behaviors (never = 0, sometimes = 1, and very often = 2). The two forms differ in that the Student Form does not include the Responsibility domain or a Problem Behavior Scale and the Parent Form does not include the Empathy domain.

Development of the SSRS followed research on social behavior in childhood, theoretical rationale, existing measures of social behavior, tryout testing, and nationwide standardization in 1988. The measure was standardized on 4,170 children (grades 3

through 10) and 1,027 parents (children grades kindergarten through 12). The sample was generally representative of the U.S. population in 1985 with regard to sex, race, geographic region, and community size. Subgroups of students with various disabilities were included in the standardization sample at rates higher than typically found in the general population.

High reliability was demonstrated through measures of internal consistency and test-retest reliability. Inter-rater reliability is not reported because students and parents were expected to differ in their responses. This measure demonstrated good internal consistency across components, with a median coefficient of .90 for the Social Skills Scale and .84 for the Problem Behavior Scale. Temporal stability of this measure was supported with test-retest reliabilities ranging from .68 to .87 across components. The Parent Form generally yielded higher test-retest reliability coefficients than the Student Form. The validity of the SSRS is supported by the results of an extensive literature review, consultation with parents and teachers on the importance of specific social behaviors, a confirmatory factor analysis, and correlations with other measures of social and problem behavior.

Vineland Adaptive Behavior Scales, Second Edition

The Vineland Adaptive Behavior Scales, Second Edition (Vineland-II) provides a measure of an individual's adaptive functioning skills and the ability to meet the demands of daily living in four core domains: Communication, Daily Living Skills, Socialization, and Motor Skills (Sparrow, Cichetti, & Balla, 2005). Scores from these four domains are combined to yield an overall Adaptive Behavior Composite. The present study included the Adaptive Behavior Composite, Communication domain, Daily Living Skills domain,

and Socialization domain. The present study used this measure to assess adaptive functioning in the participants. Of particular interest are participant scores in the Socialization domain in comparison to overall cognitive functioning and adaptive skills given that the literature has shown this domain to be an area of relative weakness for individuals with ASD (Assouline, Foley Nicpon, & Doobay, 2009; Bölte & Poustka, 2004; Carter et al., 1998; Klin et al., 2007; Tomanik, Pearson, Loveland, Lane, & Shaw, 2007).

The Vineland-II can be administered either as a semistructured Survey Interview or as a Parent/Caregiver Rating Form. Both formats were used in the present study (i.e., some participants completed the Vineland-II Survey Interview as part of their initial assessment in the clinic while others completed the Vineland-II Parent/Caregiver Rating Form at a later date solely for the purposes of this study). According to the Vineland-II manual, the two administration formats have been shown to be equivalent and can be used interchangeably as is evidenced by the statement, "the results of this comparison show that scores from the Survey Interview Form and the Parent/Caregiver Form agree as closely as do two administrations of either of the forms, indicating that the administration format does not significantly influence results" (Sparrow et al., p. 96). Both forms consist of 433 items that comprise the core domains. Each item describes a specific behavior and is rated on the frequency with which the child demonstrates the behavior (usually, sometimes, or never). For the Survey Interview Form, a trained interviewer makes the ratings based on parent responses to open-ended and specific questions and items are administered until a basal and ceiling level are established. For the Parent/Caregiver

Rating Form, parents or caregivers provide ratings for all items indicated based on the child's chronological age.

The Vineland-II standardization sample for the Survey Interview Form and Parent/Caregiver Rating Form consisted of 3,697 individuals aged birth through 90 years; the sample was reportedly representative of the U.S. population in March of 2001 with regard to race, SES, and geographic region. Disproportionately larger numbers of young children were included because of the rapid growth in adaptive skills that typically occurs during early development. An equal number of males and females were included, and the sample was controlled for community size and special education placement. Additionally, several clinical groups were included in the standardization sample, including children with ASDs. The Vineland-II was not validated on a subgroup of gifted children, but previous research has demonstrated this measure's ability to successfully identify adaptive impairments in gifted children with ASD (Huber, 2007).

Evidence of reliability for the Vineland-II includes adequate internal consistency (.70 to .96 for the core domains and .91 to .98 for the Adaptive Behavior Composite) and inter-rater reliability (.68 to .93), as well as good test-retest reliability (.85 or higher for the core domains). The Vineland-II manual also provides evidence of construct, content, and criterion-related validity. Construct validity for this measure includes the results of confirmatory factor analysis and principal components analysis as well as the progression of mean raw scores across domains by age. The Vineland-II results were also found correlate highly with measures of cognitive ability and other measures of adaptive behavior. Item development was based on the adaptive behavior and child development literature as well as through consultation with educators and clinicians.

Wechsler Adult Intelligence Scale, Third Edition

The Wechsler Adult Intelligence Scale, Third Edition (WAIS-III) assesses cognitive functioning across four domains (Verbal Comprehension [VCI], Perceptual Organization [POI], Working Memory [WMI], and Processing Speed [PSI]; Wechsler, 2002). The Verbal Comprehension Index and Working Memory Index comprise the Verbal Scale; the Perceptual Organization Index and the Processing Speed Index comprise the Performance Scale. In addition, the Full Scale Intelligence Quotient (FSIQ) is comprised of all core subtests. In the present study, the WAIS-III was used to examine the cognitive profiles of participants between the ages of 16 and 18 years. Standard scores, percentiles, and confidence intervals are provided for performance in each of the four domains and overall intellectual functioning (Full Scale IQ [FSIQ]). The WAIS-III core battery includes 13 subtests: Similarities, Vocabulary, and Information in the Verbal Comprehension domain; Comprehension contributes to the Verbal Scale but is not included in the Verbal Comprehension Index; Block Design, Picture Completion, and Matrix Reasoning in the Perceptual Organization domain; Picture Arrangement contributes to the Performance Scale but is not included in the Perceptual Organization Index; Arithmetic, Digit Span and Letter-Number Sequencing in the Working Memory domain; and Coding and Symbol Search in the Processing Speed domain. Full scale and Index scores have a mean of 100 and a standard deviation of 15. FSIQ scores range from 45 to 155; Verbal Comprehension Perceptual Organization, and Working Memory Index scores range from 50 to 150; and Processing Speed Index scores range from 54 to 150. Subtest scores have a mean of 10, a standard deviation of 3, and a range of 1 to 19.

WAIS-III development is described in detail in the technical manual. The standardization sample consisted of 2,450 individuals aged 16 to 89 years. A stratified sampling plan was used so that the demographics of the sample (i.e., age, sex, race, educational level, geographic region) would be representative of the U.S. population based on the 1995 census data. The WAIS-III has demonstrated strong reliability across measures of internal consistency, standard error of measurement, test-retest, and inter-scorer reliability. Average split-half reliability coefficients ranged from .82 to .93 for WAIS-III subtests and from .88 to .97 for composite scores. Test-retest reliability coefficients ranged from the .70s to the .90s for subtest scores and were in the .90s for composite scores, indicating fairly good to excellent reliability. Reliability coefficients for inter-scorer agreement were within the .90s for all subtests. The validity of the WAIS-III in measuring cognitive abilities and global intellectual functioning is supported by evidence of content and construct validity. The technical manual provides a detailed explanation of the test content and rationale based on theory and expert review. Evidence that the adolescent or adult engaged in the expected cognitive processes when responding to subtests was provided through literature reviews, expert consultation, and empirical testing. Intercorrelation studies were used to assess convergent and discriminant validity; results of these studies in addition to the results of exploratory and confirmatory factor analyses, supported the domain structure of the WAIS-III. Finally, the validity of this measure was further established through evidence of high correlations between the WAIS-III and similar measures of intellectual functioning.

Wechsler Intelligence Scale for Children, Fourth Edition

The Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV) assesses cognitive functioning across four domains (Verbal Comprehension [VCI], Perceptual Reasoning [PRI], Working Memory [WMI], and Processing Speed [PSI]; Wechsler, 2003). Composite scores for the WISC-IV include the Full Scale Intelligence Quotient (FSIQ), which is comprised of all core subtests, and the General Ability Index (GAI), which is comprised of VCI and PRI core subtests only. In the present study, the WISC-IV was used to examine the cognitive profiles of participants between the ages of 6 and 15 years. Standard scores, percentiles, and confidence intervals are provided for performance in each of the four domains and overall intellectual functioning (Full Scale IQ [FSIQ]). The WISC-IV core battery includes 10 subtests: Similarities, Vocabulary, and Comprehension in the Verbal Comprehension domain; Block Design, Picture Concepts, and Matrix Reasoning in the Perceptual Reasoning domain; Digit Span and Letter-Number Sequencing in the Working Memory domain; and Coding and Symbol Search in the Processing Speed domain. Full scale and Index scores have a mean of 100 and a standard deviation of 15. FSIQ scores range from 40 to 160, Verbal Comprehension and Perceptual Reasoning Index scores range from 45 to 155, and Working Memory and Processing Speed Index scores range from 50 to 150. Subtest scores have a mean of 10, a standard deviation of 3, and a range of 1 to 19.

The development of the WISC-IV, which included pilot and national tryout studies, is described in detail in the manual. The standardization sample consisted of 2,200 children aged 6:0 to 16:11. The measure was also standardized on a number of subpopulations, including youth diagnosed with autism or AS and students in gifted

education programs. The demographics of the sample (i.e., age, sex, race, parent education level, geographic region) were designed to be representative of the U.S. population based on the March 2000 census data. The WISC-IV has demonstrated strong reliability across measures of internal consistency, standard error of measurement, test-retest, and inter-scorer reliability. Average split-half reliability coefficients ranged from .79 to .90 for WISC-IV subtests and from .88 to .97 for composite scores. Test-retest reliability coefficients ranged from the .70s to the .90s for subtest scores and were in the .80s and .90s for composite scores, indicating adequate to excellent reliability. Reliability coefficients for inter-scorer agreement were between .95 and .99 for all subtests. The validity of the WISC-IV in measuring cognitive abilities and global intellectual functioning is supported by evidence of content and construct validity. The technical manual provides an in depth explanation of the test content and rationale based on theory and expert review. Evidence that the child engaged in the expected cognitive processes when responding to subtests was provided through literature reviews, expert consultation, and empirical testing. Intercorrelation studies were used to assess convergent and discriminant validity; results of both exploratory and confirmatory factor analysis supported the domain structure of the WISC-IV. Finally, the validity of this measure was further established through evidence of high correlations between the WISC-IV and similar measures. Specifically, the correlation between the WISC-IV FSIQ and WAIS-III FSIQ is .89, which is equal to the correlation between the WISC-IV FSIQ and the WISC-III FSIQ (Flanagan & Kaufman, 2004). The VCI of the WISC-IV and WAIS-III have a correlation of .86; the PRI of the WISC-IV and WAIS-III have a correlation of .76. In

general, scores on the WISC-IV have been found to be highly correlated with corresponding indices on the other Wechsler scales.

CHAPTER IV

RESULTS

The purpose of this chapter is to outline the results of the statistical analyses performed in the present study. All statistical analyses were run using SPSS version 17.0 for Windows. Comparisons between gifted youth with ASD and gifted youth without ASD on composite measures of intellectual functioning, adaptive functioning, psychosocial/behavioral functioning, and social skills were made using *t* tests. Main effects and interactions for intellectual functioning, adaptive functioning, psychosocial/behavioral functioning, and social skills in gifted youth with and without ASD were calculated using split-plot ANOVAs. The between subject main effects and interaction effects were of particular interest in the present study. Finally, follow-up *t* tests were conducted to determine significance between subscales. Across all of the analyses, power for detecting large effect sizes (.5 sd) ranges from .80 to .99 and for moderate effect sizes (.3 sd), power is between .55 and .75. Given the number of comparisons being made, a conservative alpha level of 0.01was set.

Demographics and Descriptive Statistics

A review of the BBC-ACC database yielded 86 possible participants. Of these, 40 had a diagnosis of ASD and 46 had no DSM-IV-TR Axis I or Axis II psychological diagnosis. Existing data for all 40 participants (34 males, 6 females) in the ASD group were included in the present analyses. In addition, 22 of these 40 participants completed the SSRS for the present study. Five participants from the non-ASD group were eliminated from the study due to a large amount of missing data, which resulted in a total non-ASD sample of 41 participants (21 males, 20 females). Of those 41 participants, 25

completed the Vineland-II and the SSRS for the present study. All available data for the remaining 81 participants were included in the analyses. Because many of the participants did not have data for every measure completed as part of this study, sample size varies by measure.

Table 4.1 provides demographic information for the 81 participants included in the analyses. An examination of participant demographics reveals a large difference between groups on gender distribution. In the ASD group, 85% of participants were male, while 51% of the NonASD group was male. However, this difference in gender distribution is expected given the gender differences in ASD reported in the literature (Fombonne, 2005). A majority of the sample in both the ASD and NonASD groups identified as Caucasian (87.5% and 73.2%, respectively).

Educational variables that indicate participation in gifted or special education services were included. Twenty-five percent of youth in the ASD group received whole grade acceleration, whereas 7.3% of the NonASD group were whole grade accelerated. Forty-five percent of youth in the ASD group and 48.8% of the youth in the NonASD group were single-subject accelerated. Seventy-five percent of youth in the ASD group reported participating in talented and gifted programming, and 56.1% of youth in the NonASD group reported participating in talented and gifted programming. In the ASD group, 12.5% of youth received special education services and 42.5% received tutoring. None of the participants in the NonASD group reported receiving special education services or tutoring.

Table 4.1.

Demographic Information

	ASD		NonASD		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Sex						
Male	34	85.0	21	51.2	55	67.9
Female	6	15.0	20	48.8	26	32.1
Race						
Caucasian	35	87.5	30	73.2	65	80.2
Hispanic	2	5.0	0	0.0	2	2.5
Asian	1	2.5	1	2.4	2	2.5
Multiple	1	2.5	0	0.0	1	1.2
Not Reported	1	2.5	10	24.4	11	13.6
Whole Grade Acceleration						
Yes	10	25.0	3	7.3	13	16.0
No	30	75.0	38	92.7	68	84.0
Subject Acceleration						
Yes	18	45.0	20	48.8	38	46.9
No	22	55.0	21	51.2	43	53.1
Talented and Gifted Program						
Yes	30	75.0	23	56.1	53	65.4
No	10	25.0	18	43.9	28	34.6

Table 4.1. Continued

Special Education						
Yes	5	12.5	0	0.0	5	6.5
No	35	87.5	41	100.00	76	93.8
Tutoring						
Yes	17	42.5	0	0.0	17	21.0
No	23	57.5	41	100.00	64	79.0
Diagnosis						
None	0	0.0	41	100.00	41	50.6
AD	13	32.5	0	0.0	13	16.0
AS	17	42.5	0	0.0	17	21.0
PDD-NOS	10	25.0	0	0.0	10	12.4

Note. ASD = participants with autism spectrum disorder; NonASD = participants without autism spectrum disorder; AD = Autistic Disorder; AS = Asperger Syndrome; PDD-NOS = Pervasive Developmental Disorder Not Otherwise Specified.

Table 4.2 provides descriptive statistics on age and grade level. Mean age for the ASD group and NonASD group were 10.76 and 9.43, respectively. Ages ranged from 5 to 17 years for the ASD group and 6 to 16 years for the NonASD group. Mean grade for the ASD and NonASD groups were 5.33 and 3.90, respectively. Grade level ranged from kindergarten to grade 12 for the ASD group and kindergarten through grade 10 for the NonASD group.

Table 4.2.

Descriptive Statistics for Age and Grade

Variable	N	Mean	Standard Deviation	Min	Max
Age					
ASD	40	10.76	3.26	5.6	17.9
NonASD	41	9.43	2.30	6.1	16.2
Total	81	10.09	2.88	5.6	17.9
Grade					
ASD	40	5.33	3.39	K	12
NonASD	41	3.90	2.30	K	10
Total	81	4.60	2.96	K	12

Note. ASD = participants with autism spectrum disorder; NonASD = participants without autism spectrum disorder.

Wechsler Intelligence Scale

A total of 81 participants (40 ASD, 41 NonASD) were included in the analysis of group differences on the Wechsler Intelligence Scale. Descriptive statistics for the Wechsler Intelligence Scale are reported in Table 4.3. All Wechsler Intelligence Scale scores are reported as Standard Scores (M = 100, SD =15). An independent samples t test was conducted to determine mean group differences on the Wechsler Full Scale Intelligence Quotient (FSIQ). No statistical difference was found between the ASD (M =124.90, SD = 9.96) and the NonASD group (M =127.88, SD = 9.31) on FSIQ $t(79) = 1.39$, $p = .168$.

A split-plot ANOVA was conducted to examine differences between groups on the Wechsler Intelligence Scale Index scores. Of interest in the present study are the between subjects main effect and the interaction effect. The main effect was significant,

indicating a significant difference between groups on the Wechsler Intelligence Scale Index scores, $F(1, 79) = 7.49$, $p = .008$, $\eta_p^2 = .09$. The interaction effect was also statistically significant, $F(3, 237) = 6.21$, $p < .001$, $\eta_p^2 = .07$. The results of the Wechsler Intelligence Scale ANOVA are summarized in table 4.4.

Follow-up independent samples *t* tests were conducted to examine the differences between groups for each Wechsler Intelligence Scale Index score. No significant differences were found between groups for mean scores on the Verbal Comprehension Index, Perceptual Reasoning Index, or the Working Memory Index. However, a statistically significant difference was found between the ASD group ($M = 96.43$, $SD = 16.49$) and the NonASD group ($M = 110.41$, $SD = 16.24$) on the Processing Speed Index, $t(79) = 3.85$, $p < .001$. This finding is consistent with previous studies demonstrating relatively lower performance on the Processing Speed Index in comparison to other index scores. Also consistent with expectations based on previous studies, these results suggest that participants in the ASD group had significantly lower scores on the Processing Speed Index than participants in the NonASD group. Overall, the two groups demonstrated similar scores on the Verbal Comprehension Index, Perceptual Reasoning Index, and Working Memory Index; the ASD group demonstrated significantly lower performance than the NonASD group on the Processing Speed Index. The results of Wechsler Intelligence Scale independent sample *t* tests are summarized in Table 4.5 and represented graphically in Figure 4.1.

Table 4.3.

Descriptive Statistics for Wechsler Intelligence Scale

Variable	N	Mean	Standard Deviation	Min	Max
Wechsler Full Scale Intelligence Quotient					
ASD	40	124.90	9.96	105	151
NonASD	41	127.88	9.31	109	148
Total	81	126.41	9.69	105	151
Wechsler General Ability Index					
ASD	36	133.28	10.27	116	160
NonASD	41	132.95	9.03	116	153
Total	81	133.10	9.57	116	160
Wechsler Verbal Comprehension Index					
ASD	40	130.80	13.53	102	155
NonASD	41	127.44	11.41	100	152
Total	81	129.10	12.54	100	155
Wechsler Perceptual Reasoning Index/Perceptual Organization Index					
ASD	40	125.05	13.87	86	149
NonASD	41	128.05	10.12	102	147
Total	81	126.57	12.14	86	149
Wechsler Working Memory Index					
ASD	40	111.50	12.39	86	138
NonASD	41	116.29	13.00	88	148
Total	81	113.93	12.85	86	148
Wechsler Processing Speed Index					
ASD	40	96.43	16.49	68	126
NonASD	41	110.41	16.24	78	143
Total	81	103.51	17.72	68	143

Note. ASD = participants with autism spectrum disorder; NonASD = participants without autism spectrum disorder.

Table 4.4.

Split-Plot ANOVA for Wechsler Intelligence Scale

	Sum of Squares	*df*	Mean Squares	F	η_p^2	*p*
			Within subjects			
Wechsler Scales	34493.84	3	11497.95	68.59	.46	<.001
Interaction	3120.93	3	1040.31	6.21	.07	<.001
Error	39729.16	237	167.63			
			Between subjects			
Group	1717.45	1	1717.45	7.49	.09	.008
Error	18111.35	79	229.26			

Figure 4.1

Wechsler Standard Scores by Group

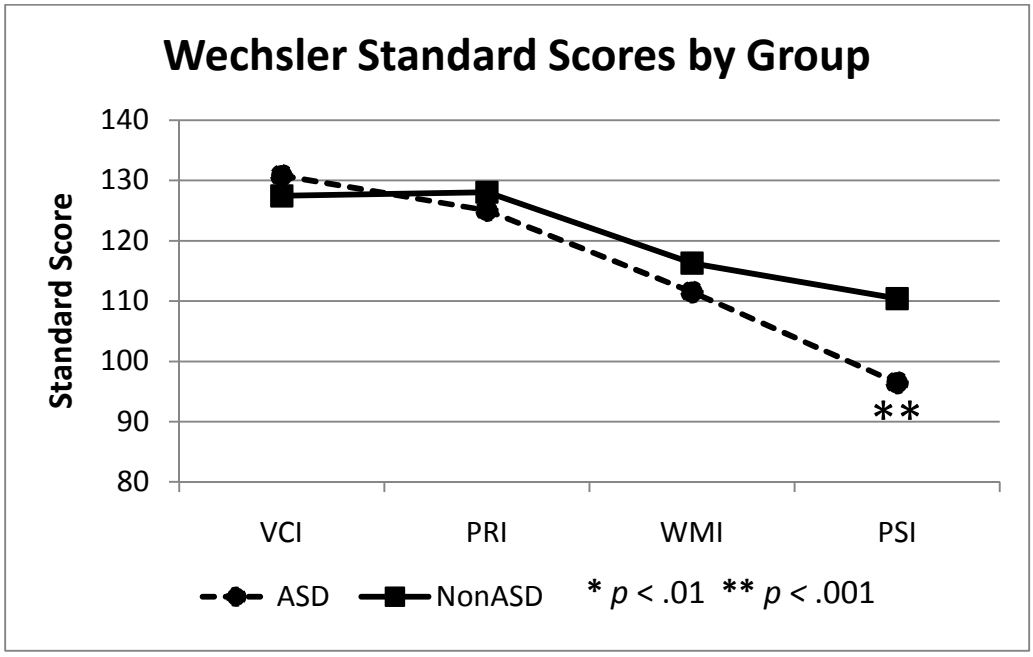


Table 4.5.

Comparisons of Means for Wechsler Intelligence Scale

	Mean Diff.	*df*	*t*	*p*
Verbal Comprehension Index	-3.36	79	-1.21	.230
Perceptual Reasoning Index	3.00	79	1.11	.269
Working Memory Index	4.79	79	1.70	.094
Processing Speed Index	13.99	79	3.85	< .001

Vineland Adaptive Behavior Scale

A total of 61 participants (36 ASD, 25 NonASD) were included in the analysis of group differences on the Vineland Adaptive Behavior Scales (Vineland-II). Descriptive statistics for the Vineland-II are reported in Table 4.6. All Vineland-II scores are reported as Standard Scores (M = 100, SD =15). An independent samples t test was conducted to determine mean group differences on the Vineland-II Adaptive Behavior Composite (ABC). Participants in the ASD group (M =83.56, SD = 7.95) were found to have significantly lower mean scores on the ABC than participants in the NonASD group (M =108.56, SD = 15.52), $t(59) = 8.25$, $p < .001$. This difference is also clinically significant with mean scores for the ASD group and NonASD group being within the Low Average range and Average range, respectively. These means are consistent with expectations based on the literature, which suggest youth with ASD demonstrate adaptive functioning deficits with scores 1 to 2 standard deviations below the mean.

A split-plot ANOVA was conducted to examine differences between groups on the Vineland-II Domain scores. Of interest in the present study are the between subjects main effect and the interaction effect. The main effect was significant, indicating a significant difference between groups on the Vineland-II Domain scores, $F(1, 62)$ =

64.81, $p < .001$, $\eta_p^2 = .51$. The interaction effect was also statistically significant, $F(2, 124) = 4.58$, $p < .001$, $\eta_p^2 = .07$. Further examination of the data reveals that the significant interaction effect is due to relatively greater differences between groups on the Socialization Domain score in comparison to the differences between groups on the other Domain scores. The results of the Vineland-II ANOVA are summarized in table 4.7.

Follow-up independent samples *t* tests were conducted to examine the differences between groups for each Vineland-II Domain score. Significant differences were found between groups on all three Domain scores. Specifically, the ASD group ($M = 92.18$, $SD = 11.55$) had significantly lower scores than the NonASD group ($M = 112.64$, $SD = 16.50$) on the Communication Domain, $t(62) = 5.84$, $p < .001$. These results are clinically significant with mean scores for the ASD group and NonASD group falling in the Average range and High Average range, respectively. The ASD group ($M = 88.49$, $SD = 12.48$) had significantly lower scores than the NonASD group ($M = 106.52$, $SD = 14.87$) on the Daily Living Skills Domain, $t(62) = 5.23$, $p < .001$. These results are clinically significant with mean scores for the ASD group and NonASD group falling in the Low Average range and Average range, respectively. The ASD group ($M = 76.54$, $SD = 11.73$) had significantly lower scores than the NonASD group ($M = 105.00$, $SD = 15.82$) on the Socialization Domain, $t(62) = 8.25$, $p < .001$. These results are clinically significant with mean scores for the ASD group and NonASD group falling in the Borderline range and Average range, respectively. The results of Vineland-II independent sample *t* tests are summarized in Table 4.8 and represented graphically in Figure 4.2.

In comparison to the existing literature on adaptive functioning in youth with ASD, these results are slightly higher than expected. Communication and Daily Living

Skills were expected to be 1 to 2 standard deviations below the mean, while observed mean scores were within 1 standard deviation for both measures. The literature suggests the Socialization score should be 2 to 3 standard deviations below the mean, while the observed mean score was between 1 and 2 standard deviations below the mean. Overall, results for the Vineland-II include a statistically significant main effect for group, interaction effect, and differences between each of the Domain scores with the ASD group demonstrating lower performance than the NonASD group in all areas.

Table 4.6

Descriptive Statistics for Vineland Adaptive Behavior Scale

Variable	N	Mean	Standard Deviation	Min	Max
Vineland-II Adaptive Behavior Composite					
ASD	36	83.56	7.95	70	95
NonASD	25	108.56	15.52	81	138
Total	61	93.80	16.94	70	138
Vineland-II Communication					
ASD	39	92.18	11.55	71	115
NonASD	25	112.64	16.50	84	138
Total	64	100.17	16.90	71	138
Vineland-II Daily Living Skills					
ASD	39	88.49	12.48	71	107
NonASD	25	106.52	14.87	85	142
Total	64	95.53	16.03	71	142
Vineland-II Socialization					
ASD	39	76.54	11.73	51	110
NonASD	25	105.00	15.82	71	127
Total	64	87.66	19.35	51	127

Note. ASD = participants with autism spectrum disorder; NonASD = participants without autism spectrum disorder.

Table 4.7

Split-Plot ANOVA for Vineland Adaptive Behavior Scale

	Sum of Squares	*df*	Mean Squares	F	η_p^2	*p*
			Within subjects			
Vineland-II	4162.51	2	2081.25	21.01	.25	<.001
Interaction	907.30	2	453.65	4.58	.07	<.001
Error	122283.27	124	99.06			
			Between subjects			
Group	22765.00	1	22765.00	64.81	.51	<.001
Error	21777.91	62	351.26			

Figure 4.2

Vineland-II Standard Scores by Group

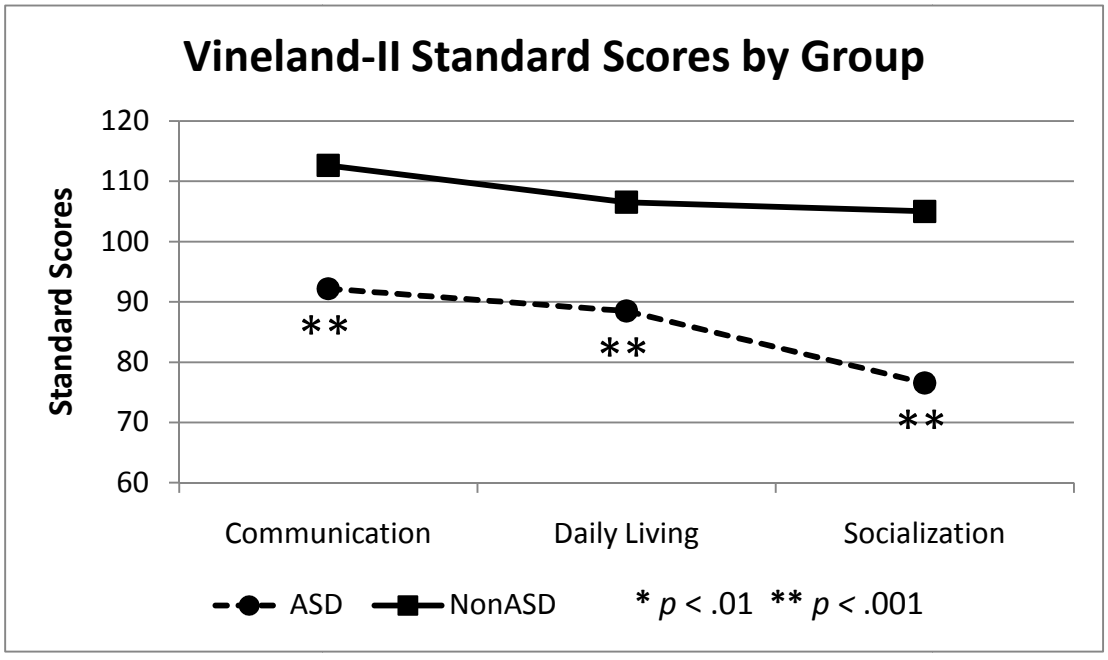


Table 4.8

Comparison of Means for Vineland Adaptive Behavior Scales

	Mean Diff.	*df*	*t*	*p*
Communication	20.46	62	5.84	< .001
Daily Living Skills	18.03	62	5.23	< .001
Socialization	28.46	62	8.25	< .001

Behavior Assessment System for Children

BASC-2 Parent Rating Scale

A total of 80 participants (40 ASD, 40 NonASD) were included in the analysis of group differences on the BASC-2 Parent Report Form (BASC-2 PRS). Descriptive statistics for the BASC-2 PRS are reported in Table 4.9. All BASC-2 PRS scores are reported as T-scores (M = 50, SD =10). Independent samples t tests were conducted to determine mean group differences on the BASC-2 PRS Index scores. Participants in the ASD group (M =70.80, SD = 9.90) were found to have significantly higher mean scores on the Behavioral Symptoms Index than participants in the NonASD group (M =49.58, SD = 8.65), $t(78) = -10.21$, $p < .001$. This difference is also clinically significant with means scores for the ASD group and NonASD group being within the Clinically Significant range and Average range, respectively, indicating parent-report of greater behavioral concerns in the ASD group than NonASD group. This result suggests greater psychosocial impairment in the ASD group than expected based on the literature, which reports the Behavioral Symptoms Index to be within the Average range for this group. Participants in the ASD group (M =37.08, SD = 5.47) were found to have significantly

lower mean scores on the Adaptive Skills Index than participants in the NonASD group (M =51.25, SD = 7.98), $t(78) = 9.28$, $p < .001$. This difference is also clinically significant with means scores for the ASD group and NonASD group being within the At Risk range and Average range, respectively, indicating parent-report of fewer adaptive skills in the ASD group than NonASD group. This finding suggests greater adaptive skill deficits as measured by the BASC-2 than reported in the literature, which suggests an Adaptive Skills Index within the Average range.

Two split-plot ANOVAs were conducted to examine differences between groups on the BASC-2 PRS subscale scores, one to examine differences on the Clinical Scales and one to examine differences on the Adaptive Scales. Of interest in the present study are the between subjects main effect and the interaction effect. The results indicate a significant difference between groups on the BASC-2 PRS Clinical Subscale scores, $F(1, 77) = 75.44$, $p < .001$, $\eta_p^2 = .49$. The interaction effect was also statistically significant, $F(8, 616) = 13.13$, $p < .001$, $\eta_p^2 = .15$. Further examination of the data reveals that the significant interaction effect is due to variability in the magnitude of the mean difference between groups. The results of the BASC-2 PRS Clinical Subscale ANOVA are summarized in table 4.10. Results further indicate a significant difference between groups on the BASC-2 PRS Adaptive Subscale scores, $F(1, 75) = 88.17$, $p < .001$, $\eta_p^2 = .54$. No significant difference was found for the interaction effect, $F(4, 300) = .49$, $p = .744$, $\eta_p^2 = .01$. The results of the BASC-2 PRS Adaptive Subscale ANOVA are summarized in table 4.11.

Follow-up independent samples t tests were conducted to examine the differences between groups for each BASC-2 PRS subscale. Although the interaction effect for the

Adaptive subscales was nonsignificant, independent samples *t* tests were conducted to explore possible trends for each of these subtests. No significant differences were found between groups on the Anxiety and Conduct Problems subscales; significant differences were found on all remaining subscales. The independent samples *t* test results are reported for the Clinical Scales first, followed by the Adaptive Scales. The results of BASC-2 PRS independent sample *t* tests are summarized in Table 4.12 and represented graphically in Figures 4.3 (Clinical Scales) and 4.4 (Adaptive Scales).

The ASD group (M = 57.18, SD = 10.78) had significantly higher scores than the NonASD group (M = 51.00, SD = 8.63) on the Aggression scale, $t(78) = -5.84$, $p = .006$; these means are both within the Average range and are not clinically significant. The ASD group (M = 61.55, SD = 6.08) had significantly higher scores than the NonASD group (M = 49.13, SD = 10.82) on the Attention Problems scale, $t(78) = -6.33$, , $p < .001$; these means are also clinically significant with scores for the ASD group in the At Risk range and scores for the NonASD group in the Average range. The ASD group (M = 76.38, SD = 13.28) had significantly higher scores than the NonASD group (M = 49.08, SD = 9.10) on the Atypicality scale, $t(78) = -10.72$, , $p < .001$; these means are also clinically significant with scores for the ASD group in the Clinically Significant range and scores for the NonASD group in the Average range. The ASD group (M = 64.75, SD = 13.24) had significantly higher scores than the NonASD group (M = 49.05, SD = 8.41) on the Depression scale, $t(78) = -6.33$, , $p < .001$; these means are also clinically significant with scores for the ASD group in the At Risk range and scores for the NonASD group in the Average range. The ASD group (M = 64.70, SD = 14.80) had significantly higher scores than the NonASD group (M = 49.80, SD = 11.48) on the

Hyperactivity scale, $t(78) = -5.03$, , $p < .001$; these means are also clinically significant with scores for the ASD group in the At Risk range and scores for the NonASD group in the Average range. The ASD group ($M = 57.30$, $SD = 16.95$) had significantly higher scores than the NonASD group ($M = 46.38$, $SD = 9.06$) on the Somatization scale, $t(78) = -3.59$, $p = .001$; these means are both within the Average range and are not clinically significant. The ASD group ($M = 71.80$, $SD = 14.18$) had significantly higher scores than the NonASD group ($M = 50.40$, $SD = 8.54$) on the Withdrawal scale, $t(78) = -8.18$, $p < .001$; these means are also clinically significant with scores for the ASD group in the Clinically Significant range and scores for the NonASD group in the Average range. These results suggest greater psychosocial difficulties in the ASD group than expected based on the existing literature which has only found consistent elevations on the atypicality and withdrawal clinical subscales.

The ASD group ($M = 35.10$, $SD = 7.95$) had significantly lower scores than the NonASD group ($M = 48.40$, $SD = 8.43$) on the Adaptability scale, $t(78) = 7.28$, $p < .001$; these means are also clinically significant with scores for the ASD group in the At Risk range and scores for the NonASD group in the Average range. The ASD group ($M = 35.18$, $SD = 8.17$) had significantly lower scores than the NonASD group ($M = 46.79$, $SD = 12.41$) on the Activities of Daily Living scale, $t(76) = 4.90$, , $p < .001$; these means are also clinically significant with scores for the ASD group in the At Risk range and scores for the NonASD group in the Average range. The ASD group ($M = 42.93$, $SD = 9.06$) had significantly lower scores than the NonASD group ($M = 53.34$, $SD = 11.43$) on the Functional Communication scale, $t(76) = 4.47$, $p < .001$; these means are both within the Average range and are not clinically significant. The ASD group ($M = 43.83$, $SD = 5.61$)

had significantly lower scores than the NonASD group (M = 52.25, SD = 7.81) on the Leadership scale, $t(78) = 7.51$, $p < .001$; these means are both within the Average range and are not clinically significant. The ASD group (M = 37.93, SD = 9.00) had significantly lower scores than the NonASD group (M = 49.13, SD = 9.34) on the Social Skills scale, $t(78) = 5.46$, $p < .001$; these means are also clinically significant with scores for the ASD group in the At Risk range and scores for the NonASD group in the Average range. These results are generally consistent with expectations based on the existing literature which has found elevations on the adaptability, functional communication, and social skills subscales. The present group of youth with ASD demonstrated relatively poorer skills in the area of activities of Daily Living but relatively better performance in Functional Communication.

In summary, results of the BASC-2 PRS are as follows. A significant main effect for group was found for the clinical scales and adaptive skills. A significant interaction effect was found for the clinical scales. Statistically and clinically significant differences (i.e., NonASD group with scores in the Average range and ASD group with scores in the At Risk or Clinically Significant range) were found between groups on the Behavioral Symptoms Index and Adaptive Skills Index in addition to the following subscales: Attention Problems, Atypicality, Depression, Hyperactivity, Withdrawal, Adaptability, Activities of Daily Living, and Social Skills. Statistically significant differences were also found between groups on the Aggression, Somatization, and Functional Communication subscales, but both groups demonstrated scores within the Average range on these subscales.

Table 4.9

Descriptive Statistics for BASC-2 Parent Rating Scale

Variable	N	Mean	Standard Deviation	Min	Max
BASC-2 PRS Behavioral Symptoms Index					
ASD	34	70.80	9.90	50	95
NonASD	36	49.58	8.65	38	69
Total	70	60.19	14.12	38	95
BASC-2 PRS Adaptive Skills Index					
ASD	40	37.08	5.47	30	54
NonASD	40	51.25	7.98	38	72
Total	80	44.26	9.84	30	72
BASC-2 PRS Adaptability					
ASD	40	35.10	7.95	16	54
NonASD	40	48.40	8.43	34	70
Total	80	41.75	10.54	16	70
BASC-2 PRS Activities of Daily Living					
ASD	40	35.18	8.17	20	56
NonASD	38	46.79	12.41	32	66
Total	78	41.36	11.03	20	66
BASC-2 PRS Aggression					
ASD	40	57.18	10.78	40	84
NonASD	40	51.00	8.63	39	75
Total	80	54.09	10.19	39	84
BASC-2 PRS Anxiety					
ASD	39	56.77	14.21	33	94
NonASD	40	50.05	10.07	31	82
Total	79	53.37	12.67	31	94
BASC-2 PRS Attention Problems					
ASD	40	61.55	6.08	41	71
NonASD	40	49.13	10.82	33	70
Total	80	55.34	10.73	33	71
BASC-2 PRS Atypicality					
ASD	40	76.38	13.28	46	100
NonASD	40	49.08	9.10	41	75
Total	80	62.72	17.79	41	100

Table 4.9. Continued

BASC-2 PRS Conduct Problems					
ASD	40	55.45	10.78	39	82
NonASD	40	50.80	7.89	34	68
Total	80	53.12	9.67	34	82
BASC-2 PRS Depression					
ASD	40	64.75	13.24	47	108
NonASD	40	49.05	8.41	37	68
Total	80	56.90	13.56	37	108
BASC-2 PRS Functional Communication					
ASD	40	42.93	9.06	23	62
NonASD	38	53.34	11.43	42	67
Total	78	48.62	10.14	23	67
BASC-2 PRS Hyperactivity					
ASD	40	64.70	14.80	40	96
NonASD	40	49.80	11.48	35	91
Total	80	57.25	15.14	35	96
BASC-2 PRS Leadership					
ASD	40	43.83	5.61	33	59
NonASD	40	55.25	7.81	45	73
Total	80	49.54	8.87	33	73
BASC-2 PRS Social Skills					
ASD	40	37.93	9.00	23	71
NonASD	40	49.13	9.34	29	71
Total	80	43.52	10.71	23	71
BASC-2 PRS Somatization					
ASD	40	57.30	16.95	36	110
NonASD	40	46.38	9.06	35	68
Total	80	51.83	14.58	35	110
BASC-2 PRS Withdrawal					
ASD	40	71.80	14.18	47	109
NonASD	40	50.40	8.54	38	67
Total	80	61.10	15.85	38	109

Note. ASD = participants with autism spectrum disorder; NonASD = participants without autism spectrum disorder; BASC-2 = Behavior Assessment System for Children, 2nd Edition; PRS = Parent Rating Scale.

Table 4.10

Split-Plot ANOVA for BASC-2 Parent Rating Scale Clinical Subscales

	Sum of Squares	*df*	Mean Squares	F	η_p^2	*p*
			Within subjects			
BASC-2 PRS	9133.89	8	1141.74	12.87	.14	<.001
Interaction	9318.29	8	1164.79	13.13	.15	<.001
Error	54641.49	616	88.70			
			Between subjects			
Group	33051.69	1	33051.69	75.44	.49	<.001
Error	33735.80	77	438.13			

Note. BASC-2 = Behavior Assessment Scale for Children, 2nd Edition; PRS = Parent Rating Scale.

Table 4.11

Split-Plot ANOVA for BASC-2 Parent Rating Scale Adaptive Subscales

	Sum of Squares	*df*	Mean Squares	F	η_p^2	*p*
			Within subjects			
BASC-2 PRS	4381.25	4	1095.31	24.20	.24	<.001
Interaction	88.45	4	22.11	.49	.01	.744
Error	13576.46	300	45.25			
			Between subjects			
Group	14505.71	1	14505.71	88.17	.54	<.001
Error	12339.32	75	164.52			

Note. BASC-2 = Behavior Assessment Scale for Children, 2nd Edition; PRS = Parent Rating Scale.

Figure 4.3

BASC-2 PRS Clinical T-Scores by Group

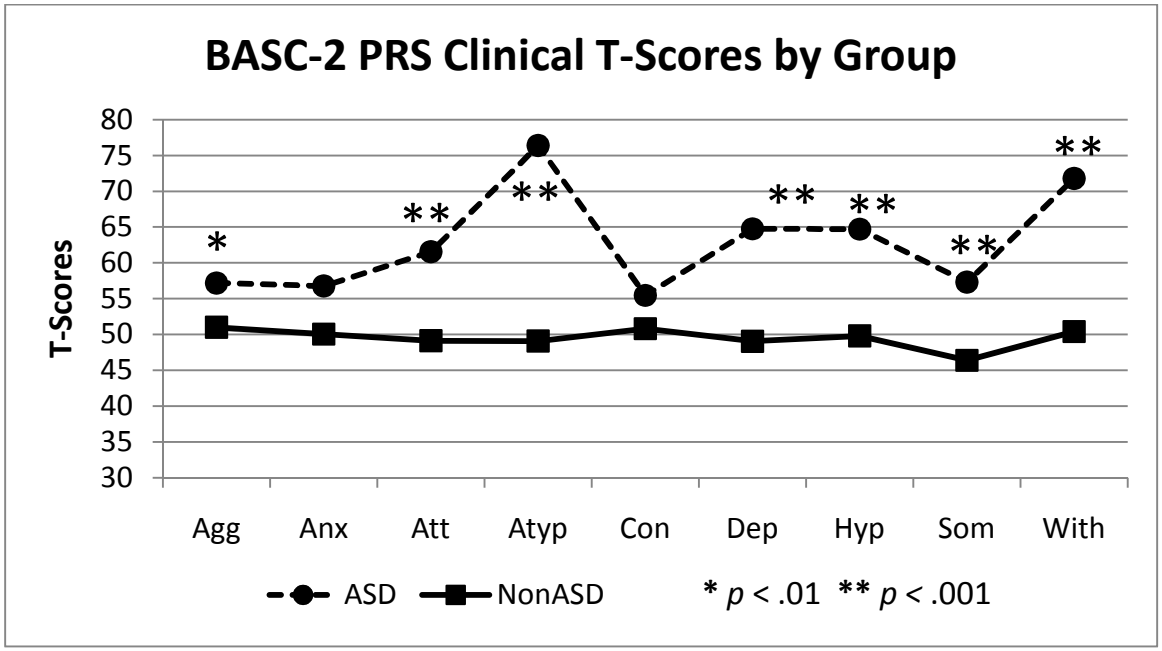


Figure 4.4

BASC-2 PRS Adaptive T-Scores by Group

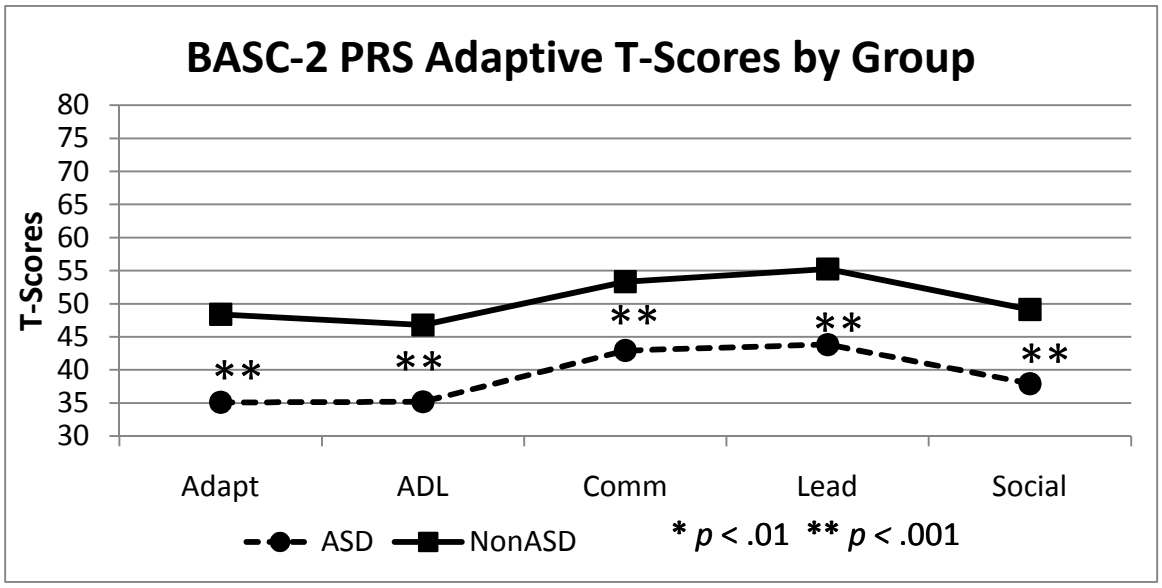


Table 4.12

Comparison of Means for BASC-2 Parent Rating Scale

	Mean Diff.	*df*	*t*	*p*
Aggression	-6.17	78	-2.83	.006
Anxiety	-6.72	77	-2.43	.017
Attention Problems	-12.42	78	-6.33	< .001
Atypicality	-27.30	78	-10.72	< .001
Conduct Problems	-4.65	78	-2.20	.031
Depression	-15.70	78	-6.33	< .001
Hyperactivity	-14.90	78	-5.03	< .001
Somatization	-10.92	78	-3.59	.001
Withdrawal	-21.40	78	-8.18	< .001
Adaptability	13.30	78	7.28	< .001
Activities of Daily Living	11.61	76	4.90	< .001
Functional Communication	10.42	76	4.47	< .001
Leadership	11.42	78	7.51	< .001
Social Skills	11.20	78	5.46	< .001

BASC-2 Teacher Rating Scale

A total of 70 participants (34 ASD, 36 NonASD) were included in the analysis of group differences on the BASC-2 Teacher Report Form (BASC-2 TRS). Descriptive statistics for the BASC-2 TRS are reported in Table 4.13. All BASC-2 TRS scores are reported as T-scores (M = 50, SD =10). Independent samples t test were conducted to determine mean group differences on the BASC-2 TRS Index scores. Participants in the ASD group (M =64.35, SD = 10.83) were found to have significantly higher mean scores on the Behavioral Symptoms Index than participants in the NonASD group (M =49.28, SD = 9.98), $t(68) = -6.06$, $p < .001$. This difference is also clinically significant with means scores for the ASD group and NonASD group being within the At Risk range and Average range, respectively, indicating teacher-report of greater behavioral concerns in

the ASD group than NonASD group. This finding suggests greater psychosocial impairment in the ASD group than expected based on the literature where the BSI was reported to be within the Average range for this population. Participants in the ASD group (M =41.97, SD = 6.68) were found to have significantly lower mean scores on the Adaptive Skills Index than participants in the NonASD group (M =54.53, SD = 8.03), $t(67) = 7.02$, $p < .001$; these means are both within the Average range and are not clinically significant. This finding is consistent with the existing literature which also reported an Adaptive Skills Index within the Average range.

Two split-plot ANOVAs were conducted to examine differences between groups on the BASC-2 TRS subscale scores, one to examine differences on the Clinical Scales and one to examine differences on the Adaptive Scales. Of interest in the present study are the between subjects main effect and the interaction effect. The results indicate a significant difference between groups on the BASC-2 TRS Clinical Subscale scores, $F(1, 68) = 28.98$, $p < .001$, $\eta_p^2 = .30$. The interaction effect was also statistically significant, $F(9, 612) = 6.99$, $p < .001$, $\eta_p^2 = .09$. Further examination of the data reveals that the significant interaction effect is due to variability in the magnitude of the mean difference between groups. The results of the BASC-2 TRS Clinical Subscale ANOVA are summarized in Table 4.14. Results further indicate a significant difference between groups on the BASC-2 TRS Adaptive Subscale scores, $F(1, 61) = 38.83$, $p < .001$, $\eta_p^2 = .39$. The interaction effect was also statistically significant, $F(4, 244) = 3.57$, $p = .008$, $\eta_p^2 = .05$. Further examination of the data reveals that the significant interaction effect is due to variability in the magnitude of the mean difference between groups. The results of the BASC-2 TRS Adaptive Subscale ANOVA are summarized in Table 4.15.

Table 4.13

Descriptive Statistics for BASC-2 Teacher Rating Scale

Variable	N	Mean	Standard Deviation	Min	Max
BASC-2 TRS Behavioral Symptoms Index					
ASD	34	64.35	10.83	46	91
NonASD	36	49.28	9.98	37	84
Total	70	56.60	12.82	37	91
BASC-2 TRS Adaptive Skills					
ASD	33	41.97	6.68	27	58
NonASD	36	54.53	8.03	33	71
Total	69	48.52	9.70	27	71
BASC-2 TRS Adaptability					
ASD	33	36.76	7.96	23	50
NonASD	36	50.69	9.64	32	68
Total	69	44.03	11.26	23	68
BASC-2 TRS Aggression					
ASD	34	56.41	11.02	42	81
NonASD	36	49.14	8.11	41	68
Total	70	52.67	10.24	41	81
BASC-2 TRS Anxiety					
ASD	34	56.74	15.85	39	117
NonASD	36	51.31	14.19	38	110
Total	70	53.94	15.16	38	117
BASC-2 TRS Attention Problems					
ASD	34	57.03	7.08	43	72
NonASD	36	47.17	8.58	34	65
Total	70	51.20	9.27	34	72
BASC-2 TRS Atypicality					
ASD	34	69.26	16.77	42	120
NonASD	36	48.33	11.44	42	99
Total	70	58.50	17.67	42	120

Table 4.13. Continued

BASC-2 TRS Conduct Problems					
ASD	34	52.56	9.39	40	75
NonASD	36	47.11	6.62	40	66
Total	70	49.76	8.48	40	75
BASC-2 TRS Depression					
ASD	34	61.85	13.78	42	110
NonASD	36	52.08	12.14	41	93
Total	70	56.83	13.77	41	110
BASC-2 TRS Functional Communication					
ASD	32	43.41	6.94	22	60
NonASD	31	55.97	7.29	36	65
Total	63	49.59	9.48	22	65
BASC-2 TRS Hyperactivity					
ASD	36	57.09	11.31	41	81
NonASD	34	48.92	9.76	37	74
Total	70	52.89	11.25	37	81
BASC-2 TRS Leadership					
ASD	34	44.94	5.85	36	58
NonASD	36	55.44	8.46	40	73
Total	70	50.34	8.98	36	73
BASC-2 TRS Learning Problems					
ASD	34	48.15	5.19	40	59
NonASD	36	42.75	4.38	37	59
Total	70	45.37	5.48	37	59
BASC-2 TRS Social Skills					
ASD	34	42.88	10.43	28	70
NonASD	36	51.92	9.09	24	67
Total	70	47.53	10.71	24	70
BASC-2 TRS Somatization					
ASD	34	53.06	14.27	42	107
NonASD	36	47.92	7.52	42	70
Total	70	50.41	11.52	42	107
BASC-2 TRS Study Skills					
ASD	34	47.35	7.01	35	64
NonASD	36	55.44	7.55	37	67
Total	70	51.51	8.31	35	67

Table 4.13. Continued

BASC-2 TRS Withdrawal					
ASD	34	68.50	11.09	43	85
NonASD	36	51.67	9.57	38	78
Total	70	59.84	13.31	38	85

Note. ASD = participants with autism spectrum disorder; NonASD = participants without autism spectrum disorder; BASC-2 = Behavior Assessment System for Children, 2nd Edition; TRS = Teacher Rating Scale.

Table 4.14

Split-Plot ANOVA for BASC-2 Teacher Rating Scale Clinical Subscales

	Sum of Squares	*df*	Mean Squares	F	η_p^2	*p*
Within subjects						
BASC-2 TRS	12139.95	9	1348.88	18.65	.21	<.001
Interaction	4548.75	9	505.42	6.99	.09	<.001
Error	44268.74	612	72.33			
Between subjects						
Group	15535.36	1	15535.36	28.98	.30	<.001
Error	36451.23	68	536.05			

Note. BASC-2 = Behavior Assessment Scale for Children, 2nd Edition; TRS = Teacher Rating Scale.

Follow-up independent samples *t* tests were conducted to examine the differences between groups for each BASC-2 TRS subscale. No significant differences were found between groups on the Anxiety and Somatization subscales; significant differences were found on all remaining subscales. The independent samples *t* test results are reported for the Clinical Scales first, followed by the Adaptive Scales. The results of BASC-2 PRS

independent sample *t* tests are summarized in Table 4.16 and represented graphically in Figures 4.5 (Clinical Scales) and 4.6 (Adaptive Scales).

Table 4.15

Split-Plot ANOVA for BASC-2 Teacher Rating Scale Adaptive Subscales

	Sum of Squares	*df*	Mean Squares	F	η_p^2	*p*
			Within subjects			
BASC-2 TRS	2329.23	4	582.31	19.64	.24	<.001
Interaction	423.51	4	105.88	3.57	.05	.008
Error	7236.02	244	29.66			
			Between subjects			
Group	7852.08	1	7852.08	38.84	.39	<.001
Error	12332.67	61	202.17			

Note. BASC-2 = Behavior Assessment Scale for Children, 2nd Edition; TRS = Teacher Rating Scale.

The ASD group (*M* = 56.41, *SD* = 11.02) had significantly higher scores than the NonASD group (*M* = 49.14, *SD* = 8.11) on the Aggression scale, *t*(68) = -3.16, *p* = .002; these means are both within the Average range and are not clinically significant. The ASD group (*M* = 57.03, *SD* = 7.08) had significantly higher scores than the NonASD group (*M* = 47.17, *SD* = 8.58) on the Attention Problems scale, *t*(68) = -5.23, , *p* < .001; these means are both within the Average range and are not clinically significant. The ASD group (*M* = 69.26, *SD* = 16.77) had significantly higher scores than the NonASD group (*M* = 48.33, *SD* = 11.44) on the Atypicality scale, *t*(68) = -6.13, , *p* < .001; these means are also clinically significant with scores for the ASD group in the At Risk range

and scores for the NonASD group in the Average range. The ASD group (*M* = 52.56, *SD* = 9.39) had significantly higher scores than the NonASD group (*M* = 47.11, *SD* = 6.62) on the Conduct scale, *t*(68) = -2.82, *p* = .006; these means are both within the Average range and are not clinically significant. The ASD group (*M* = 61.85, *SD* = 13.78) had significantly higher scores than the NonASD group (*M* = 52.08, *SD* = 12.14) on the Depression scale, *t*(68) = -3.15, , *p* = .002; these means are also clinically significant with scores for the ASD group in the At Risk range and scores for the NonASD group in the Average range. The ASD group (*M* = 57.09, *SD* = 11.31) had significantly higher scores than the NonASD group (*M* = 48.92, *SD* = 9.76) on the Hyperactivity scale, *t*(68) = -3.24, *p* < .002; these means are both within the Average range and are not clinically significant. The ASD group (*M* = 48.15, *SD* = 5.19) had significantly higher scores than the NonASD group (*M* = 42.75, *SD* = 4.38) on the Learning Problems scale, *t*(68) = -4.71, *p* = .001; these means are both within the Average range and are not clinically significant. The ASD group (*M* = 68.50, *SD* = 11.09) had significantly higher scores than the NonASD group (*M* = 51.67, *SD* = 9.57) on the Withdrawal scale, *t*(68) = -6.81, , *p* < .001; these means are also clinically significant with scores for the ASD group in the At Risk range and scores for the NonASD group in the Average range. These scores are generally consistent with expectations based on the existing literature which reported significant elevations in the areas of atypicality and withdrawal; the present sample of youth with ASD also had clinically significant elevations in depression.

The ASD group (*M* = 36.76, *SD* = 7.96) had significantly lower scores than the NonASD group (*M* = 50.69, *SD* = 9.64) on the Adaptability scale, *t*(67) = 6.51, *p* < .001; these means are also clinically significant with scores for the ASD group in the At Risk

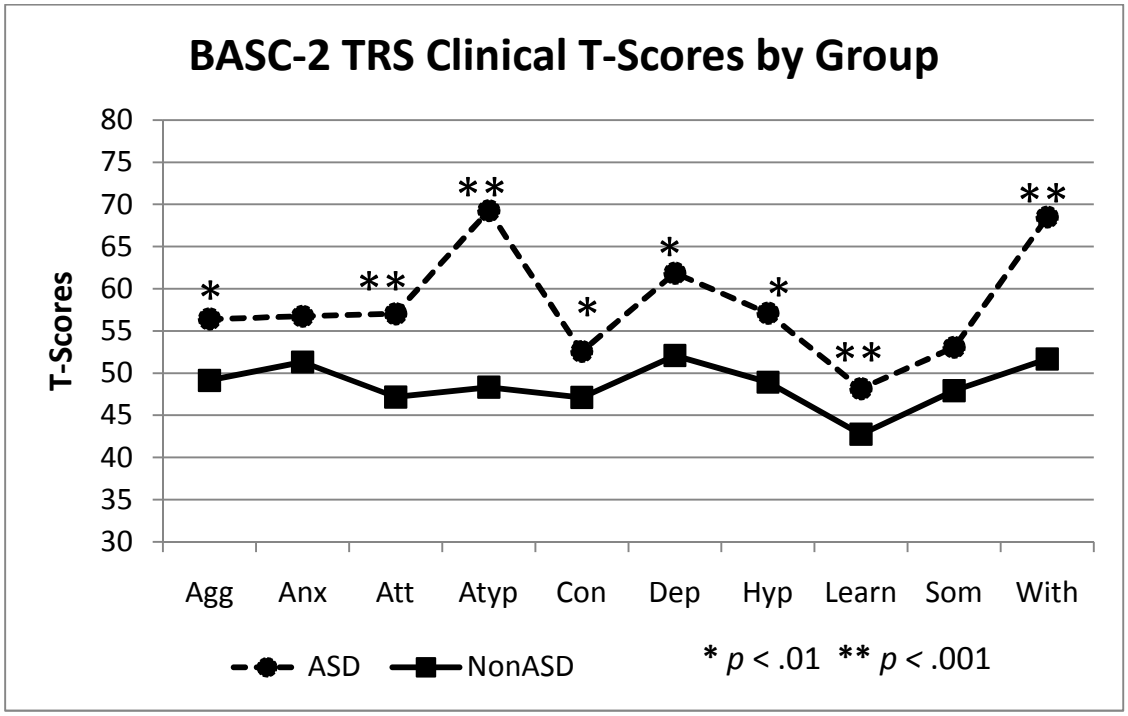
range and scores for the NonASD group in the Average range. The ASD group (M = 43.41, SD = 6.94) had significantly lower scores than the NonASD group (M = 55.97, SD = 7.29) on the Functional Communication scale, $t(61) = 7.00$, $p < .001$; these means are both within the Average range and are not clinically significant. The ASD group (M = 44.94, SD = 5.85) had significantly lower scores than the NonASD group (M = 55.44, SD = 8.46) on the Leadership scale, $t(68) = 6.01$, $p < .001$; these means are both within the Average range and are not clinically significant. The ASD group (M = 42.88, SD = 10.43) had significantly lower scores than the NonASD group (M = 51.92, SD = 9.09) on the Social Skills scale, $t(68) = 3.87$, $p < .001$; these means are both within the Average range and are not clinically significant. The ASD group (M = 47.35, SD = 7.01) had significantly lower scores than the NonASD group (M = 55.44, SD = 7.55) on the Study Skills scale, $t(68) = 4.64$, $p < .001$; these means are both within the Average range and are not clinically significant. These findings suggest less impairment in the area of Social Skills for the ASD group than described in the literature; the existing literature and present sample of youth with ASD both reported clinically significant elevations in adaptability.

In summary, results of the BASC-2 TRS are as follows. A significant main effect for group was found for the clinical scales and adaptive skills. Similarly, a significant interaction effect was found for both the clinical and adaptive scales. Statistically and clinically significant differences (i.e., NonASD group with scores in the Average range and ASD group with scores in the At Risk or Clinically Significant range) were found between groups on the Behavioral Symptoms Index in addition to the following subscales: Atypicality, Depression, Withdrawal, and Adaptability. Statistically significant

differences were also found between groups on the Adaptive Symptoms Index as well as the Aggression, Attention Problems, Hyperactivity, Learning Problems, Functional Communication, Leadership, Social Skills, and Study Skills subscales.

Figure 4.5

BASC-2 TRS Clinical T-Scores by Group



BASC-2 Self-Report of Personality

A total of 69 participants (35 ASD, 34 NonASD) were included in the analysis of group differences on the BASC-2 Self-Report of Personality (BASC-2 SRP). Descriptive statistics for the BASC-2 SRP are reported in Table 4.17. All BASC-2 SRP scores are reported as T-scores (M = 50, SD =10). Independent samples t tests were conducted to determine mean group differences on the BASC-2 SRP Index scores. Participants in the

ASD group (*M* =51.63, *SD* = 9.18) were found to have significantly higher mean scores on the Emotional Symptoms Index than participants in the NonASD group (*M* =42.35, *SD* = 13.37), *t*(67) = -3.37, *p* = .001; these means are both within the Average range and are not clinically significant. There was no significant difference between the ASD group (*M* =45.37, *SD* = 10.57) and the NonASD group (*M* =51.71, *SD* = 15.64) on the Personal Adjustment Index, *t*(56) = 1.82, *p* = .074. The results of BASC-2 SRP independent sample *t* tests are summarized in Table 4.20.

Figure 4.6

BASC-2 TRS Adaptive T-Scores by Group

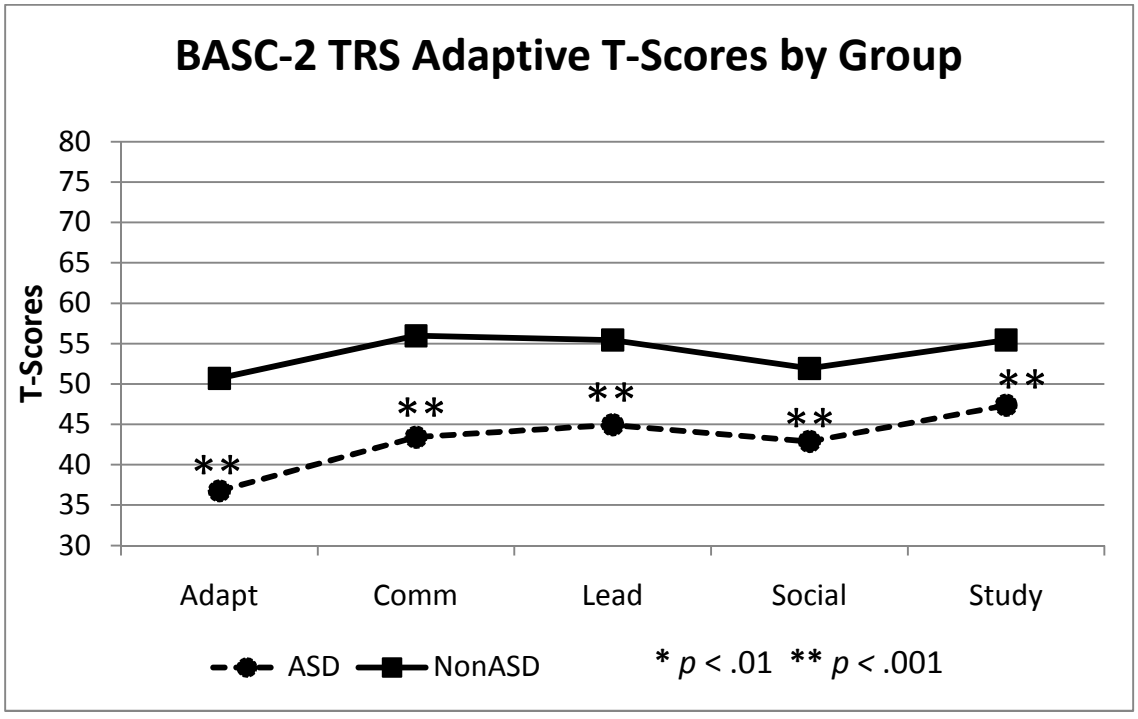


Table 4.16

Comparison of Means for BASC-2 Teacher Rating Scale

	Mean Diff.	*df*	*t*	*p*
Aggression	-7.27	68	-3.16	.002
Anxiety	-5.43	68	-1.51	.135
Attention Problems	-9.86	68	-5.23	< .001
Atypicality	-20.93	68	-6.13	< .001
Conduct Problems	-5.45	68	-2.82	.006
Depression	-9.77	68	-3.15	.002
Hyperactivity	-8.17	68	-3.24	.002
Learning Problems	-5.40	68	-4.71	< .001
Somatization	-5.14	68	-1.90	.062
Withdrawal	-16.83	68	-6.81	< .001
Adaptability	13.94	67	6.51	< .001
Functional Communication	12.56	61	7.00	< .001
Leadership	10.50	68	6.01	< .001
Social Skills	9.03	68	3.87	< .001
Study Skills	8.09	68	4.64	< .001

Two split-plot ANOVAs were conducted to examine differences between groups on the BASC-2 SRP subscale scores, one to examine differences on the Clinical Scales and one to examine differences on the Adaptive Scales. Of interest in the present study are the between subjects main effect and the interaction effect. No significant difference was found between groups on the BASC-2 SRP Clinical Subscale scores, $F(1, 13) = .35$, $p = .056$, $\eta_p^2 = .03$. The interaction effect was not statistically significant, $F(11, 143) = .64$, $p = .79$, $\eta_p^2 = .05$. The results of the BASC-2 SRP Clinical Subscale ANOVA are summarized in Table 4.18. A significant difference was found between groups on the BASC-2 SRP Adaptive Subscale scores, $F(1, 54) = 19.74$, $p < .001$, $\eta_p^2 = .27$. The interaction effect was not statistically significant, $F(3, 162) = 1.02$, $p = .038$, $\eta_p^2 = .02$.

The results of the BASC-2 SRP Adaptive Subscale ANOVA are summarized in Table 4.19.

Although the results of the interactions were nonsignificant, independent samples *t* tests were conducted to explore possible trends for each BASC-2 SRP subscale. The ASD group (M = 50.40, SD = 9.48) had significantly higher scores than the NonASD group (M = 42.85, SD = 13.07) on the Anxiety scale, $t(67) = -2.75$, $p = .008$. The ASD group (M = 51.23, SD = 9.93) had significantly higher scores than the NonASD group (M = 42.18, SD = 12.01) on the Depression scale, $t(67) = -3.42$, $p = .001$. The ASD group (M = 49.77, SD = 9.29) had significantly higher scores than the NonASD group (M = 40.04, SD = 12.52) on the Sense of Inadequacy scale, $t(68) = -3.35$, $p = .001$. The ASD group (M = 53.86, SD = 10.25) had significantly higher scores than the NonASD group (M = 43.62, SD = 13.50) on the Social Stress scale, $t(67) = -3.55$, $p = .001$. All means were within the Average range and no clinically significant differences between means were found. No statistically significant differences were found between groups on the remaining clinical scales of Attention Problems, Attitude to School, Attitude to Teachers, Atypicality, Hyperactivity, Locus of Control, Sensation Seeking, or Somatization. In addition, none of the Personal Adjustment scales (e.g., Interpersonal Relations, Relations with Parents, Self-Esteem, and Self-Reliance) were different at a statistically significant level. The results of BASC-2 SRP independent sample *t* tests are summarized in Table 4.20 and represented graphically in Figures 4.7 (Clinical Scales) and 4.8 (Adaptive Scales). These findings suggest self-report of fewer psychosocial difficulties in the present sample than expected based on the existing literature, with previous studies reporting elevations on the Social Stress, Atypicality, and Sense of Inadequacy subscales.

Table 4.17

Descriptive Statistics for BASC-2 Self-Report of Personality

Variable	N	Mean	Standard Deviation	Min	Max
BASC-2 SRP Emotional Symptoms Index					
ASD	35	51.63	9.18	36	76
NonASD	34	42.35	13.37	35	67
Total	69	47.06	12.28	35	76
BASC-2 SRP Personal Adjustment					
ASD	30	45.37	10.57	10	60
NonASD	28	51.71	15.64	45	63
Total	58	48.43	13.53	10	63
BASC-2 SRP Anxiety					
ASD	35	50.40	9.48	33	68
NonASD	34	42.85	13.07	34	64
Total	69	46.68	8.86	33	68
BASC-2 SRP Attention Problems					
ASD	30	51.97	11.88	33	76
NonASD	25	43.76	15.35	36	68
Total	55	48.24	14.06	33	76
BASC-2 SRP Attitude to School					
ASD	35	49.91	14.16	32	77
NonASD	34	47.38	17.24	37	80
Total	69	48.67	15.69	32	80
BASC-2 SRP Attitude to Teachers					
ASD	35	52.71	13.18	38	91
NonASD	34	44.88	15.35	38	76
Total	69	48.86	14.72	38	91
BASC-2 SRP Atypicality					
ASD	35	52.71	13.18	35	70
NonASD	34	43.38	13.66	35	63
Total	69	46.43	11.68	35	70
BASC-2 SRP Depression					
ASD	35	51.23	9.93	40	80
NonASD	34	42.18	12.01	39	61
Total	69	46.77	11.83	39	80

Table 4.17. Continued

BASC-2 SRP Hyperactivity					
ASD	30	54.07	10.02	34	80
NonASD	25	45.88	16.32	34	66
Total	55	50.34	13.76	34	80
BASC-2 SRP Interpersonal Relations					
ASD	35	46.60	11.97	14	62
NonASD	34	51.18	14.90	29	61
Total	69	48.85	13.59	14	62
BASC-2 SRP Locus of Control					
ASD	30	52.13	12.34	31	80
NonASD	27	43.00	14.44	36	66
Total	57	47.81	14.03	31	80
BASC-2 SRP Relations with Parents					
ASD	30	45.70	10.81	11	65
NonASD	28	48.07	15.34	34	63
Total	58	46.84	13.13	11	65
BASC-2 SRP Self-Esteem					
ASD	30	47.00	11.48	10	58
NonASD	28	50.25	14.94	41	58
Total	58	48.57	13.24	10	58
BASC-2 SRP Self-Reliance					
ASD	30	48.30	7.90	29	62
NonASD	28	51.89	16.37	41	67
Total	58	50.03	12.73	29	67
BASC-2 SRP Sensation Seeking					
ASD	12	45.75	13.51	34	77
NonASD	3	51.67	9.45	41	59
Total	15	46.93	12.74	34	77
BASC-2 SRP Sense of Inadequacy					
ASD	30	49.77	9.29	34	77
NonASD	27	40.04	12.52	41	59
Total	57	45.16	11.89	34	77
BASC-2 SRP Social Stress					
ASD	35	53.86	10.25	39	77
NonASD	34	43.62	13.50	35	64
Total	69	48.81	12.94	35	77

Table 4.17. Continued

BASC-2 SRP Somatization					
ASD	12	52.00	12.86	40	85
NonASD	3	48.67	10.02	41	60
Total	15	51.33	12.09	40	85

Note. ASD = participants with autism spectrum disorder; NonASD = participants without autism spectrum disorder; BASC-2 = Behavior Assessment System for Children, 2nd Edition; SRP = Self-Report of Personality.

Table 4.18
Split-Plot ANOVA for BASC-2 Self-Report of Personality Clinical Subscales

	Sum of Squares	*df*	Mean Squares	F	η_p^2	*p*
			Within subjects			
BASC-2 SRP	703.13	11	63.92	.91	.07	.529
Interaction	491.08	11	44.64	.64	.05	.793
Error	9998.47	143	69.92			
			Between subjects			
Group	151.25	1	151.25	.35	.03	.561
Error	5534.53	13	425.73			

Note. BASC-2 = Behavior Assessment Scale for Children, 2nd Edition; SRP = Self-Report of Personality.

In summary, on the BASC-2 SRP there was a clinically significant main effect for the Adaptive Scales. No clinically significant differences (i.e., NonASD group with scores in the Average range and ASD group with scores in the At Risk or Clinically Significant range) were found between groups on the Index scales or subscales. However, statistically significant differences between groups, with the ASD groups reporting

greater psychosocial difficulties, on the Emotional Symptoms Index as well as the Anxiety, Depression, Sense of Inadequacy, and Social Stress subscales.

Table 4.19

Split-Plot ANOVA for BASC-2 Self-Report of Personality Adaptive Subscales

	Sum of Squares	*df*	Mean Squares	F	η_p^2	*p*
			Within subjects			
BASC-2 SRP	317.75	3	105.92	2.13	.04	.100
Interaction	152.54	3	50.85	1.02	.02	.385
Error	8063.73	162	49.78			
			Between subjects			
Group	3410.86	1	3410.86	19.74	.27	<.001
Error	9329.12	54	172.76			

Note. BASC-2 = Behavior Assessment Scale for Children, 2nd Edition; SRP = Self-Report of Personality.

Social Skills Rating Scale

A total of 47 participants (22 ASD, 25 NonASD) were included in the analysis of group differences on the Social Skills Rating Scale (SSRS). Descriptive statistics for the SSRS are reported in Table 4.21. All SSRS scores are reported as Standard Scores (M = 100, SD =15). A split-plot ANOVA was conducted to examine differences between groups on the SSRS. Of interest in the present study are the between subjects main effect and the interaction effect. No significant difference was found between groups on the SSRS, $F(1, 42) = 3.76$, $p = .059$, $\eta_p^2 = .08$. However, the interaction effect was

statistically significant, $F(2, 84) = 19.32$, $p < .001$, $\eta_p^2 = .31$. Further examination of the data reveals that the significant interaction effect is due the ASD group having lower means on the Social Skills composites but higher means on the Problem Behaviors composite when compared to the NonASD group. The results of the SSRS ANOVA are summarized in table 4.22.

Figure 4.7

BASC-2 SRP Clinical T-Scores by Group

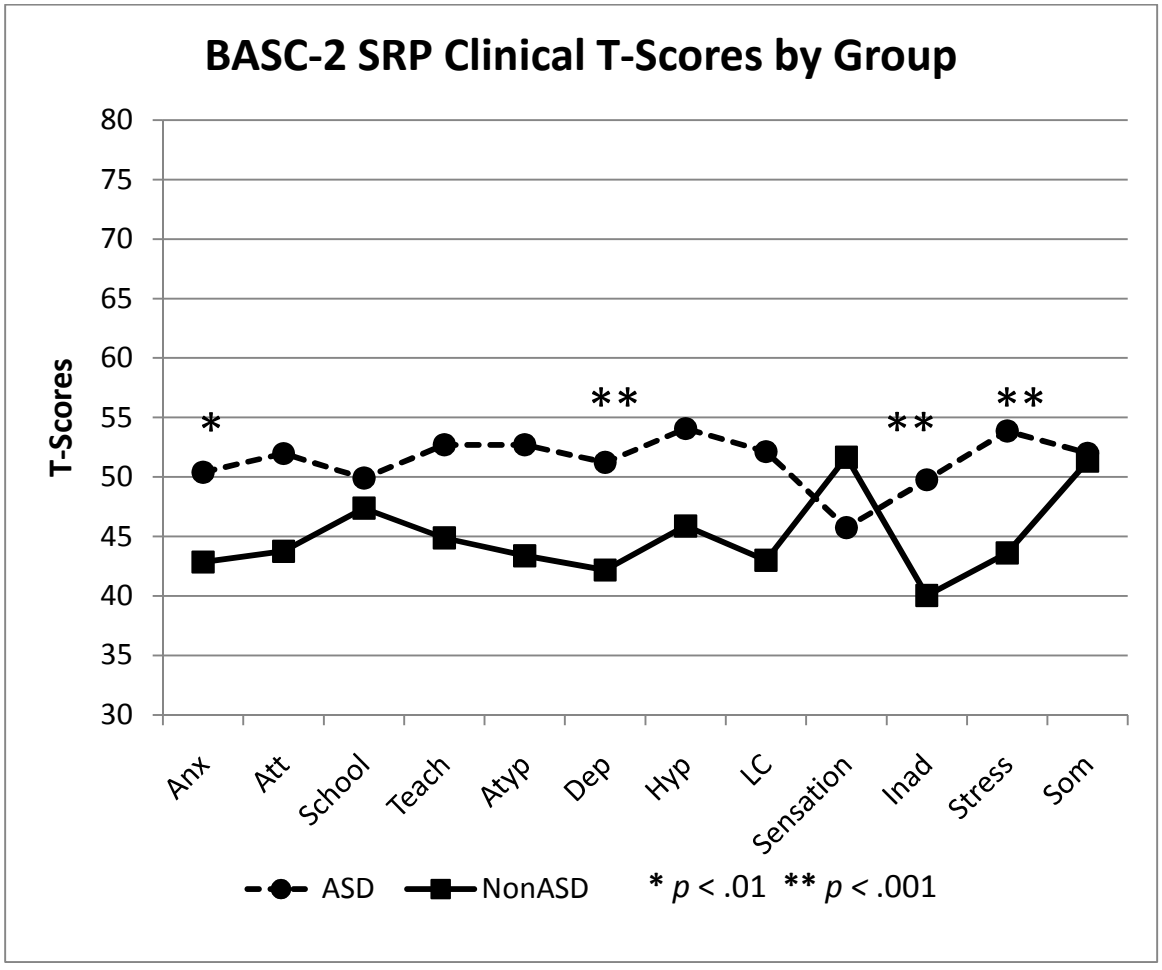


Figure 4.8

BASC-2 SRP Adaptive T-Scores by Group

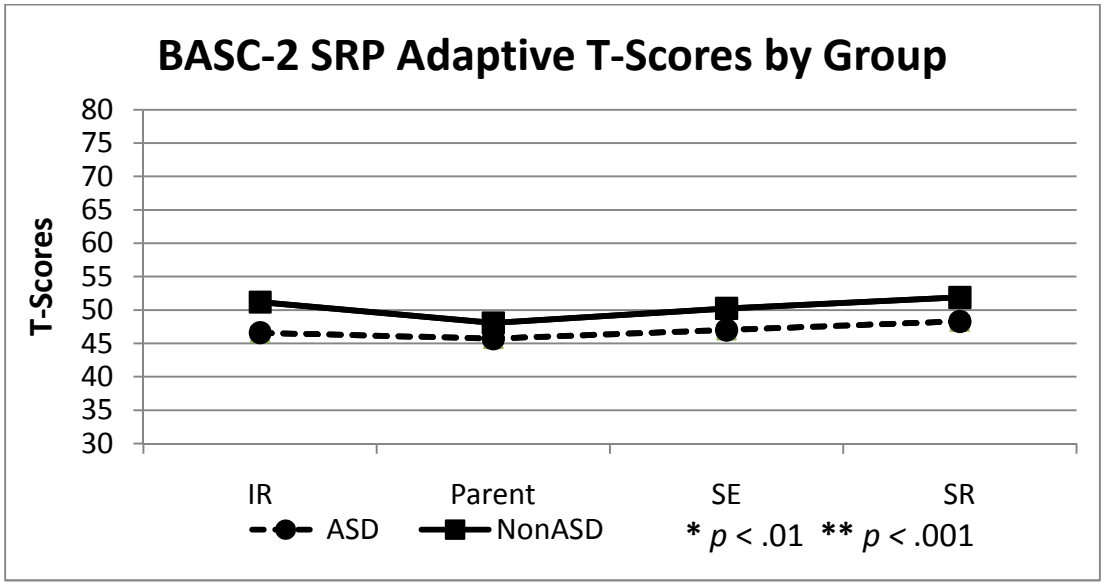


Table 4.20

Comparison of Means for BASC-2 Self-Report of Personality

	Mean Diff.	*df*	*t*	*p*
Anxiety	-7.55	67	-2.75	.008
Attention Problems	-8.21	53	-2.23	.030
Attitude to School	-2.53	67	-.67	.507
Attitude to Teachers	-7.83	67	-2.28	.026
Atypicality	-6.02	67	-2.20	.031
Depression	-9.05	67	-3.42	.001
Hyperactivity	-8.19	67	-2.28	.027
Locus of Control	-9.13	55	-2.57	.013
Sensation Seeking	5.92	13	-1.53	.145
Sense of Inadequacy	-9.73	55	-3.35	.001
Social Stress	-10.24	67	-3.55	.001
Somatization	-1.33	13	-.41	.761
Interpersonal Relations	4.58	67	1.41	.164
Relations with Parents	2.37	56	.68	.497
Self Esteem	3.25	56	.93	.355
Self-Reliance	3.59	56	1.08	.287

Table 4.21

Descriptive Statistics for Social Skills Rating Scale

Variable	N	Mean	Standard Deviation	Min	Max
SSRS Parent Form Social Skills Scale					
ASD	22	83.59	14.41	61	109
NonASD	25	104.96	17.25	71	130
Total	47	94.56	19.14	61	130
SSRS Parent Form Problem Behavior Scale					
ASD	21	113.71	15.09	85	137
NonASD	24	95.33	9.44	85	121
Total	45	103.91	15.36	85	137
SSRS Student Form Social Skills Scale					
ASD	21	100.57	13.59	82	126
NonASD	25	111.68	12.49	91	130
Total	46	106.61	14.02	82	130

Note. ASD = participants with autism spectrum disorder; NonASD = participants without autism spectrum disorder; SSRS = Social Skills Rating Scale.

Follow-up independent samples *t* tests were conducted to examine the differences between groups for each SSRS Scale score. A statistically significant difference was found between the ASD group (M = 83.50, SD = 14.41) and the NonASD group (M = 104.96, SD = 17.25) on the Parent Form Social Skills Scale, $t(45) = 4.57$, $p < .001$. These results suggest that participants in the ASD group had significantly lower scores on the Social Skills Scale than participants in the NonASD group. A statistically significant difference was found between the ASD group (M = 113.71, SD = 15.09) and the NonASD group (M = 95.33, SD = 9.44) on the Parent Form Problem Behaviors Scale, $t(43) = -4.96$, $p < .001$, indicating that parents of participants in the ASD group reported significantly more behavior problems than parents of participants in the NonASD group.

No significant difference was found between groups on the Student Form Social Skills Scale. These results are consistent with expectations based on the literature that indicates significant parent-report of social skills deficits in youth with ASD, but no self-report of social skills deficits. The results of SSRS independent sample *t* tests are summarized in Table 4.23 and represented graphically in Figure 4.9.

In summary, there was no significant main effect for group, but the interaction was statistically significant. There were significant differences between groups on parent-report of social skills deficits and problem behaviors indicating poorer functioning in the ASD group. Students did not self-report any social skills deficits.

Table 4.22

Split-Plot ANOVA for Social Skills Rating Scale

	Sum of Squares	*df*	Mean Squares	F	η_p^2	*p*
			Within subjects			
SSRS	3852.62	2	1926.31	8.52	.17	<.001
Interaction	8732.99	2	4366.49	19.32	.31	<.001
Error	18982.30	84	225.98			
			Between subjects			
Group	502.04	1	502.04	3.76	.08	.059
Error	16134.38	42	215.125			

Note. SSRS = Social Skills Rating Scale.

Figure 4.9

SSRS Standard Scores by Group

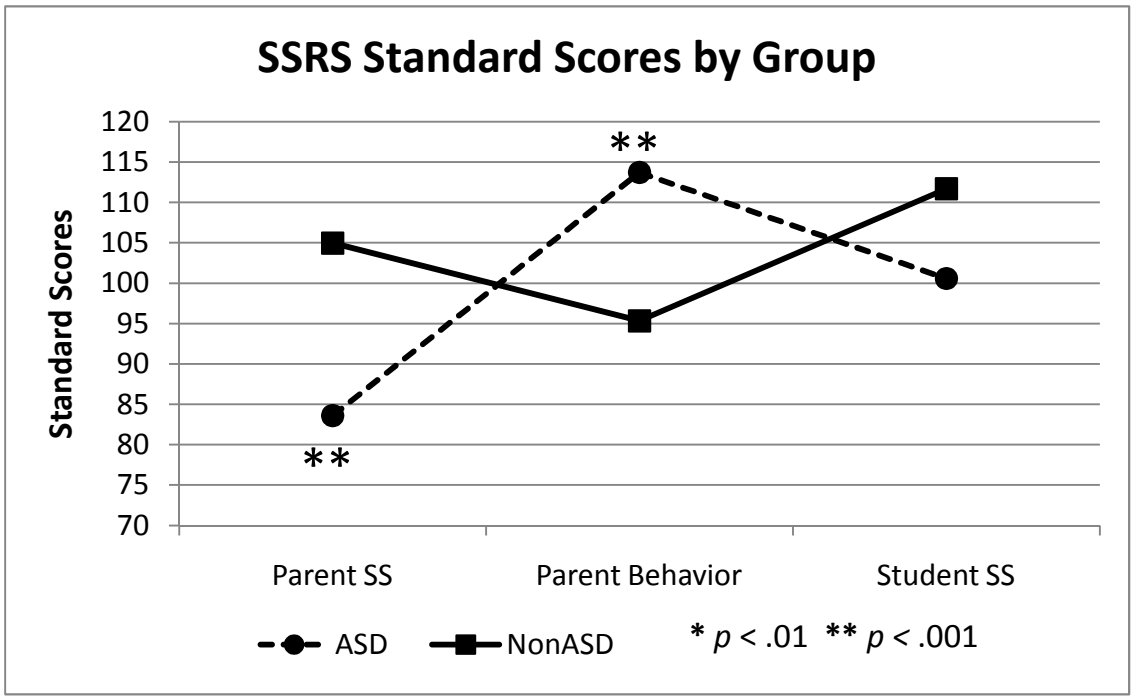


Table 4.23

Comparison of Means for Social Skills Rating Scale

	Mean Diff.	*df*	*t*	*p*
Parent Form Standard Score	21.37	45	4.57	< .001
Parent Form Behavior	-18.38	43	-4.96	< .001
Student Form Standard Score	11.11	44	2.89	.774

Summary of Results

Results of the present study indicate the presence of significant differences between groups on all measures assessed. In general, results were consistent with expectations based on the existing literature. In the area of intellectual functioning, the

only significant difference was in the area of Processing Speed, with youth in the ASD group demonstrating statistically and clinically significantly lower functioning in this domain than their gifted peers without ASD. Statistically and clinically significant differences were found between groups on all domains of adaptive behavior as measured by the Vineland-II, with the ASD group demonstrating greatest impairment in the Socialization Domain.

Statistically significant differences were found on nearly all scales of the BASC-2 PRS and TRS, with youth in the ASD group demonstrating greater psychosocial difficulties than youth in the NonASD group. On the BASC-2 PRS, statistically and clinically significant differences (i.e., NonASD group with scores in the Average range and ASD group with scores in the At Risk or Clinically Significant range) were found between groups on the Behavioral Symptoms Index and Adaptive Skills Index in addition to the following subscales: Attention Problems, Atypicality, Depression, Hyperactivity, Withdrawal, Adaptability, Activities of Daily Living, and Social Skills. On the BASC-2 TRS, statistically and clinically significant differences were found on the Behavioral Symptoms Index as well as the Atypicality, Depression, Withdrawal, and Adaptability subscales. There were no clinically differences between groups based on student self-report on the BASC-2 SRP. Statistically significant differences were found on the BASC-2 SRP Emotional Symptoms Index as well as the Anxiety, Depression, Sense of Inadequacy, and Social Stress subscales. Finally, statistically significant differences were found between groups on parent-report of social skills and problem behaviors on the SSRS, with youth with ASD demonstrating greater difficulties in these areas; no differences were found in self-report of social skills on this measure.

CHAPTER V

DISCUSSION

The purpose of this chapter is to discuss the implications of the results presented in Chapter 4. First, the results of the present study are discussed in relation to the existing literature on gifted youth with ASD. Specifically, possible explanations of the findings and their convergence or divergence with previous literature are provided. Next, implications of this study in the areas of diagnosis, psychological intervention, and education are discussed. Limitations of the study are reviewed and suggestions for future directions are made. The chapter ends with a summary of overarching conclusions of the current study.

Purpose of Present Study

Autism is one of the most researched psychological disorders and is currently a topic of great interest by the scientific community, as well as the lay population. However, the fields of psychology and education still have much to learn about ASDs. Specifically, little is known about the intersection of ASD and intellectual giftedness. Myths about characteristics of ASD in gifted youth are pervasive and do little to aid in the understanding of these youth or the development of appropriate interventions for this population. The present study was designed to provide the first empirical account of characteristics of gifted youth with ASD in comparison to gifted youth without ASD using a group study design. A comparison group of intellectually gifted youth without ASD was included in this study to aid in defining crucial diagnostic elements of ASD within the gifted population. Dimensions assessed in the present study include intellectual functioning, adaptive behavior, psychosocial/behavioral functioning, and social skills.

This study is considered to be largely exploratory in nature due to it being the first to examine differences between gifted youth with and without ASD in the domains described using an empirical, group study design.

Review of Hypotheses and Results of Present Study

Wechsler Intelligence Scale

The first research question was as follows: How do gifted youth with and without ASD differ in the domain of intellectual functioning (as measured by the WISC-IV or WAIS-III)? Because inclusion criteria for the study required a verbal or nonverbal index score within the Very Superior range on the WISC-IV or WAIS-III, it was expected that all of the youth in this study would demonstrate generally above average to very superior cognitive functioning in the domains assessed. However, the literature on cognitive profiles in youth with high functioning ASD suggests processing speed to be an area of relative weakness. Therefore, hypothesis 1 stated that gifted youth with ASD would show a clinically significant weakness on the Processing Speed Index in comparison to gifted youth without ASD. This hypothesis was supported by the results. Specifically, the group of gifted youth with ASD had a statistically significant relative weakness in processing speed, with a score in the Average range. This is in comparison to the group of gifted youth without ASD who had a mean Processing Speed Index in the High Average range. This finding is congruent with several studies that have found youth with ASD demonstrate a relative weakness on the Coding subtest, one of two subtests comprising the Processing Speed Index (Barnhill et al., 2000; Ehlers et al., 2000; Ozonoff et al., 2000; Mayes & Calhoun, 2003b). The two studies that have examined intellectual

profiles in gifted youth with ASD have found the PSI to be significantly lower than the other index scores (Assouline et al., 2009; Huber, 2007).

Comparing the mean FSIQ with the mean PSI for the group of gifted youth with ASD reveals a clinically significant difference in functioning (Wechsler, 2002). Practically, this suggests that, as a whole, gifted youth with ASD may demonstrate greater difficulties with tasks involving fine motor skills and speeded processing, such as quickly copying information from a blackboard, printing neatly, or completing timed tasks (e.g., daily timed tests of arithmetic). However, it is important to note that, as a group, these youth still performed within the Average range on tasks of processing speed. Consequently, this relative weakness may not translate into true functional deficits for most of these youth.

Both groups were found to demonstrate Superior to Very Superior Functioning in the domains of Verbal Comprehension and Perceptual Reasoning. Working Memory for both groups was in the High Average Range, as was Processing Speed for the group of gifted youth without ASD. The variability in scores across domains is supported by a theory in gifted education that posits that most gifted youth do not demonstrate "global giftedness" (Lovecky, 2004; Webb et al., 2005). Similarly, it is widely accepted in the field of giftedness that youth often demonstrate relatively lower performance in the areas of Working Memory and Processing Speed than in the core domains of cognitive reasoning (i.e., Verbal Comprehension and Perceptual Reasoning).

Vineland Adaptive Behavior Scale

The second research question asked: how do gifted youth with and without ASD differ in the domain of adaptive functioning (as measured by the Vineland-II)? Based on

the existing literature on adaptive behavior in youth with ASD, the primary hypothesis was that that gifted youth without ASD would have significantly higher scores on all Vineland-II domains than gifted youth with ASD, and that the largest difference would be in the domain of Socialization. This hypothesis was supported by the results and represents the most striking difference found between the two groups in the present study. A statistically significant difference at a $p < .001$ level was found between the two groups on each of the three domains of adaptive functioning. The greatest difference between groups was clearly in the area of Socialization, with a mean difference of nearly 30 points. This finding is supported by the existing literature on youth with ASD, which indicates that this population demonstrates significant deficits in adaptive functioning, regardless of intellectual ability (e.g., Assouline et al., 2009; Bölte & Poustka, 2002; Klin et al., 2007; Saulnier & Klin, 2007; Tomanik et al., 2007), while there is no evidence in the literature to suggest that gifted youth without ASD have deficits in adaptive functioning. Furthermore, deficits in social functioning, which are measured by the Socialization domain of the Vineland-II, are a core feature of ASD and thus deficits in this area are expected for this population (APA, 2000).

It was further hypothesized that the gifted youth with ASD in this study would demonstrate significant deficits in adaptive functioning, defined as having scores falling one to two standard deviations below the mean; again, greatest deficits were hypothesized to be within the Socialization domain. While participants with ASD in this study did show relative deficits in adaptive functioning, the Socialization domain was the only area with mean scores of one to two standard deviations below the mean. The mean score for the Communication domain was within the Adequate range. Similarly, the mean

score for the Activities of Daily Living domain was just within the Adequate range (approximately three points short of being one standard deviation below the mean). The mean score on the Socialization domain fell within the Moderately Low range and was approximately one and a half standard deviations below the mean. The lack of clinically significant deficits in Communication and Activities of Daily Living as measured by the Vineland-II in this sample is consistent with the definition of Asperger Disorder as stated in the DSM-IV-TR, although these findings are inconsistent with the diagnostic criteria for Autistic Disorder which requires deficits in adaptive functioning (APA, 2000). These scores suggest that participants with ASD in this study had relatively stronger adaptive skills as measured by the Vineland-II than generally reported in the literature on adaptive behavior in youth with ASD. While research on the adaptive behavior profiles of intellectually gifted youth with ASD is scant, research on youth with High Functioning Autism or Asperger Syndrome has found Daily Living skills to be one to two standard deviations below the mean, Communication skills one and a half to two standard deviations below the mean, and Socialization skills two to three standard deviations below the mean (Klin et al., 2007). It may be possible that intellectually gifted youth are able to compensate for some of these deficits with superior intellectual abilities and thus demonstrate less impairment in adaptive functioning. An examination of the literature reveals that adaptive behavior scores may decrease with age in individuals with ASD, thus indicating a failure to develop adaptive skills at a rate commensurate with typically developing peers as well as with gains in chronological age (Carter et al.; Klin et al., 2007; Tomanik et al.). Perhaps having a relatively younger sample, with approximately

75% of the sample being twelve years of age or younger, partially accounts for the relatively smaller difference found between groups in adaptive functioning.

Importantly, results of the present study do demonstrate clinically significant deficits in adaptive functioning in comparison to intellectual functioning for the ASD group. The mean difference between the Full Scale IQ and Adaptive Behavior Composite for the group of gifted youth with ASD was 42 points. Given that that the Wechsler Intelligence Scales and Vineland-II both have a mean of 100 and standard deviation of 15, this is a difference of nearly three standard deviations. There is mean difference of 38 points, or approximately two and a half standard deviations, between the Verbal Comprehension Composite of the Wechsler scale and the Communication domain of the Vineland-II, which could be expected to measure related concepts. Perhaps most notable is the 49 point difference, or three and a quarter standard deviations, between the Full Scale IQ and the Socialization domain on the Vineland-II. The mean difference for each of these three comparisons for gifted youth without ASD was between 18 and 20 points, which represents a difference of one and a quarter to one and a third standard deviations. While gifted youth did demonstrate a relative difference of approximately one standard deviation between their mean intelligence scores and mean adaptive behavior scores, all of their adaptive functioning scores remained in the Average to High Average range. Comparatively, a majority of the adaptive functioning scores for the group with ASD were in the Low Average to Borderline range and are severely discrepant from the intellectual scores. Clearly, the gifted youth with ASD in this study demonstrate significant deficits in adaptive functioning relative to their intellectual abilities.

The literature suggests that adaptive functioning may be a greater relative weakness for gifted youth than youth with average or below average intellectual functioning because they present with much higher intellectual skills without commensurate gains in adaptive functioning (e.g., Assouline et al., 2009; Bölte & Poustka, 2002; Klin et al., 2007; Saulnier & Klin, 2007; Tomanik et al., 2007). Attempting to apply the observed difference of 42 points between IQ and adaptive functioning in the present sample of youth with ASD would result in an individual with a measured IQ of 55 having an adaptive composite of 13. Consequently, it appears that the present results further support this supposition in the literature that gifted youth with ASD show larger relative deficits in adaptive functioning than individuals with ASD and average to below average intellectual abilities.

Behavior Assessment System for Children

The third research question was as follows: how do gifted youth with and without ASD differ in the domain of psychosocial/behavioral functioning (as measured by the BASC-2)? Based on the existing literature, including the BASC-2 normative data for youth with PDD, it was hypothesized that the group of youth with ASD would have significantly greater concerns endorsed on the BASC-2 than the group of youth without ASD, particularly in the areas of social stress, atypicality, and sense of inadequacy on the self-report form and in the areas of atypicality, withdrawal, adaptability, social skills, and functional communication on the parent- and teacher-report forms. Results for the BASC-2 Parent-Report Scale, Teacher-Report Scale, and Self-Report of Personality are discussed separately below.

Parent Report Form

As hypothesized, parents of gifted youth with ASD did endorse greater concerns in the areas of atypicality, withdrawal, adaptability, social skills, and functional communication than parents of gifted youth with ASD. However, parents of gifted youth with ASD also endorsed significantly greater concerns in the areas of aggression, attention, depression, hyperactivity, somatization, activities of daily living, and leadership than parents of gifted youth without ASD. In general, parents of gifted youth with ASD in this study endorsed more areas of concern than expected based on the BASC-2 normative sample of youth with PDD (Reynolds & Kamphaus, 2004). However, areas of predicted differences were based on literature that identified areas of clinically significant elevations on BASC-2 scales as opposed to statistically significant differences between youth with and without ASD, suggesting that the difference in results may simply reflect a different manner of defining significance.

Further examination of the results of the present study reveals that all of the mean scale scores for the group of gifted youth without ASD were solidly within the Average range. This finding is expected based on the literature on gifted youth which suggests that, as a group, gifted children are no more likely than their peers to suffer social or emotional difficulties (Gross, 2002; Lehman & Erdwins, 1981; Neihart, 2002; Rost, & Czeschlik, 2004; Touq, Kamal, & Fada, 1998; Vialle, Heaven, & Ciarrochi, 2007; Webb et al. 2005). Therefore, it is possible that mean scores for the gifted youth with ASD represent statistically significant differences but not clinically significant elevations. However, this does not appear to be the case. For gifted youth with ASD, mean elevations were found to be within the Clinically Significant range in the areas of

atypicality and withdrawal; mean elevations were within the At Risk range in the areas of attention, depression, hyperactivity, adaptability, activities of daily living, and social skills. Again, this suggests that parents in the present study endorsed the same clinically significant concerns as reported in the BASC-2 normative sample, with the exception of functional communication, but also endorsed several additional concerns.

It is unclear why parents in this sample endorsed more concerns than did parents in BASC-2 normative sample. Literature in the area of giftedness suggests that uneven cognitive development can lead to the perception of increased psychosocial difficulties (Reis & Renzulli, 2004). Perhaps parents of gifted youth with ASD have higher expectations of their children than do parents in previous studies because they perceive their children as being more capable as a result of their superior intellect. They may have the expectation that a child who demonstrates sound reasoning and problem-solving skills, a strong vocabulary, and the ability to learn new information quickly should also posses the necessary skills to successfully manage their emotions, behavior, and activities of daily living. Conversely, parents of youth with ASD and relatively lower cognitive functioning may observe the same psychosocial and behavioral concerns as parents in the present study, but they may be more likely to attribute those challenges to their child's developmental differences and, consequently, rate them as being less significant or distressing for the family. Another theory is that gifted youth with ASD may be better able than their peers with ASD and lower intellectual functioning to express and articulate psychosocial challenges, such as depression or difficulty focusing. In other words, youth with ASD and varying levels of intellectual functioning may be

experiencing the same level of psychosocial difficulty, but gifted youth with ASD may be more effective in communicating those challenges to their parents.

The three theories presented all suggest a difference in the perception of psychosocial or behavioral difficulties as opposed to true differences in functioning. Research by Loveland and Tunali-Kotoski (2005) suggests that greater awareness of how one differs from his or her peers can lead to psychosocial distress. This argument is typically used to explain why adolescents with ASD may have greater psychosocial distress than children with ASD. Perhaps becoming aware of one's differentness occurs at a younger age for gifted youth with ASD because of their greater cognitive capacity, and this leads to greater psychosocial challenges in this population as a whole. This suggests that the current results may represent true increases in psychosocial problems observed by parents of gifted youth with ASD than observed by parents of youth with ASD and relatively lower cognitive functioning that were included in previous studies, including the normative sample.

One previous study by Barnhill and colleagues (2000) examining BASC-2 profiles for youth diagnosed with Asperger syndrome also found more widespread concerns than reported in the BASC-2 normative sample. Specifically, they found Clinically Significant elevations on the hyperactivity and atypicality subscales and At Risk concerns in the areas of aggression, depression, attention problems, withdrawal, adaptability, leadership, and social skills. Thus, it may be that future studies would support the results of the current study and the Barnhill et al. study by finding global psychosocial and behavioral concerns reported by parents of youth with ASD, including gifted youth with ASD. Overall, it appears that further research in this area is needed to

determine whether these results can be replicated, and if so, what accounts for this difference in parent-report of psychosocial functioning.

Teacher Report Form

As predicted, there was a statistically significant difference in teacher ratings of atypicality, withdrawal, adaptability, functional communication, and social skills, with teachers of gifted youth with ASD endorsing more concern in these domains than teachers of gifted youth without ASD. Similar to the results of the BASC-2 PRS, teachers also endorsed significantly greater concerns in the areas of aggression, attention, conduct, depression, hyperactivity, learning problems, leadership, and study skills from a statistical perspective. Clinically, significantly more concerns were reported by teachers of gifted youth with ASD than teachers of gifted youth without ASD in the areas of adaptability, atypicality, depression, and withdrawal; mean scores for each of these scales was elevated into the At Risk range. Of note, there were no clinically significant elevations in the areas of functional communication or social skills. Again, mean scores for all scales in the group of gifted youth without ASD were within the Average range. Like the results of the parent form, these results indicate greater concerns, both statistically and clinically, than expected based on existing research (Reynolds & Kamphaus, 2004).

Theories to explain this unexpected finding mirror those presented above for the BASC-2 PRS. Briefly, teachers may be perceiving greater challenges in gifted youth with ASD than youth with ASD and relatively lower cognitive functioning due to increased expectations about a gifted youth's ability to manage and cope with psychosocial stress, a reduced likelihood of considering these emotional and behavioral challenges as a

symptom of underlying developmental differences, or a greater capacity for gifted youth to communicate their psychosocial challenges to their teachers. Conversely, these results may suggest a true difference in psychosocial and behavioral functioning, possibly as a function of greater awareness of being different from peers in comparison to youth with ASD and lower cognitive skills.

Overall, teachers appear to report many of the same concerns as parents, but at a lower intensity. More specifically, while teachers were fairly equivalent to parents in reporting concerns at a statistically significant level, they reported far fewer concerns that met clinical significance. Parents endorsed Clinically Significant concerns for two scales and At Risk concerns for six scales. Teachers endorsed At Risk concerns for four scales; no scales were in the Clinically Significant range. This is consistent with the results of the Barnhill et al. (2000) study of youth with Asperger syndrome. In addition to finding widespread concerns endorsed by teachers on the BASC-2—with At Risk concerns endorsed in the areas of anxiety, depression, attention problems, atypicality, and withdrawal—they further noted a tendency for teachers to perceive fewer, less significant problems than parents (Barnhill et al., 2000).

Somewhat surprising was the lack of clinical significance in teacher-report of social skills. As deficits in social functioning are a core feature of ASD, one would expect social skills difficulties to be observed within the classroom (APA, 2000). Teachers may have fewer opportunities than parents to observe natural peer interactions, including reciprocal play, because they are in a structured and predictable academic setting. This may be particularly true for middle and high school teachers. Further, gifted children with ASD are often better at interacting with adults than with their peers,

(Gallagher & Gallagher, 2002; Little, 2002, Neihart, 2000). This behavior may be perceived by teachers as a sign of sophistication, maturity, or intellectual giftedness rather than as a social deficit. In general, teachers may have different expectations for the social skills of intellectually gifted youth than more typically developing youth.

Also surprising was the statistical difference between groups on teacher-report of study skills. While measures of academic achievement were not included in the present study, all participants met criteria for intellectual giftedness. It seems reasonable to expect these students to perform academic tasks with little difficulty, but the results of this study suggests that teachers of gifted youth with ASD have concerns about the academic functioning of their students at a higher rate than teachers of gifted youth without ASD. Perhaps this reflects concerns about a student's ability to apply appropriate skills in the classroom, such as sustaining attention, transitioning between activities, remembering to complete and turn-in homework, and following directions. In fact, there is research to support that youth with ASD do demonstrate deficits in executive functioning skills, which can interfere with the successful completion of academic tasks (Corbett & Constantine, 2006; Corbett, Constantine, Hendren, Rocke, & Ozonoff, 2009; Geurts, Verte, Oosterlaan, Roeyers, & Sergeant, 2004; Goldberg et al., 2005; Landa & Goldberg, 2005; Russel, 1997). Future research is needed to better understand the impact of ASD on academic functioning and study skills in gifted youth.

Self-Report of Personality

The hypothesis that gifted youth with ASD would endorse greater concerns than gifted youth without ASD in the areas of social stress and sense of inadequacy was supported by the results of this study. The hypothesis that they would also endorse

greater concerns in the area of atypicality was not supported. Gifted youth with ASD in this study further reported greater concerns in the areas of depression and anxiety. However, none of these concerns reached clinical significance by having mean scores within the At Risk or Clinically Significant range. In general, findings from the BASC-2 SRS suggests that gifted youth with ASD in this study view themselves as having psychosocial and behavioral functioning similar to that of their peers who do not have ASD. This is consistent with the findings of the Barnhill et al. (2000) study where no significant concerns were endorsed on the BASC SRP, possibly indicating that most youth with ASD lack awareness of their emotional and behavioral problems. Some researchers have posited that youth may not become aware of their psychosocial or behavioral challenges until adolescence (Loveland & Tunali-Kotoski, 2005). As more than 75% of this sample was age 12 or younger, it may be that the lack of clinically significant concerns is a function of having a relatively young sample. However, a study by Foley Nicpon et al. (2010) did not detect any clinically significant concerns on the BASC-2 SRP in gifted adolescents with ASD. Overall, it appears that gifted youth with ASD tend to dramatically underreport psychosocial and behavioral concerns and, in general, are not able to provide accurate self-reports of psychosocial and behavioral functioning.

Social Skills Rating Scale

The fourth research question asked: how do gifted youth with and without ASD differ in the domain of social skills functioning (as measured by the SSRS)? Based on the existing literature and the fact that qualitative impairment in social interaction is a hallmark of ASD, it was hypothesized that gifted youth with ASD would be rated as

having significantly poorer social skills than gifted youth without ASD. Both the Parent Form and Student Form of the SSRS were administered as part of this study. As hypothesized, parents of gifted youth with ASD rated their children as having significantly poorer social skills than parents of gifted youth without ASD. The difference is also clinically significant as the average social functioning of gifted youth with ASD was more than one standard deviation below the mean. No differences were found between groups on the student form. Gifted youth with ASD reported social functioning within the Average range, indicating that they view themselves as having similar social skills to their peers. These results are consistent with previous research that has found parent report of social skills deficits but no self-reported concerns on the SSRS in youth with ASD (Macintosh & Dissanayake, 2006). The finding that youth with ASD in this study fail to report social skills difficulties, which is consistent with the existing literature, may indicate that gifted youth without ASD lack awareness into their social skills deficits.

As noted previously, the existing research indicates that gifted youth are generally as well adjusted as their same-age peers (Gross, 2002; Lehman & Erdwins, 1981; Martin et al., 2010; Neihart, 2002; Reis & Renzulli, 2004; Rost & Czeschlik, 1994; Touq et al., 1998; Vialle et al., 2007; Webb et al. 2005). In fact, some research has suggested that gifted youth may demonstrate better adjustment than their peers (Lehman & Erdwins, 1981; Sayler & Brookshire, 1993; Touq et al., 1998; Vialle, et al., 2007). For example, Touq and colleagues and Sayler and Brookshire both reported statistically better social skills and social relationships in their samples of gifted youth in comparison to typical peers. Gifted youth without ASD in the present study had mean parent ratings of social

skills within the average range. Mean self-report ratings of social skills were in the above average range. In general, the present study supports previous findings that gifted youth demonstrate similar psychosocial and social skills functioning to their typical peers. The current results do not suggest that, as a group, gifted youth demonstrate superior social skills.

Summary

Taken together, the results of the present study suggest significant differences between gifted youth with and without ASD across multiple domains. Most striking is the difference between groups in all areas of adaptive functioning, but particularly in the socialization domain. These findings may suggest relative deficits in adaptive functioning are a key feature of ASD in gifted populations. Further, a statistically and clinically significant relative weakness was found in processing speed on the Wechsler Intelligence Scale, consistent with previous research on cognitive profiles of youth with high functioning ASD. Finally, statistically and clinically significant differences were found between groups on parent- and teacher-report of psychosocial and behavioral problems on the BASC-2. Clinically significant concerns were found in the areas of activities of daily living, adaptability, attention, atypicality, depression, hyperactivity, social skills, and withdrawal. In general, teachers reported fewer and less significant concerns than parents. While gifted youth with ASD reported significantly greater concerns in the areas of depression, anxiety, social stress, and sense of inadequacy, they did not report any clinically significant concerns regarding psychosocial functioning. Results of this study were generally consistent with study hypotheses with the exception of greater

psychosocial concerns reported by parents and teachers and fewer self-reported psychosocial concerns on the BASC-2.

Implications for Diagnosis of ASD in Gifted Youth

Prior to the present study, very little empirical data existed to guide providers in the process of diagnosing ASD in gifted youth. Characteristics of gifted youth described in the literature were based primarily on anecdotal accounts from parents and teachers (e.g., Little, 20002; Neihart, 2000; Webb et al., 2005). The lack of empirical data about the defining diagnostic characteristics of gifted youth with ASD led to diagnostic confusion and, ultimately, missed diagnosis and misdiagnosis. Based on myths about giftedness and ASD, it appears that some gifted youth without ASD are being given an unwarranted diagnosis of ASD due to characteristics of giftedness being misperceived as symptoms of ASD (Niehart, 2000; Webb et al., 2005). Conversely, some gifted youth who truly do meet criteria for ASD are being missed for diagnosis due to myths that giftedness and ASD cannot co-occur or because these youths' "quirks" are being mistaken as signs of giftedness rather than a disability (Little, 2002; Webb et al.). Further, the lack of empirical clarity in diagnosing ASD in gifted youth likely contributes to the finding in the literature that high functioning youth with ASD, on average, receive the diagnosis later than their peers with lower intellectual abilities (Cederlund & Gillberg, 2004; Howlin & Asgharian, 1999; Mayes & Calhoun, 2003c). This research has also indicated that many high functioning individuals with ASD often receive misdiagnoses of learning disabilities, ADHD, OCD, or other conditions matching a specific aspect of the child's presentation prior to receiving the accurate diagnosis of ASD (Cederlund & Gillberg; Gilchrist et al., 2001; Webb et al.). In effect, these youth experience a delay in

receiving the diagnosis that will lead to appropriate interventions and accommodations to meet their learning and developmental needs (Assouline et al., 2009).

The present study provides an empirical account of how gifted youth with ASD differ from gifted youth without ASD on multiple measures commonly used in diagnostic evaluations, thus dispelling previous myths suggesting that all gifted youth have ASD or that giftedness and ASD are mutually exclusive. Specifically, based on the results of the present study, gifted youth with ASD can be expected to demonstrate very strong cognitive abilities with a relative weakness in processing speed, deficits in adaptive functioning, and widespread psychosocial and behavioral concerns on parent- and teacher-report measures. Further, gifted children without ASD would not be expected to demonstrate deficits in adaptive functioning, nor should one expect to see widespread psychosocial or behavioral concerns on parent- or teacher-report forms.

It is important to note that these profiles are based on mean performance of youth in this sample and cannot necessarily be directly applied to individual youth. An examination of the score ranges for each measure reveals significant variability in performance for this population. For example, the Socialization score on the Vineland had a range of 51 (Extremely Low) to 110 (High Average) in the population of gifted youth with ASD. Similarly, scores for the gifted youth without ASD ranged from 71 (Borderline) to 127 (Very Superior), indicating that not all gifted youth without the diagnosis of ASD are impervious to social difficulties, as perceived by their parents. As such, it is critically important that gifted youth suspected of ASD participate in a comprehensive evaluation by knowledgeable and experienced providers. Diagnosis should not be made on the basis of one test score in isolation. Despite current diagnostic

practices by some clinicians, results of the current study clearly indicate that one cannot diagnose ASD solely on the basis of an IQ test. The two groups demonstrated nearly identical performance on this measure. Including measures of adaptive behavior and psychosocial functioning improve diagnostic clarity, but may simply indicate general concerns about overall functioning by parents and teachers rather than information specific to the diagnosis of autism.

When used in combination with the other measures discussed, administration of the Autism Diagnostic Observation System (ADOS) and Autism Diagnostic Interview-Revised (ADI-R) are currently the gold standard in assessing diagnostic elements of ASD (Assouline et al.; Huber, 2007; Tomanik, Pearson, Loveland, Lane, & Shaw, 2007). Huber (2007) provided the first empirical account of the performance of gifted youth on the ADOS and ADI-R, but additional research is needed in this area to better understand diagnostic characteristics of gifted youth with ASD on these important measures, as well as how performance differs between gifted youth with and without ASD.

In sum, the present study has significant implications for the diagnosis of ASD in gifted youth. Mean profiles were provided for several widely used assessment instruments, and significant differences were found between mean scores for gifted youth with ASD and gifted youth without ASD on several of the measures assessed (e.g., Vineland-II, BASC-2 PRS, BASC-2 TRS, SSRS). However, observed variability in performance on each of the measures included in the present study highlights the importance of basing diagnostic decisions on the results of a comprehensive diagnostic evaluation that includes measures designed to specifically assess ASD symptomology in order to increase diagnostic accuracy.

Implications for Treatment of ASD in Gifted Youth

Results of the present study have important implications for treatment of gifted youth with ASD. First, it is important to recognize that gifted youth with ASD have significant deficits in multiple areas that warrant intervention. These youth cannot use their superior intellect to compensate for their disability without appropriate intervention. The present study suggests that most gifted youth with ASD evidence mild to severe relative deficits across domains of adaptive functioning. Therefore, these youth would benefit from intervention and direct instruction to increase adaptive functioning. Depending on the specific areas of weakness that need to be addressed, these types of interventions may appropriately be implemented by a teacher, psychologist, occupational therapist, speech therapist, or vocational rehabilitation counselor. For example, a speech therapist may help a child improve communication skills by focusing on deficits in pragmatic language or nonverbal aspects of language. An occupational therapist may aid in the development of life skills, including successfully completing household chores, self-care skills, or even by teaching play skills. A psychologist may work directly with a child to increase functional abilities, including social and relational skills, but may also work directly with parents to help them break down the skills involved in daily activities so that they may teach their children to complete activities of daily living independently. A vocational rehabilitation counselor may be a key member of a child's transition team as they prepare to begin college or enter the world of work. This counselor can assist the child in accessing appropriate services and teaching them to access services and advocate for their needs so that they may function at their fullest potential.

In addition to addressing deficits in adaptive functioning, results of the present study suggest a need to address the psychosocial and behavioral challenges as well. These youth may need to be explicitly taught strategies for coping with intense emotion, self-monitoring behavior, and improving social skills. Further, parents and teachers may benefit from training in focused methods of behavioral management that may be most effective for youth with ASD. Although none of the scales on the BASC-2 SRS reached clinical significance, gifted youth with ASD reported more concerns than gifted youth without ASD in the areas of anxiety, depression, inadequacy, and social stress at a statistically significant level. It is possible that these youth are at risk for more internalizing problems than gifted youth without ASD, but that they do not possess the skills to accurately recognize and report these challenges to others. As such, it may be appropriate to monitor gifted youth for signs of anxiety and depression and to provide supportive counseling or psychological interventions as needed.

Overall, the results of this study point to several areas of potential intervention for gifted youth with ASD. These youth may benefit from interactions with a variety of providers trained in improving adaptive functioning. They may also need additional assistance in managing their psychosocial and behavioral challenges, including possible symptoms of depression and anxiety. Clearly intellectual giftedness does not protect against the possibility of significant challenges or deficits in other areas of functioning, but providers may find benefit in capitalizing on the strengths of these gifted youth—such as advanced verbal skills or a tendency for rule-governed behavior—to ameliorate some of their weaknesses.

Implications for Counseling Psychology

Although there is much overlap between the fields of counseling psychology, clinical psychology, and school psychology, there remain a few philosophical beliefs and clinical practices that are unique to counseling psychology. For example, in contrast to more traditional "disease models" employed by most psychologists, counseling psychologists have a long history of using strength-based approaches to assessment and intervention and typically incorporate an individual's strengths into a treatment plan. Counseling psychologists also give specific focus to issues of individual difference and diversity, thus recognizing and valuing the unique circumstances individuals face. Finally, counseling psychologists have interest and training in the area of career counseling and therefore attend to the importance of education and career development throughout the lifespan. Given these values and characteristics of counseling psychologists, the following aspects of the present study have implications specific to the field of counseling psychology.

The findings of the present study clearly illustrate some of the strengths of the participants. Youth in both groups had extraordinary cognitive abilities and reasoning skills. Many of the youth were similarly strong in at least some areas of academic achievement as evidenced by participation in talented and gifted programming and/or acceleration opportunities. In addition, despite the statistically significant differences noted between groups on the measures of psychosocial functioning, several of the scores remained within the Average range for both groups. There were virtually no significant concerns regarding aggression or conduct problems. This finding suggests that, despite having a diagnosis of ASD, many of these youth had adequate coping skills and

adjustment to manage their difficulties in a way that allowed them to appropriately function at school and home.

While not specifically investigated as part of the present study, gifted youth with and without ASD often have very strong areas of interest and may have a great deal of knowledge and talent in a specific area (e.g., mathematics, geography, physics, U.S. presidents, dinosaurs, engineering, etc.). In working with these populations, counseling psychologists can help youth develop and cultivate their strengths in order to reach their potential. Gifted youth with ASD can benefit from working with a counseling psychologist who recognizes and appreciates their strengths, and further assists the youth in capitalizing on his or her strengths to overcome areas of weakness. For example, finding ways to relate aspects of social functioning to their interest and knowledge of baseball or animal dominance hierarchies may help them connect with and integrate the information better. In addition, by capitalizing on strengths counseling psychologists can help to identify accommodations that may increase a child's functioning capacity, such as using voice recognition software to allow a child with a written language weakness to dictate the elaborate story he has created for his Language Arts class.

While it is important to continue to provide appropriate support and intervention to develop social and adaptive skills, gifted youth with ASD may also benefit from working with a counseling psychologist who can help them find their niche—a place where their gifts can be appreciated and their weaknesses are less debilitating. This can be done by employing career counseling techniques to help a student identify strengths and weaknesses and to consider how they match career fields of interest. The counseling psychologist can help the student explore how their gifts and interests match societal

values and can be used to make a meaningful contribution to the community. Those strengths or gifts can then be enhanced with specific training designed to prepare the student for specific career fields with special attention given to aspects of the job that may be more difficult for the student (e.g., communicating with co-workers or supervisors, interviewing skills, responding to constructive feedback). Counseling psychologists could be invaluable in helping these individuals focus on various aspects of their career throughout their life span, from education to job placement to retirement, with an eye toward their continued capacity for growth.

Implications for Education

Results of the present study begin to provide an account of the general strengths and weaknesses of gifted youth with and without ASD. That information is crucial in the development of appropriate classroom interventions. Specifically, it is clear that both groups would benefit from opportunities for acceleration and enrichment to in order to nurture gifts and cultivate potential. Having specific deficits in some areas should not prohibit the provision of gifted and talented programming to these youth.

Similarly, it is clear that gifted youth with ASD may also demonstrate significant deficits in specific areas of functioning that necessitate the provision of special education services and classroom accommodations. For example, one student may benefit from participating in an accelerated mathematics course and advanced reading instruction while also receiving occupational therapy for difficulties with fine motor control, participating in a social skills group, and having an IEP for positive behavioral support to manage intense emotional reactions in the classroom. School districts may be in the best position to provide appropriate remediation services for this population in addition to

meeting their needs as a gifted learner. Consequently, it will be particularly important for gifted educators, special educators, and administrators to be both active participants and consumers of developments in this area of research to best serve the needs of their students. Further, it will be imperative for gifted educators, special educators, and regular education teachers to continue with collaborative efforts that blossomed since the onset of full inclusion in order to identify and address the diverse needs of this twice exceptional population.

Limitations

There are multiple limitations to the current study. First, a convenience sample of participants that had already completed evaluations at the Belin-Blank Center Assessment and Counseling Clinic was used due to time and financial constraints of the study. The use of a convenience sample may limit the generalizability of the findings from this study. A majority of the sample was comprised of middle class, Caucasian, Midwestern families, and thus it lacks racial/ethnic, socioeconomic, and geographical diversity.

Another limitation involved having a relatively lower sample size for gifted youth without ASD on the Vineland-II and for both groups on the SSRS. For most participants, these measures were not completed as part of their previous evaluation and thus participants had to be recruited to complete extra forms. Several families either declined to complete or failed to return these additional forms, resulting in a smaller sample size for these measures. However, there still appeared to be sufficient power to detect differences between groups on these measures.

While this study attempted to include a sample that was representative of all ages of school-age youth, the sample was relatively young on the whole. This was particularly

true for the group without ASD, for which only 3 of 41 youth were 13 years or older. Nine of the 40 participants with ASD were 13 years or older. Thus, the effects of age could not be investigated during the present study. Further, this study did not include toddlers or preschool-aged youth, which is age group of interest given the implications for early diagnosis in this population.

One final limitation was the gender distribution of this sample. Specifically, only 6 of 40 participants in the ASD group were female. While this is generally consistent with the gender distribution seen in the population of youth with high functioning ASD (Fombonne, 2005), it prohibited an examination of potentially important gender differences in gifted youth with ASD.

Future Directions

The current project joins a small group of pioneering studies examining a new area of research: the characteristics and needs of gifted youth with ASD. As is common when beginning to explore a new area of research, the results of this study lead to more questions than answers. Currently, there are countless research questions to address for this population of twice exceptional youth, a few of which are outlined below.

As indicated in the limitations of the current study, the observed gender distribution in individuals with high functioning ASD has made it difficult for researchers to examine gender effects in this population. Some knowledge can be gained by case studies on gifted girls with ASD, such as that conducted by Assouline et al. (2009). However, future research should also attempt to recruit samples of gifted girls with ASD of sufficient size in order to examine the characteristics and needs of this population as

well as make to make comparisons between gifted boys and girls, in order to aid in diagnostic clarification and the development of appropriate interventions.

Another potential area of future research alluded to in the discussion of study limitations is to specifically examine the effects of age on gifted youth with ASD. Examination of age effects was not within the scope of the present study, but results of this type of study would aid in defining developmental aspects of ASD in gifted youth and in identifying age and developmentally appropriate interventions throughout the lifespan. Research in this area could further aid in delineating the effects of intervention by allowing a comparison of same-age gifted youth who have and have not received particular interventions to determine which effects were due to the intervention versus which could be accounted for by maturation. Additional research into the characteristics of gifted toddlers and preschool students with ASD has the potential to improve efforts at early identification and, correspondingly, the provision of effective early intervention services.

Replication of the current study in itself would contribute to the current literature by providing further evidence regarding characteristics of gifted youth with and without ASD, as well as a comparison between the two groups. In addition, adding measures of ASD symptomology and academic achievement to a replication study would expand current knowledge on this population. For example, including the ADOS and the ADI-R would allow a direct comparison of similarities and differences in autistic symptomology between gifted youth with and without ASD. This would serve to further expel myths about the intersection of giftedness and ASD and provide valuable information to aid in diagnostic clarification and the development of directed interventions for this population.

Including measures of academic achievement would be particularly beneficial to teachers by potentially outlining a pattern of academic strengths and weaknesses associated with ASD in gifted youth. Again, results of this type of research could inform the development of intervention and acceleration or enrichment programs for gifted youth with ASD.

Comparing characteristics of gifted youth with ASD to other populations may be a potentially fruitful area of inquiry. For example, it would be interesting to directly compare gifted youth with ASD to youth with ASD and average intellectual functioning. This would highlight unique differences between groups, as well as underscore ways in which the two groups are the same, thus making it possible to generalize research on high functioning ASD to gifted youth with ASD. Further, future research could compare gifted youth with ASD to a general sample of youth with ASD to determine the importance and usefulness of separating ASD research based on intellectual ability. In addition, comparing gifted youth with ASD to other twice exceptional populations would aid in diagnostic clarity. Currently, many gifted youth with ASD are initially misdiagnosed with another disorder, such as ADHD, a learning disability, or OCD (Cederlund & Gillberg, 2004; Gilchrist et al., 2001; Webb et al., 2005). Therefore, research into the similarities and differences of various groups of twice exceptional youth has the potential to improve diagnostic accuracy for gifted youth.

Currently, research is lacking on cultural differences in the presentation and diagnosis of ASD. The literature suggests that the prevalence of ASD is not related to race, social class, or immigrant status (Fombonne, 2005). However, whether differences exist in the the manner in which cultural groups understand, conceptualize, and respond to having a child with ASD is largely unknown. As we know cultural differences exist in

social norms and relationships and ASD is largely a diagnosis of dysfunctional social interaction, it is possible that the presentation or appearance of ASD varies somewhat by culture in the same way it may differ by sex. Clearly, there is much to learn about cultural differences in ASD making this a fruitful area for both qualitative and quantitative investigation.

In the present study, a larger proportion of gifted youth with ASD were found to have participated in acceleration opportunities, particularly whole grade acceleration, than gifted youth without ASD. This is somewhat of a curious finding given that both groups demonstrated equally strong cognitive skills and given the findings from the Vineland-II, BASC-2, and SSRS indicating that gifted youth with ASD were significantly more likely to demonstrate psychosocial and adaptive skills deficits. Therefore, future qualitative research should be conducted with educators to investigate how decisions are made regarding acceleration. In particular, it would be interesting to investigate whether differences exist in how educators and other members of the educational team make decisions about acceleration regarding gifted child with and without ASD.

Perhaps most importantly, future research needs to begin applying literature on gifted youth with ASD to the development of effective, directed interventions to serve the complex needs of this population. Currently, it is unknown whether existing ASD interventions are appropriate or effective for gifted youth with ASD. Perhaps existing interventions are effective, but less so than interventions that could be designed specifically for gifted youth based on the research describing the characteristics of this population. Similarly, it is unknown whether current gifted education opportunities are successful in facilitating this twice exceptional population to reach their potential.

Intervention programs for gifted youth with ASD will need to take into account both the strengths and weaknesses of this population, thereby providing acceleration and enrichment opportunities to address talents and gifts as well as special education interventions and accommodations to address relative deficits in functioning.

Conclusions

Results of this study support the predictions stated in Chapter 2 that gifted youth with and without ASD would differ in performance across multiple domains. As hypothesized, gifted youth with ASD had statistically significant and clinically significant deficits in processing speed, adaptive functioning, psychosocial/behavioral functioning, and social skills functioning in comparison to gifted youth without ASD. The most striking difference between groups was in adaptive functioning, where youth with ASD showed the greatest deficits. More significant differences were found in psychosocial functioning than hypothesized. Parents and, to a slightly lesser extent, teachers reported significantly greater concerns in the areas of atypicality, withdrawal, adaptability, social skills, functional communication, aggression, attention, depression, hyperactivity, somatization, learning problems, activities of daily living, study skills, and leadership for youth with ASD in comparison to youth without ASD. On the self-report form, youth with ASD endorsed statistically greater concerns than youth without ASD in the areas of anxiety, depression, social stress, and sense of inadequacy; however, these concerns did not reach clinical significance.

In sum, the present study is the first to empirically provide information regarding the functioning of gifted youth with ASD in comparison to gifted youth without ASD across the domains of intellectual functioning, adaptive functioning,

psychosocial/behavioral functioning, and social skills using a group study design. Results of this study have significant implications for diagnosis of ASD in gifted populations, the development of appropriate interventions for these twice exceptional youth, as well as implications for educational services.

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APPENDIX A

DSM-IV-TR CRITERIA FOR AUTISTIC DISORDER, ASPERGER'S DISORDER, AND PDD-NOS

Diagnostic Criteria for 299.00 Autistic Disorder

A. A total of six (or more) items from (1), (2), and (3), with at least two from (1), and one each from (2) and (3):

(1) qualitative impairment in social interaction, as manifested by at least two of the following:

(a) marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction

(b) failure to develop peer relationships appropriate to developmental level

(c) a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest)

(d) lack of social or emotional reciprocity

(2) qualitative impairments in communication as manifested by at least one of the following:

(a) delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime)

(b) in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others

(c) stereotyped and repetitive use of language or idiosyncratic language

(d) lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level

(3) restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:

(a) encompassing preoccupation with one or more stereotyped and restricted patterns of

interest that is abnormal either in intensity or focus

(b) apparently inflexible adherence to specific, nonfunctional routines or rituals

(c) stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)

(d) persistent preoccupation with parts of objects

B. Delays or abnormal functioning in at least one of the following areas, with onset prior to age 3 years: (1) social interaction, (2) language as used in social communication, or (3) symbolic or imaginative play.

C. The disturbance is not better accounted for by Rett's Disorder or Childhood Disintegrative Disorder.

Diagnostic criteria for 299.80 Asperger's Disorder

A. Qualitative impairment in social interaction, as manifested by at least two of the following:

(1) marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction

(2) failure to develop peer relationships appropriate to developmental level

(3) a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest to other people)

(4) lack of social or emotional reciprocity

B. Restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:

(1) encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus

(2) apparently inflexible adherence to specific, nonfunctional routines or rituals

(3) stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)

(4) persistent preoccupation with parts of objects

C. The disturbance causes clinically significant impairment in social, occupational, or other important areas of functioning.

D. There is no clinically significant general delay in language (e.g., single words used by age 2 years, communicative phrases used by age 3 years).

E. There is no clinically significant delay in cognitive development or in the development of age-appropriate self-help skills, adaptive behavior (other than in social interaction), and curiosity about the environment in childhood.

F. Criteria are not met for another specific Pervasive Developmental Disorder or Schizophrenia

Diagnostic criteria for 299.80 Pervasive Developmental Disorder, Not Otherwise Specified

This category should be used when there is a severe and pervasive impairment in the development of reciprocal social interaction associated with impairment in either verbal or nonverbal communication skills or with the presence of stereotyped behaviors, interests, and activities, but the criteria are not met for a specific Pervasive Developmental Disorder, Schizophrenia, Schizotypal Personality Disorder, or Avoidant Personality Disorder. For example, this category includes “atypical autism” – presentations that do not meet the criteria for Autistic Disorder because of late age of onset, atypical symptomatology, or subthreshold symptomatology, or all of these.

APPENDIX B

PROPOSED DSM-V DIAGNOSTIC CRITERIA FOR AUTISM SPECTRUM DISORDER

Proposed DSM-V Diagnostic Criteria for 299.00 Autism Spectrum Disorder

Must meet criteria 1, 2, and 3:

(1) Clinically significant, persistent deficits in social communication and interactions, as manifested by all of the following:
(a) marked deficits in nonverbal and verbal communication used for social interactions
(b) lack of social reciprocity,
(c) failure to develop and maintain peer relationships appropriate to developmental level;

(2) Restricted, repetitive patterns of behavior, interests, and activities as manifested by 2 of the following:
(a) stereotyped motor or verbal behaviors, or unusual sensory behaviors,
(b) excessive adherence to routines and ritualized patterns of behavior; and/or
(c) restricted, fixated interests

(3) Symptoms must be present in early childhood (but may not become fully manifest until social demands exceed limited capacities)

APPENDIX C

MARLAND REPORT DEFINITION OF GIFTEDNESS

M**arland Report Definition of Giftedness (1972)**

Gifted and talented children are those identified by professionally qualified persons who, by virtue of outstanding abilities, are capable of high performance. These are children who require differential educational programs and/or services beyond those provided by the regular school program in order to realize their contribution to self and the society.

Children capable of high performance include those with demonstrated achievement and/or potential ability in any of the following areas, singly or in combination: 1) general intellectual ability; 2) specific academic aptitude; 3) creative or productive thinking; 4) leadership ability; 5) visual and performing arts; and 6) psychomotor ability.*

It can be assumed that utilization of these criteria for identification of the gifted and talented will encompass a minimum of 3% to 5% of the school population.

*This category was later removed.

Marland, S. P. (1972). *Education of the Gifted and Talented*. Report to the Congress of the United States by the U.S. Commissioner of Education. Washington, DC: U.S. Government Printing Office.