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Anxiety in Children with Autism Spectrum Disorders: An Examination of Reporting Trends Among Children, Parents, and Teachers

Cathryn A. Lehman

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ANXIETY IN CHILDREN WITH AUTISM SPECTRUM DISORDERS: AN
EXAMINATION OF REPORTING TRENDS AMONG CHILDREN, PARENTS, AND
TEACHERS

A Dissertation

Submitted to the School of Education

Duquesne University

In partial fulfillment of the requirements for
the degree of Doctor of Philosophy

By

Cathryn A. Lehman

December 2010

Copyright by
Cathryn A. Lehman

2010

DUQUESNE UNIVERSITY
SCHOOL OF EDUCATION
Department of Counseling, Psychology and Special Education

Dissertation

Submitted in partial fulfillment of the requirements for the degree
Doctor of Philosophy (Ph.D.)

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ABSTRACT

ANXIETY IN CHILDREN WITH AUTISM SPECTRUM DISORDERS: AN EXAMINATION OF REPORTING TRENDS AMONG CHILDREN, PARENTS, AND TEACHERS

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December 2010

Dissertation Chair: Tammy L. Hughes, Ph.D.

Autism spectrum disorders (ASD) are characterized by impairments in reciprocal social skills, abnormal language development, and/or a restricted repertoire of behaviors and interests. Among individuals with ASDs, up to 84 percent are thought to have comorbid anxiety diagnoses, which can result in decreased social, emotional, behavioral, academic, and/or adaptive functioning. While differential diagnosis is necessary in order to create symptom-specific treatment protocols to address anxious symptoms, diagnostic decisions can be difficult for clinicians to make due to the common reliance on self-, parent- and teacher-report measures for collecting data. Based on theory, problems arise because deficits in the individual with ASD's ability to understand and express their feelings, and deficits in the individual with ASD's expressive and receptive language are sometimes thought to hinder their ability to self-report. Also, parent's and teacher's

abilities to identify internalizing disorders through observed, externalized symptoms are sometimes questioned. In order to better understand the usefulness of self-, parent-, and teacher-reports for the purpose of improving the accuracy of symptom detection for individuals on the autism spectrum, self-, parent-, and teacher-report data was analyzed. Rater groups were analyzed, including subjects with and without a comorbid anxiety diagnosis. Results indicated that child, parent, and teacher reports were not correlated. Scores reported by parents and teachers were significantly higher than those reported by children. Differences between raters were not influenced by whether or not the child was given an anxiety diagnosis. For children with ASD ages 6 to 16, age did not have a significant effect on the reporting trends of children, parents, and teachers. Additionally, age did not have a significant effect on scores of children with and without an anxiety diagnosis. When all three rater's scores were factored into the prediction model, parent ratings were the only ratings to significantly improve the model. Parent's scores most often predicted the presence of an Anxiety Disorder, NOS diagnosis, while teachers most often predicted the absence of an Anxiety Disorder, NOS diagnosis.

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CHAPTER I

Introduction

The Centers for Disease Control and Prevention (CDCP) have most recently found the prevalence rate of autism spectrum disorders (ASD) to be one in every 110 children (Centers for Disease Control and Prevention, 2010). Among individuals with ASD, up to 84 percent are thought to have comorbid anxiety diagnoses (Bradley, Summers, Wood, & Bryson, 2004; Chung, Luk, & Lee, 1990; Flom, 2007; Green, Gilchrist, Burton & Cox, 2000; Leyfer et al, 2006). Researchers have found that children with an ASD who have comorbid anxiety and fear exhibit increased loneliness (White, Roberson-Nay, 2009), a decreased ability to cope with stressful situations (Romanczyk & Gillis, 2006; Russell & Sofronoff, 2005), increased aggressive behaviors, poorer relationships with teachers, peers, and family members (Kim, Szatmari, Bryson, Streiner, & Wilson, 2000), and an increase in conduct problems, somatic complaints, learning problems, substance use, impulsivity, and hyperactivity (Evans, Canavera, & Kleinpeter, 2005). Comorbid disorders such as anxiety have also been found to add additional burdens on the family, and have been shown to substantially limit parents' social activities (Kim et al, 2000; Leyfer et al, 2006; Tsai, 2006).

Comprehensive assessment for the ASD population is therefore critical in order to properly identify and treat comorbid diagnoses, thereby increasing the potential to provide comprehensive services that may serve to mitigate individual and family stress. Comorbid diagnoses, such as anxiety, require additional, symptom-specific treatment protocols that can only be achieved through proper diagnosis (Leyfer, et al, 2006). For example, when comorbid diagnoses such as ASD and social anxiety are identified,

interventions for a pending social event become clearer (Romanczyk, & Gillis, 2006). In other words, once comorbid disorders are identified, treatment can be tailored to address the specific needs of the individual (Romanczyk & Gillis, 2006).

Autism Spectrum Disorders

The term autism spectrum disorder describes an array of diagnoses characterized by severe and pervasive impairment in several areas of development, including reciprocal social and communication skills, language, and/or the presence of a restricted repertoire of behaviors, interests, and activities (American Psychiatric Association, 2000; Klinger, Dawson, & Renner, 2003; Vlokmar & Klin, 2005). Although a range of developmental disorders have been documented, for the purposes of this paper, the term autism spectrum disorder will encompass Autistic Disorder, Asperger's Disorder, and Pervasive Developmental Disorder, Not Otherwise Specified (PDD, NOS); the three most commonly diagnosed Autism Spectrum Disorders.

In order to meet the diagnostic criteria for Autistic Disorder, a child must exhibit deficits in the communication and social domains, as well as evidence stereotyped behaviors and/or interests (American Psychiatric Association, 2000). While older lines of research suggested that up to 70 percent of individuals with Autistic Disorder have an IQ of less than 70, newer lines of research indicate that only 41 percent have an IQ of 70 or below (Centers for Disease Control, 2010). Individuals who meet the criteria for autism, yet have average to above average IQs are often referred to as having high functioning autism (HFA) (Stokes, & Kaur, 2005). A diagnosis of Asperger's Disorder involves a severe and sustained impairment in social interaction, along with the development of restricted, repetitive behaviors and interests (American Psychiatric Association, 2000).

Individuals with Asperger's Disorder, therefore, do not exhibit deficits in communication. Finally, the PDD, NOS diagnosis is appropriate for children who exhibit symptoms of Autistic Disorder after the age of 3 years, or for children who show some symptomology of Autistic Disorder but do not exhibit significant impairments in all three areas (American Psychiatric Association, 2000).

Anxiety

Biological, behavioral, cognitive, interpersonal, and contextual processes are key factors in the progression to pathologically-anxious symptoms among all individuals (Weems, 2008). According to theorists, situations of danger generate a complex stress response that mobilizes the body's energy resources for defense against potential harm. When the organism is in a prolonged state of readiness to confront potential situations of danger, anxiety ensues (LaBar & LeDoux, 2006). When the person is placed in situations where they experience feelings of excessive anxiety, significant deficits in the person's ability to cope with various situations can lead to maladaptive behaviors and ineffective coping strategies (Romanczyk & Gillis, 2006). The progression from a manageable state of arousal to prolonged, excessive anxiety resulting in maladaptive coping strategies can be thought of as a continuum of symptoms that eventually result in a pathological state. This pathological state can be labeled as any one of the anxiety disorders listed in the DSM-IV-TR, based on the source of the arousal.

There are 10 different types of anxiety recognized in the DSM-IV-TR that can be diagnosed in children. These include Panic Disorder with and without Agoraphobia, Agoraphobia, Specific Phobia, Social Phobia (Social Anxiety Disorder), Obsessive Compulsive Disorder (OCD), Post Traumatic Stress Disorder, Acute Stress Disorder,

Generalized Anxiety Disorder (GAD), Anxiety Disorder, Not Otherwise Specified, and Separation Anxiety (Albano, Chorpita & Barlow, 2003; American Psychiatric Association, 2000). As indicated above, differential diagnoses are made between anxiety disorders based on the focus of the child's arousal. In 2009, White, Oswald, Ollendick, and Scahill reviewed over 40 studies of anxiety among the ASD population and determined that Generalized Anxiety Disorder, Separation Anxiety, Specific Phobias, Obsessive Compulsive Disorder, and Social Phobia are the most common among children on the autism spectrum. Each of the afore mentioned diagnosis will therefore be outlined in detail in Chapter 2.

Comorbidity of ASDs and Anxiety

Rates of anxiety among the ASD population are reported to range from 17 to 84 percent (Ando & Yoshimura, 1979; Bradley et. al, 2004; Chung, Luk, & Lee, 1990; Flom, 2007; Green, Gilchrist, Burton, & Cox, 2000; Leyfer et al, 2006; Le Couteur et al., 1989; Muris, Steerneman, Merchelbach, Holdrinet, & Meesters, 1998; Rutter, Greenfeld, & Lockyer, 1967; Sukhodolsky et al., 2007). This is in stark contrast to reports of anxiety disorders occurring in five to eight percent of the typically developing population (Bernstein, & Borchardt, 1991; King, & Ollendick, 1997). This is particularly alarming as individuals with ASD who have comorbid anxiety exhibit decreased social, emotional, academic, and adaptive functioning (Evans et al., 2005; Kim et al, 2000; Romanczyk & Gillis, 2006; Russell & Sofronoff, 2005; Velting, Setzer, & Albano, 2004; White & Roberson-Nay, 2009).

Some theorists have argued that individuals with high functioning autism spectrum disorders (e.g., High Functioning Autism, Asperger's Disorder, and PDD,

NOS) experience higher levels of anxiety than lower functioning individuals. According to this theory, higher functioning individuals have greater cognitive abilities and more intact language skills, resulting in more attention to their social deficits (Klin, Volkmar, & Sparrow, 2000) and awareness of their differences (Barnhill, 2001; Gillberg, 2002). This leads to increased frustration and stress (Church, Alisanki, & Amanullah, 2000). Theorists who subscribe to this line of thinking suggest that anxiety is secondary to the individual's ASD diagnosis.

Other researchers argue that anxiety is universally associated with autism spectrum diagnoses (Howlin, 1997; Kanner, 1943; Tatum, 2000; Tsai, 1996) and suggest that many of the core characteristics of ASDs such as social withdrawal, ritualistic or compulsive behaviors, repetitive movements, and atypical attention and cognitive functioning are the result of the individual's obsessive desire to maintain sameness (Frith, 1991; Groden, Cautela, Prince, & Berryman, 1994; Howlin, 1997, 1998; Morgan, 2006; Tsai, 1996). Temple Grandin (1996), a well-known author and professor with ASD, lends support to this theory. In her writing, she discusses in detail the unconventional calming strategies, often referred to as stereotyped behaviors, that she and other individuals on the autism spectrum use in an attempt to maintain order within their lives (Grandin, 1996).

Whether anxiety is a contributing factor in ASD, or ASD result in anxiety among portions of the population, most researchers agree that comorbidity rates between the two diagnoses are high (Bradley et. al, 2004; Chung, Flom, 2007; Green, Gilchrist; Leyfer et al, 2006). Research aimed at treating these individuals is therefore essential.

Problem Statement

Self-, parent-, and teacher-report measures are frequently used to diagnose childhood anxiety both in research and clinical practice (Muris et al., 2002). While self-report measures have been found to be reliable and valid for measuring anxiety in typically-developing children and those with other psychiatric disorders, their use with children diagnosed with autism spectrum disorders has not been tested thoroughly. The diagnostic usefulness of these instruments should be examined, as some of the specific deficits associated with autism may compromise a child's ability to self-report.

For example, individuals on the autism spectrum have been found to have difficulty identifying emotions in themselves and others (Baron Cohen et al., 1985; Hill et al., 2004). Higher functioning individuals with ASD are thought to be able to identify simple emotions such as happy, sad, and angry, but experience deficits in their ability to identify and report more complex emotions, which may include anxiety. Lower functioning individuals may struggle to comprehend and communicate even concrete emotions (Capps et al., 1992). It is therefore possible that with deficits in one's ability to identify and report emotions, the usefulness of self-report measures among individuals with ASD would be compromised.

Additionally, individuals with autism spectrum disorders often have deficits in receptive and expressive communication (American Psychiatric Association, 2000), which may compromise the self-reporting of symptoms. While self-report scales typically do not require a great deal of expressive communication, they can require significant amounts of reading (if the questions are not administered orally), receptive communication (if the questions are administered orally), and in some cases expressive

language. Language deficits among individuals with ASD are therefore another area of specific concern when attempting to assess individuals using self-report measures.

Finally, the individual with ASD's ability to self-report may vary as a product of age (Achenbach et al., 1997; Langley et al., 2004; White et al., 2009). Research suggests that among the typical population, young children may struggle to self-report as they have smaller vocabularies, limited comprehension skills, and may experience difficulty communicating their feelings when compared to older children and adolescents (Langley et al., 2004). Additionally, typically-developing individuals in the adolescent years (defined as 12-18 years old) are thought to have better developed abstract thinking abilities as compared to younger children (defined as 8-11 years old; Soto, John, Gosling, & Potter, 2008). This should be explored specifically within the ASD population, as the ability to think abstractly is known to be a pervasive deficit among this population (Baron Cohen et al., 1985; Leslie, 1987).

While the ability of children with ASD to accurately report anxious symptoms should be evaluated carefully, the ability of their caregivers to make accurate reports should be assessed as well. Among all populations, when ratings are completed by parents and teachers, responses may be rated based on their understanding of the child and not the actual symptoms witnessed (Renk, 2005) or the symptoms in question may not be exhibited by the child in the environment in which the adult is present (Comer, 2004). Additionally, due to the internalized nature of anxiety, it is possible that the adults caring for the child may be unable to observe symptoms of anxiety, or the child's symptoms may be masked by other behavioral symptoms attributed to their ASD diagnosis. In deed some researchers have suggested that individuals with ASD exhibit

more externalized behaviors that are correlated to anxiety than other individuals with anxiety symptoms (Evans et al., 2005). As a result, anxiety may be inadvertently reported as a number of externalizing disorders, causing inaccurate reports made by secondary observers such as parents or teachers.

With the above data in mind, it seems as though clinical interviews with the child, parent, and teacher may prove to be a more accurate method for determining the additional diagnosis of anxiety for children with ASD. The clinical interview would allow for clarification of symptoms via follow up questions, and the use of clinical judgment on the part of the clinician. However, this is not always possible due to time constraints or participant availability. Additionally, clinical interviews do not necessarily ensure measurable data, nor do they insure more accurate reporting among participants (Boyle et al., 1997). Taken together, there is no single instrument or clinical interview process that can yet be described as the best practice for identifying comorbid anxiety within the ASD population. As such, this study seeks to determine the usefulness of the self-, parent- and teacher report options, which are most commonly used in the assessment process (Muris et al., 2002).

Synthesis of Relevant Literature

The first line of research critical to the current investigation assesses the ability of self- and caregiver-report forms to accurately and reliably measure the construct of anxiety. Researchers have found that children as young as age six are reliable sources of information about their own physical and mental health (Moreau & Weissman, 1993; Riley, 2004). Additionally, commonly used self-report measures have been found to poses moderate to high internal consistency, moderate reliability, moderate test-retest

reliability, and to correlate well with one another (Boehnke, Silberisen, Reynolds, & Richmond, 1986; Ferrando, 1994; Fox & Houston, 1983; Ollendick, 1983; Perrin & Last, 1992; Reynolds & Richmond, 1978). Self-report measures such as the Revised Children's Manifest Anxiety Scale (RCMAS), and parent report measures such as the Achenbach Child Behavior Checklist (CBCL) have been found to successfully discriminate between groups of anxious and non-anxious children, and to be valid, reliable, useful indicators of anxiety among children (Gerard, & Reynolds, 1999; Perrin & Last, 1992; Seligman, Ollendick, Langley, & Baldacci, 2004; Varela, & Biggs, 2006; Witt, Heffer, & Pfeiffer, 1990). Measures such as the RCMAS and CBCL are therefore considered to be psychometrically sound and clinically useful for determining the presence and nature of anxiety among referred and non-referred populations (Gerard, & Reynolds, 1999; Seligman et al., 2004).

Additionally, current research on non-ASD populations suggests that correlations across raters, while low, are typically significant among self-, parent-, and teacher-ratings, when utilizing rating scales (Achenbach et al, 1987; Cowen, Zax, Klein, Izzo, & Trost, 1965; Cole, Hoffman, Tram, & Maxwell, 2000; Sourander and Piha; 1997). In a meta-analysis of 119 existing studies on the agreement between child, parent, teacher, mental health worker, observer, and peer reports, the correlation between child and parent ratings of symptoms and behaviors was found to be significant (average $r=.25$), as was the correlation between parents and teachers (average $r=.27$; Achenbach et al., 1987). It is important to note that this meta analysis compiled studies that used rating scales assessing both internalized and externalized symptoms and behaviors. When these are examined separately, researchers have found that parents tend to be better at identifying

externalized behaviors as opposed to internalized symptoms (Bird, Gould, & Staghezza, 1992). Still, overall findings suggest that correlations between reporters using rating scales are typically significant and clinically meaningful (Achenbach et al, 1987; Cole, Garrison and Earls, 1985; Cowen et al., 1965; Cole, Hoffman, Tram, & Maxwell, 2000; Sourander and Piha; 1997).

The second line of research critical to the current investigation includes studies assessing the ability of individuals with ASD, and their caregivers to accurately report symptoms of anxiety. At this time, there is only one available study that approaches this topic directly. In a study by Berthoz and Hill (2005), the ability to self-report symptoms of emotion dysregulation was tested among 32 adults with autism spectrum disorders. Self-report data from three alexithymia questionnaires was analyzed, including the Bermond and Vorst Alexithymia Questionnaire Form B (BVAQ-B), the 20-Question Toronto Alexithymia Questionnaire (TAS-20), and the Beck Depression Inventory (BDI). The construct of alexithymia is described in previous literature as “difficulties in identifying and describing feelings, difficulties in distinguishing feelings from the bodily sensations of emotional arousal, impaired symbolization, as evidenced by a paucity of fantasies and other imaginative activity, and a tendency to focus on external events rather than inner experiences” (Berthoz & Hill, 2005). Data was analyzed using observed test comprehension, convergent validity, and test-retest reliability. Results pertinent to the current investigation indicated that individuals with autism spectrum disorders were able to accurately report their own emotions using self-reports.

It should be noted however, that many of the researcher’s conclusions relevant to the current investigation were based on the observed item comprehension of respondents

with ASD. For example, respondents were given a phone number to call if they had questions regarding individual items on the questionnaires. Researchers concluded that because phone calls were not made, respondents had a general understanding of the items asked. This was interpreted to mean that individuals on the autism spectrum are able to understand questions related to complex emotions and provide accurate information regarding their emotions using such questionnaires. This study, which is also specific to adults with ASD rather than children, should therefore be considered with these cautions.

Although only one study has considered the accuracy of self-report within the ASD population, there are four studies that examine the relationship between raters regarding symptoms of anxiety among individuals with ASD. All four studies examine the relationship between parent- and child-reports, leaving a gap in research regarding teacher-reports. First, Gillott, Furriss, & Walter (2001) compared the parent- and self-reports of 15 children with high functioning autism between the ages of 8 and 12 using the Spence Children's Anxiety Scale (SCAS) and the Spence Social Worries Questionnaire (SWQ). The SWQ was administered to both the children and the parents; the SCAS was administered to the children only. Similar to the data provided on the RCMAS and the CBCL (Gerard, & Reynolds, 1999; Perrin & Last, 1992; Seligman, Ollendick, Langley, & Baldacci, 2004; Varela, & Biggs, 2006; Witt, Heffer, & Pfeiffer, 1990) correlations between parents and children were weak but significant ($r=.28$). Results showed that parents of children with ASD rated their children higher on social worries than the children rated themselves, with the mean of parent's ratings being 10.67, and the mean of the child's ratings being 9.27. This is compared to the normally developing sample, where the parents' mean score for non-referred children was 4.33,

and the children rated themselves with a mean score of 6.80. Results suggest the presence of increased anxiety among the ASD population. Parents rated children with ASD higher than the children rated themselves, which was not true among the typical population; however the magnitude of the differences between parent and child ratings was larger among the non-clinical sample.

In 2005, Russell and Sofronoff (2005) also administered the SCAS and the SWQ to a sample of 65 children with ASD, ages 10 to 13 years, and their parents. Similar to the Gillot et al. (2001) findings, parents rated children's symptoms of separation anxiety, social phobia, and generalized anxiety disorder higher than the children rated themselves. Post hoc comparisons revealed significant differences between parent and child ratings of separation anxiety, obsessive compulsive symptoms, social phobia, and generalized anxiety disorder, with parent ratings higher on all occasions, except for obsessive compulsive symptoms.

Chow (2008) administered the Children's Depression Inventory (CDI; Kovacs, 2001), Multidimensional Anxiety Scale for Children (MASC), Behavior Assessment System for Children – Second Edition, Parent Rating Scales (BASC-2, PRS), and child and parent versions of the Children's Interview for Psychiatric Syndromes (ChIPS/P-ChIPS; Weller, Weller Teare, & Fristad, 1999) to 32 high functioning individuals with ASD and also to a non-clinical control group. Self- and parent-reports were collected regarding anxiety and depressive symptoms. Although researchers found a significant difference between parent and children with ASD's rating of depressive symptoms, differences were not significant for anxiety, as measured by the Child MASC and the Parent BASC-2. Specifically, the mean T-score for anxiety, as reported by parents of

children with ASD, was 55.31, whereas the mean T-score, as reported by children with ASD, was 52.34. Average T-scores for the control group ratings were 49.50 for parents and 52.81 for the child self-report. This is consistent with the findings of Gillott, Furriss, & Walter (2001). While Gillot et al.'s findings showed clinically significant differences between populations, with individuals with ASD having significantly more anxious symptoms than individuals without ASD, parents in both studies rated children with ASD higher than the children rated themselves, which was not true among the typical population. However the magnitude of the differences between parent and child ratings was larger among the non-clinical sample in both studies.

Finally, Kuusikko et al. (2008) examined social anxiety and internalizing symptoms among 54 high functioning subjects with Autistic Disorder and Asperger's Disorder on self- and parent-reports using the Social Phobia and Anxiety Inventory for Children (SPAI-C), the Social Anxiety Scale for Children Revised, (SASC-R), and the Child Behavior Checklist (CBCL/6-18). Results indicated low but significant correlations between child ratings on the SPAI-C and parent ratings on the CBCL/6-18 ($r=.264$), and child ratings on the SASC-R and parent ratings on the CBCL/6-18 ($r=.253$). Mean differences were not provided; however, this study remains particularly relevant because it was the only available study that examined the differences in child reports as a product of age. Using both the SPAI-C ($T=3.9$) and the SASC-R ($T=3.6$), subjects with ASD above 12 years old ($M= 18.1, 48.2$) reported more symptoms of social anxiety than those below 12 years of age, as compared to their typically-developing counterparts ($M=9.3, 36.6$).

Significance of the Problem

Results of the extant literature suggest that, while providing consistently lower ratings than their parents, children with ASD self-report their anxiety symptoms about as well as typically developing children, when correlations with parent ratings are examined. Among individuals with ASD, clinical samples, and non-referred children, correlations between parent- and child-reports are low but significant. Parents of children with ASD consistently rated their child's anxiety higher than the children rated themselves, which was not the case among non-ASD control groups. The only exception was regarding obsessive compulsive symptoms, which were rated higher by children with ASD than their parents. Further, among children with ASD, older children reported more anxiety than younger children. Although there are some preliminary results to suggest that anxiety is indeed measurable and comparable across raters for children with ASD and their parents, researchers have not yet determined how information from teachers may contribute to measuring anxiety in this group. Finally, it is unclear how self-, parent-, and teacher-report measures are related to the diagnosis given by the psychologist. Based on these conclusions, the following research questions were developed and proposed:

Research Questions and Hypotheses

1. For children with autism spectrum disorders, how do parents, teachers, and children rate symptoms of anxiety? Specifically, are there differences among raters when children present with a specific anxiety disorder diagnosis?
 - a. How do parent ratings differ from children with ASD's ratings?
 - b. How do parent ratings differ from teacher ratings?
 - c. How do children with ASD's ratings differ from teacher ratings?

- d. How do parent ratings differ from children with ASD ratings and teacher ratings when holding age constant?

Hypothesis: Based on the available research, it was hypothesized that children with ASD, their parents, and their teachers would not differ significantly in their reports of the child's symptoms of anxiety; however, parents would report more symptoms in all cases except in children with Obsessive Compulsive Disorder. Additionally, the self-reports of older children with ASD would be more aligned with the reports made by their parents and teachers than the self-reports of younger children.

It should be noted, that based on limitations of the data obtained, this research question could not be answered in full.

2. Is the report of anxiety symptoms by children with ASD, their parents, or their teachers predictive of an anxiety disorder diagnosis, as documented by trained examiners?

Hypothesis: Based on the available research, it is hypothesized that the self-reports of children with ASD will be equally predictive of an anxiety disorder diagnosis as parent and teacher ratings. Further, each will contribute meaningful variance to the prediction equation.

CHAPTER II

Literature Review

Historical Background of ASD

In 1911, the word “autism,” derived from the Greek word meaning “self,” was first used by Swiss psychiatrist Eugen Bleuler to describe individuals with schizophrenia who had lost contact with reality (Bleuler, 1950, as cited in Klinger, Dawson, & Renner, 2003). Bleuler discussed the patient’s autistic withdrawal into their own fantasies, against which any influence from the outside world were intolerable (Kuhn, 2004). Over thirty years later, two men, Austrian-American psychiatrist, Leo Kanner (1943) and Austrian pediatrician, Hans Asperger (1944) independently described children who presented with deficits in social relationships, language, and exhibited restricted and repetitive interests. These children were compared to those previously described by Bleuler; however, the original diagnosis of schizophrenia commonly associated with Bleuler’s patients was not used.

In a series of case studies, Leo Kanner (1943) described eleven children who he claimed exhibited extreme isolation. He reported that they had an inability to relate to people and situations from the beginning of life. Kanner stated that the children presented with deviances in language, characterized by a delay in acquisition, echolalia, occasional mutism, pronoun reversal, and literalness; as well as an obsessive desire to maintain sameness (Klinger, Dawson, & Renner, 2003). The term “autism” was used to describe these individuals, and has since become the accepted term for this presentation of symptoms.

In 1944, Hans Asperger described a group of children similar to those observed by Kanner; however, these children did not have an impairment in language skills. Instead, Asperger noted that the children had strong vocabularies and grammatical abilities, but displayed difficulties in social interactions and conversation skills. He reported that these children exhibited pedantic speech, and unusual volume, tone, and flow of speech. Asperger also noted that they often exhibited extreme originality in thought, and experienced preoccupations with a specific area of interest (Klinger, Dawson, & Renner, 2003). Asperger described these children as having “autistic psychopathy.” This presentation of symptoms was later termed Asperger’s Syndrome in Lorna Wing’s 1981 translation of his work.

Today, the term Autism Spectrum Disorder is used synonymously with Pervasive Developmental Disorder to describe an array of diagnoses characterized by severe and pervasive impairment in several areas of development, including reciprocal social and communication skills, language, and/or the presence of a restricted repertoire of behaviors, interests and activities (American Psychiatric Association, 2000; Klinger, Dawson, & Renner, 2003; Vlokmar & Klin, 2005). According to the Diagnostic and Statistical Manual, Fourth Edition, Text Revision (DSM-IV-TR; American Psychiatric Association, 2000), Autism Spectrum Disorders include Autistic Disorder, Rett’s Disorder, Childhood Disintegrative Disorder, Asperger’s Disorder, and Atypical Autism/Pervasive Developmental Disorder, Not Otherwise Specified (PDD, NOS) (American Psychiatric Association, 2000; Vlokmar & Klin, 2005). Rett’s Disorder and Childhood Disintegrative Disorder are extremely rare. Therefore, for the purposes of this

paper, Autistic Disorder, Asperger's Disorder, and PDD, NOS will be discussed, and referenced collectively as Autism Spectrum Disorders.

Autism. In order to be given a diagnosis of Autistic Disorder, a child must exhibit deficits in all three developmental areas affected by ASD, including communication, socialization, and stereotyped behaviors. Core social deficits of autism include the inability to form attachment relationships, imitate another person, understand another person's emotions, and engage in pretend play. Core language deficits include significantly delayed and deviant language development, semantics, and pragmatic language, as well as echolalia, pronoun reversal, and extremely literal language comprehension. Stereotyped behaviors and interests encompasses repetitive motor movements such as hand flapping, as well as insistence on following elaborate routines, and circumscribed interests (Klinger, Dawson, & Renner, 2003).

Cognitive abilities among individuals with ASD are as expansive as the typically-developing population. Some children with autism have intellectual abilities that are well below average. While they may fall into the mentally retarded (MR) range; however, their diagnosis is quite different than the general MR population. For example, most children who have mental retardation develop language and social skills that are consistent with their intellectual abilities. Children with Autistic Disorder and MR; however, have language and social skills that fall below their skills in other areas (Powers, 2000). These individuals may also have stereotypical behaviors.

While older lines of research suggested that up to 70 percent of individuals with Autistic Disorder have an IQ of less than 70, newer lines of research indicate that only 41 percent have an IQ of 70 or below (Centers for Disease Control, 2010). Individuals who

meet the criteria for autism, yet have average to above average IQs are often referred to as having high functioning autism (HFA) (Stokes, & Kaur, 2005). A debate continues over the relevance of the differentiation between HFA and Asperger's Disorder. The most common argument is that the differences lie in the area of spoken language (Flom, 2007). Specifically, children with HFA typically have delays in spoken language, difficulty beginning or sustaining a conversation, and/or stereotyped or repetitive language, whereas children with Asperger's Disorder do not. For example, in a 2-year follow-up study of children with either Autistic Disorder or Asperger's Disorder, Szatmari et. al. (1997) found that children with Asperger's Disorder had better social, and language abilities, as compared to children classified as having high functioning autism.

Asperger's Disorder. Asperger's Disorder is defined as involving a severe and sustained impairment in social interaction, such as marked impairment in the use of nonverbal communication, failure to develop social relationships appropriate to developmental level, lack of spontaneous seeking of shared enjoyment, interests, or achievements, and/or a lack of social or emotional reciprocity. Additionally, individuals with Asperger's Disorder exhibit restricted, repetitive behaviors and interests of abnormal intensity, inflexible adherence to nonfunctional routines and rituals, stereotyped and repetitive motor mannerisms, and/or a preoccupation with specific parts of objects (American Psychiatric Association, 2000). In contrast to people with autism; however, individuals with Asperger's Disorder do not display significant delays in language, and most often have average to above average intelligence (Klinger, Dawson, & Renner, 2003).

Pervasive Developmental Disorder, Not Otherwise Specified. The DSM-IV-TR uses the diagnosis of PDD, NOS for children who exhibit the symptoms of autism after the age of 3 years, or for children who show autistic symptomology but do not have significant impairments in all three of the areas required for the diagnosis of autism. Specifically, the DSM-IV-TR defines PDD, NOS as an appropriate diagnosis when a child has impairments in social interaction, verbal and nonverbal communication skills, or stereotyped behaviors and interests (American Psychiatric Association, 2000; Klinger, Dawson, & Renner, 2003). There is a great amount of variability in symptoms among individuals with PDD, NOS, making assumptions about the group as a whole quite difficult.

Historical Background of Anxiety

The study of childhood anxiety also has a history dating back several decades (Albano, Causey, & Carter, 2001), with studies ranging from Watson and Rayner (1920) to Freud (1965). Over time, theory on the origin of anxiety disorders has shifted from the basis of psychoanalytic theory to a modern day developmental psychopathological approach. As such, anxiety disorders have transitioned over time from being viewed as psychoneurotic reactions to phobic neuroses, to deviations from typical development (Achenbach, Howell, McConaughy, & Stanger, 1995). This most recent view, as a deviation from typical development, can be aligned with a physiological understanding of anxiety.

According to LaBar and LeDoux (2006) anxiety should be understood within an evolutionary context by which sensing a threat, or a deviation from what is normally experienced, is critical to survival. Specifically:

“Situations of danger generate a complex stress response with motoric, autonomic, endocrine, and immunological sequelae that mobilize the body’s energy resources for defense against potential harm. Vigilance systems must act quickly and must exert a powerful influence over sensory, cognitive, and visceromotor domains to prepare the body for attack, execute coping strategies, and remember the properties and locations of threatening stimuli so that they can avoid them in the future. When the organism is in a prolonged state of readiness to confront potential situations of danger, anxiety ensues” (LaBar & LeDoux, 2006).

In other words, when an individual is placed in a situation where they experience feelings of prolonged arousal to danger, anxiety results. At that time, significant deficits in the person’s ability to cope with various situations can lead to maladaptive behaviors and coping strategies (Romanczyk & Gillis, 2006). This progression from a normal state of arousal to prolonged, excessive anxiety resulting in maladaptive coping strategies should be thought of as a deviation from typical development resulting in a pathological state. Biological, behavioral, cognitive, interpersonal and contextual processes are key factors in the progression to pathologically-anxious symptoms (Weems, 2008).

Current research on pathological anxiety in children is somewhat sparse as compared to research in adult populations. This is because it is developmentally appropriate for children to exhibit anxious responses, or fears, to certain situations as they grow and develop (Albano, Causey, & Carter, 2001). For example, it is developmentally appropriate for a toddler to express some degree of separation anxiety when entering a new preschool classroom, or when their mother or father leaves to go to work.

It is therefore important to separate individual fears from a diagnosable phobia or anxiety disorder. Fears are thought to be short lived, and not sufficiently problematic to warrant attention (King, Ollendick, & Murphy, 1997). It is also developmentally appropriate for young children to express specific fears, such as a fear of heights, or a large animal with which they are not familiar. According to Evans et. al. (2005) in the

first two years of life, infants typically fear sudden loud noises, looming objects, unfamiliar adults, separation from caregivers, dismembered dolls, and strange peers and animals. These fears are considered to be biologically programmed for survival, and therefore appropriate. During the preschool years, children often fear animals, the dark, and ghosts. By school age, fears associated with danger reemerge, including burglaries, fire, and the death of a parent. Because these fears are considered to be developmentally appropriate, when formally diagnosing a child, developmental age as well as the intensity and duration of a specific fear must be considered.

Definitions and Developmental Course of Anxiety Disorders

There are 12 different types of anxiety recognized in the DSM-IV-TR, including Panic Disorder with and without Agoraphobia, Agoraphobia, Specific Phobia, Social Phobia (social anxiety disorder), Obsessive Compulsive Disorder (OCD), Post Traumatic Stress Disorder, Acute Stress Disorder, Generalized Anxiety Disorder (GAD), Anxiety due to a General Medical Condition, Substance-Induced Anxiety Disorder, and Anxiety Disorder, Not Otherwise Specified, and Separation Anxiety (American Psychiatric Association, 2000). Two of these disorders, Anxiety due to a General Medical Condition, and Substance-Induced Anxiety Disorder are not considered to be disorders of childhood (Albano, Chorpita & Barlow, 2003) and therefore will be excluded from further discussion. General diagnostic criteria for anxiety disorders uncommon to individuals with ASD are:

- Panic Disorder without Agoraphobia – Recurrent unexpected panic attacks about which there is persistent concern.

- Panic Disorder with Agoraphobia – Recurrent, unexpected panic attacks and agoraphobia.
- Agoraphobia - Anxiety about being in places or situations from which escape might be difficult or embarrassing, or in which help may not be available in the event of a panic attack.
- Post-Traumatic Stress Disorder – Symptoms of increased arousal and avoidance of stimuli following an extremely traumatic event.
- Acute Stress Disorder – Anxiety occurring immediately after an extremely traumatic event (American Psychiatric Association, 2000).

In White, Oswald, Ollendick and Scahill's 2009 review of over 40 studies on ASD and anxiety, Generalized Anxiety Disorder, Separation Anxiety, Specific Phobias, Obsessive Compulsive Disorder, and Social Phobia were found to be most common among children on the autism spectrum. For this reason, they will be discussed in greater detail than the previously outlined disorders. In addition to diagnostic criteria, age of onset and developmental progression of these disorders will be discussed. This information is pertinent to the current investigation, as age is an independent variable in the first research question.

Generalized Anxiety Disorder. Generalized Anxiety Disorder (GAD) is characterized by excessive and uncontrollable anxiety about a number of events and activities occurring more days than not for at least six months, which interferes with the individual's daily functioning. The diagnosis of GAD requires one or more physiological symptom, including restlessness, fatigue, difficulty concentrating or one's mind going blank, irritability, muscle tension, and/or sleep disturbance. It also requires that the

anxiety is not more accurately diagnosed as another more specific anxiety disorder, or the result of substance use (American Psychiatric Association, 2000). Children with GAD are typically self-conscious, and require reassurance from others. These individuals overestimate the likelihood of negative consequences, exaggerate situations to a catastrophic degree, and underestimate their own abilities (Albano, Causey, & Carter, 2001).

Individuals with GAD who do not have a developmental disability typically experience onset in the teenage years. Research has shown that children below 12 years of age experience fewer symptoms of GAD than older children. Additionally, children above 12 years of age typically rate themselves higher on self report measures of anxiety than do younger children (Strauss, Lease, Last, & Francis, 1988; Tracey, Chorpita, Dauban, & Barlow, 1997). This may be due to an increase in symptoms or an increased awareness and understanding of their internalized emotions.

Specific Phobia. The DSM-IV-TR (American Psychiatric Association, 2000) states that specific phobia is diagnosed as a result of marked and persistent fear that is excessive and unreasonable, cued by the presence or anticipation of specific objects or situations. This phobia must cause an immediate anxious response, which in children can take the form of crying, tantrums, freezing, or clinging. As a result, the phobic situation is avoided or endured with significant distress. In children, the duration of the phobia must be no less than six months.

Among the typical population, specific anxieties tend to be the first type of anxiety to develop, beginning in the childhood years (Ost, 1987). Studies have shown that specific anxieties tend to manifest between six and nine years of age (Burke, Burke,

Regner, & Rae, 1990; Giaconia et al., 1994; Weems, 2008). While rates of many other forms of anxiety tend to drop off with age, rates of specific anxieties remain consistent across the lifespan (Vasey & Olendick, 2000).

Separation Anxiety. Separation Anxiety Disorder is a disorder specific to childhood, and is characterized by excessive anxiety surrounding separation from the home or from those whom the child is attached. The disturbance must last for at least four weeks and must cause significant distress or impairment in social, academic, or other areas of functioning. Separation anxiety is diagnosed in approximately four percent of children and young adolescents. It typically begins in early childhood and decreases steadily from childhood through adolescents (American Psychiatric Association, 2000).

Obsessive-Compulsive Disorder. According to the DSM-IV-TR (2000), Obsessive-Compulsive Disorder consists of recurrent obsessions or compulsions that are severe enough to interfere with the individual's daily life, or cause marked distress or physical impairment. The obsessions of individuals with OCD are more than typical worries about real-life problems. As a result of the obsessive thoughts, the person feels driven to perform repetitive behaviors aimed at preventing or reducing distress. When diagnosing OCD in children, rituals common among typically-developing children must be parsed out from those associated with OCD. Researchers have found that the rituals of typically-developing children are not excessive, the child does not become severely distressed if the ritual is interrupted, and most rituals of typically-developing children dissipate by age nine (Leonard, Goldberger, Rapoport, Cheslow, & Swedo, 1990). In adults, the individual with OCD must realize that their obsessions or compulsions are excessive and unreasonable; however, this is not true among children.

Researchers studying OCD in children have found that the average age of onset is between 10 and 12 and a half years of age (Leonard & Rapoport, 1991; Wewerzer et al., 2001). According to Albano, Chorpita, and Barlow (2003) onset appears earlier in males than females, resulting in a predominance of boys in younger samples.

Social Phobia. Social phobia is diagnosed when an individual experiences marked or persistent fear of social or performance situations that may result in embarrassment. In adults, the individual must realize that the fear is excessive or unreasonable. As a result of this anxiety, feared social or performance situations are avoided or endured with extreme distress, and interfere with the individual's daily functioning (American Psychiatric Association, 2000). Children and adolescents with social phobia are more reluctant to join group activities, endorse more loneliness on self-report measures, and are described more often as shy than typically-developing peers (Beidel, Turner, & Morris, 1999).

According to Ost (1987) the mean age of acquisition for social phobia among the typically-developing population is 16 years old. Social phobia was most often found to be the result of conditioned experience, such as past embarrassment in a social situation (Ost, 1987).

Comorbidity Rates of ASD and Anxiety

A high clinical presence of comorbid anxiety disorders among the ASD population as a whole has been established (Bellini, 2004; Benjamin, Costello & Warren, 1990; Bird, 1996; Cath, Ran, Smit, Van Balkom, & Comijs, 2008; Gillott, Furniss, & Walter, 2001; Green, Gilchrist, Burton, & Cox, 2000; Kim, Szatmari, Bryson, Streiner, & Wilson, 2000; Klin & Volkmar, 1997; Lainhart, 1999; Matson & Love, 1990; Tatum,

2000). Researchers have cited a variety of comorbidity rates, ranging from 17 to 84 percent (Ando & Yoshimura, 1979; Bradley et al., 2004; Chung, Luk, & Lee, 1990; Flom, 2007; Green, Gilchrist, Burton, & Cox, 2000; Le Couteur et al., 1989; Leyfer et al., 2006; Muris et al., 1998; Rutter, Greenfeld, & Lockyer, 1967; Sukhodolsky et al., 2007). This is in stark contrast to reports of anxiety disorders occurring in five to eight percent of typically developing children and adolescents (Bernstein, & Borchardt, 1991; King, & Ollendick, 1997).

In addition to formal comorbid diagnoses, there are many studies that measure the rate of individual symptoms thought to be related to anxiety within the ASD population. For example, Le Couter et al. (1989) used the Autism Diagnostic Interview (ADI) with 16 children with autism and found that 89 percent had stereotyped utterances, 88 percent had unusual preoccupations, 55 percent had verbal rituals, 81 percent had compulsion rituals, 69 percent had finger mannerisms, and 63 percent had unusual sensory interests. In a similar study using the ADI, conducted by Fombonne (1992), 50 percent of French subjects with Autism had stereotyped utterances, 53 percent had unusual preoccupations, 16 percent had compulsion rituals, 74 percent had finger mannerisms, and 42 percent had unusual sensory interest. Among the most common anxiety producing subjects were thunderstorms, riding the school bus, dark places, large crowds, baths and bathrooms, toilets, going to the dentist, and closed places (Evans et al., 2005). As indicated above, many fears pertinent to survival are developmentally appropriate at various points throughout childhood; however, it is evident that many of the fears of children on the autism spectrum do not fall into this category.

Theorists have argued that individuals with high functioning autism spectrum disorders, such as High Functioning Autism, Asperger's Disorder, and PDD, NOS, have higher levels of anxiety than lower functioning individuals. According to some theorists, this is because higher functioning individuals have higher cognitive abilities and more intact language skills, resulting in more attention to their social deficits (Klin & Volkmar, 2000), and awareness of their differences and deficits (Barnhill, 2001; Gillberg, 2002). According to this theory, increased awareness leads to increased frustration and stress (Church et al., 2000).

There is inconsistent research regarding the differences between symptoms of anxiety among individuals with Autistic Disorder, Asperger's Disorder, and PDD, NOS. For example, in a study conducted by Muris et al. (1998) researchers found that some anxiety symptoms such as simple phobia, separation anxiety, avoidant disorder, and overanxious disorder were more prevalent among children diagnosed with PDD, NOS than Autistic Disorder. In a study conducted by Sukhodolsky et al. (2008), higher levels of anxiety were associated with higher IQ, the presence of functional language, and higher levels of stereotyped behaviors. In other studies, researchers found that there were no differences in anxiety levels between children with high function autism and Asperger's Disorder (Kim, Szatmari, Bryson, Streiner, & Wilson, 2000; Rumsey, Rapoport, & Sceery, 1985; Szatmari, Bartolucci, & Bremner, 1989; Tantum, 1988). Due to an overall lack of research, it is unclear at this time if differences exist between anxiety levels within ASD diagnoses.

Developmental Course of Anxiety in Individuals with ASD

Data on the developmental course of anxiety among the typical population has been outlined above; however, research on the developmental course of anxiety across the lifespan among individuals with ASD is largely unavailable. Many studies have evidenced high levels of anxiety among the ASD population (Ando & Yoshimura, 1979; Bellini, 2004; Chung, Luk, & Lee, 1990; Benjamin, Costello & Warren, 1990; Bird, 1996; Cath, 2008; Flom, 2007; Gillott, Furniss, & Walter, 2001; Green, Gilchrist, Burton, & Cox, 2000; Kim, Szatmari, Bryson, Streiner, & Wilson, 2000; Klin & Volkmar, 1997; Lainhart, 1999; Leyfer et al, 2006; Matson & Love, 1990; Sukhodolsky et al., 2007; Tantum, 2000) however to this researcher's knowledge, none have studied anxiety in ASD in relation to age. It is therefore unknown if the developmental course of anxiety among individuals with ASD is similar to that of typically-developing individuals.

Theory Relevant to the Research Questions

Theory of Mind was first proposed by Premack and Woodruff in 1978. The two defined Theory of Mind as the ability to impute mental states to one's self and others. Theory of Mind was later described by Baron Cohen (2002) as the ability to not only attribute mental states to one's self or others, but also to make sense of and predict behaviors on the basis of these mental states (p.4).

Baron Cohen et al. (1985) and Leslie (1987) argue that having Theory of Mind is impossible without the capacity to form second order representations. According to this theory, infants have the capacity to form primary representations, which allow a person to represent aspects of the world in a literal way (Leslie, 1987). Toward the end of infancy, a "decoupling mechanism" takes over, which allows the mind to form representations of one's own as well as other people's thoughts. This typically appears in the second year of

life and it is from these “second order representations” that pretend play skills emerge. Around the age of four years, typically-developing children begin to understand that each individual has beliefs and desires about the world, and it is these mental states that determine a person’s emotions and behaviors (Happé, 1995). This understanding is the direct result of second order representations, and can be called Theory of Mind.

According to several theorists, individuals with ASD lack second order representation abilities, which leads to deficits in Theory of Mind. That is, individuals with ASD have deficits in their ability to think about theirs and other people’s thoughts; resulting in deficits in social and emotional functioning, as well as the ability to think hypothetically.

It is important to note that the cognitive mechanism known as Theory of Mind is considered to be independent of intellectual ability, (Frith, 1982; Hermelin & O’Conner, 1970; Rutter, 1983). Several studies have found that children with Autistic Disorder who have high IQs lack pretend play skills and the ability to impute beliefs to others, while severely mentally retarded individuals with Down’s syndrome, as well as typically developing children do not (Baron-Cohen, Leslie & Frith 1985; Hill & McCune-Nicolich, 1981). Researchers have used this data to conclude that children with ASD, no matter their intellectual capacity, uniquely lack Theory of Mind.

While Theory of Mind is a developed independent from intellectual ability, among individuals with lower functioning autism spectrum diagnoses, such as Autistic Disorder, emotion-related deficits appear to be more broad and pervasive, often involving deficits in understanding and recognition of both concrete and socially-motivated emotions (Hobson, 1986; LaBar & LeDoux, 2006; Ozanoff, Pennington, & Rogers, 1990). This means that where individuals with High Functioning Autism, PDD, NOS,

and Asperger's Disorder are often able to understand and express concrete emotions, individuals with more severe deficits, such as those with Autistic Disorder, are often less able to do so.

Some theorists reason that relative validity of parent and child assessments may vary as a product of the child's age or developmental level (Achenbach et al., 1997; Langley et al., 2004; White et al., 2009). For example, according to Langley et al. (2004) parents should play a larger role in the assessment of young children as opposed to older children or adolescents because young children have smaller vocabularies, limited comprehension skills, and may experience difficulty communicating their feelings. Additionally, typically-developing individuals in late adolescents (defined as 12-18 years old) are thought to have better developed abilities to think abstractly and consider hypotheticals, rather than being tied to the concrete, as compared to children in their late childhood (defined as 8-11 years old) years (Soto, John, Gosling, & Potter, 2008). This is consistent with developmental literature, which suggests that children's affective experiences and abilities to communicate emotions become more differentiated with age (Cicchetti & Hesse, 1982; Lewis & Michaelson, 1983; Capps et al., 1992).

Summary of Theory

In summary, anxiety is defined as a prolonged fight or flight response to external stimuli, leading to maladaptive thought patterns (LaBar and LeDoux, 2006). Whether anxiety is secondary to, or a contributing factor in ASD, the two have a high comorbidity rate that exceeds the general population (Bellini, 2004; Benjamin, Costello & Warren, 1990; Bird, 1996; Cath, 2008; Gillott, Furniss, & Walter, 2001; Green, Gilchrist, Burton, & Cox, 2000; Kim et al., 2000; Klin & Volkmar, 1997; Lainhart, 1999; Matson & Love,

1990; Tantum, 2000). While individuals on the autism spectrum may be able to feel anxious emotions, they have difficulty identifying these feelings in themselves and others, and to think hypothetically, due to deficits in second order representation and Theory of Mind (Premack & Woodruff, 1978).

According to theorists, because individuals on the autism spectrum have deficits in second order representation abilities and Theory of Mind, higher functioning individuals are typically able to identify basic emotions such as happy, sad, and angry, but have difficulty identifying and reporting more complex emotions, such as anxiety. Lower functioning individuals such as those with Autistic Disorder; however, may struggle to comprehend and communicate even the most basic emotions (Happé, 1995; Hobson, 1986; LaBar & LeDoux, 2006; Ozanoff, Pennington, & Rogers, 1990). Finally, vocabulary, comprehension skills, difficulty communicating feelings, and deficits in abstract thinking skills suggests that children's affective experiences and abilities to communicate emotions become more differentiated with age (Cicchetti & Hesse, 1982; Lewis & Michaelson, 1983; Capps et al., 1992).

Current Empirical Literature Relevant to the Research Questions

Emotional Awareness among Individuals with ASD. Based on the above theory, research was reviewed in order to determine if individuals with ASD indeed have deficits in their ability to identify their own emotions. In each study reviewed, individuals on the autism spectrum were able to identify basic emotions such as happy, sad, and mad, but struggled with more complex emotions such as embarrassment, shame, and empathy (Baron-Cohen, Leslie & Frith, 1985; Berthoz & Hill, 2005; Capps et al., 1992; Heerey,

Keltner & Capps, 2003; Hobson, 1986; Silani et al., 2008; Yirmiya, Sigman, Kasari & Mundi, 1992).

The most recent available study was conducted by Silani et al. (2008). In this investigation, researchers assessed the ability of individuals with High Functioning Autism and Asperger's Disorder to identify and distinguish their own feelings using alexithymia and empathy questionnaires, as well as fMRI data. The construct of alexithymia was described in detail in chapter one, and is characterized as deficiencies in the understanding, processing, or describing of emotions. Results of this study suggested that individuals with ASD differed significantly from the typically-developing control group on both alexithymia and empathy questionnaires. Additionally, alexithymia and lack of empathy were correlated, which lead researchers to conclude that a link exists between understanding ones' own and other people's emotions.

The presence of Theory of Mind was tested by Baron-Cohen, Leslie, and Frith in 1985, using Wimmer and Perner's Puppet Paradigm. Here, researchers compare high functioning individuals with autism to a group of children with Down's Syndrome. Researchers determined that children with Down's Syndrome were able to impute beliefs on others, while individuals with Autistic Disorder could not. Results of this study suggested that despite increased age and cognitive abilities in the Autistic sample, individuals with autism experience deficits in Theory of Mind while individuals with mental retardation did not.

In another relevant study conducted by Capps et al. (1992), researchers compared high functioning children with Autistic Disorder to a control group in terms of emotional expression and recognition. Results indicated that high functioning children with autism

were able to identify basic emotions, such as happy and sad, but had difficulty recognizing and expressing more complex emotions such as pride or embarrassment. Results of this study suggested that, similar to Leslie's theory, individuals with autism were found to possess the ability to identify the most basic of emotions; however, they experience difficulty with more abstract emotions that require second order representation and Theory of Mind.

In one final study, high functioning individuals with autism and age-matched, non-clinical controls were asked to identify the emotions experienced by a videotaped protagonist. The individuals were also asked to report their own emotional responses. Again, although the individuals with autism were able to perceive the emotions, their social and empathetic awareness was found to be significantly less accurate than the control group (Yirmiya, Sigman, Kasari & Mundi, 1992).

As a whole, the above research suggests the merit of theories involving deficits in individuals with ASD in regards to second order representation and Theory of Mind. In the available research, individuals on the autism spectrum were often able to identify basic emotions involving first order representation such as happy, sad, and mad, but lacked the ability to identify abstract or more complex emotions that require second order representation and Theory of Mind.

Use of Rating Scales among the General Population. With the above research in mind, it is logical to question the use of self-report measures for assessing complex emotions, such as anxiety, in individuals on the autism spectrum. Prior to doing so, it is important to investigate their use with the general population. Self-, parent-, and teacher-report measures are frequently used to diagnose childhood anxiety both in research and

clinical practice (Muris et al., 2002). In one recent meta analysis, researchers found that many psychologists based their diagnoses on self, parent, and/or teacher ratings alone. Of the 26 studies reviewed in the meta analysis, 33 percent of diagnoses were based on child report only, seven percent used only parent report, 42 percent used reports from both the parent and child, two percent were based on reports from a parent and a teacher, and nine percent used data from the child, parent, and teacher (Seligman, Ollendick, Langley, & Baldacci, 2004). While it is recommended that psychologists always use multiple sources of information when making a diagnosis, this research suggests that report measures are often a critical source of information for the clinician.

For psychologist working with the non-ASD population, report measures have been found to be valid, reliable, and useful source of information. Referred and non-referred samples as young as age six have been found to be reliable sources of information about their own physical and mental health (Moreau & Weissman, 1993; Norwood, 2007; Riley, 2004). Commonly used self-report measures have been found to poses moderate to high internal consistency, moderate reliability, moderate test-retest reliability, and to correlate well with one another (Boehnke et al., 1986; Ferrando, 1994; Fox & Houston, 1983; Ollendick, 1983; Perrin & Last, 1992; Reynolds & Richmond, 1978). Additionally, self-report measures such as the RCMAS, and parent report measures such as the CBCL have been found to successfully discriminate between groups of anxious and non-anxious children, and to be valid, reliable, useful indicators of anxiety. Researchers have therefore concluded that report measures, such as the CBCL/6-18 and the RCMAS, are considered to be psychometrically sound and clinically useful

measures of anxious symptoms (Gerard, & Reynolds, 1999; Perrin & Last, 1992; Seligman et al., 2004; Varela, & Biggs, 2006; Witt, Heffer, & Pfeiffer, 1990).

Still, there are there are universal drawbacks to using rating scales, which should be discussed. When attempting to measure anxious symptoms in children, the most notable drawback is the lack of distinction between childhood anxiety and depressive symptoms, which may cause rating scales to be insensitive to differentiation between the two diagnoses. This is consistent with several studies, which have shown that throughout childhood and adolescents, depressed and anxious mood are closely related (Compas & Oppedisano, 2000). Studies most often find moderate to high correlations (between .50 and .70) and comorbidity between anxious and depressed symptoms (Eason, Finch, Brasted, & Saylor, 1985; Inderbitzen & Hope, 1995). As a matter of fact, Brady and Kendall (1992) found that the Childhood Depression Inventory (CDI), a commonly used self rating tool for diagnosing depression in children, has six direct analogs on the RCMAS. While some researchers, such as Vasey and Ollendick (2000) have proposed that constructs of anxiety and depression contribute to a single dimension, most researchers maintain that despite their overlap in symptomology, critical differences remain between the two constructs. This is because anxiety and depression can differ in terms of course, prognosis, and treatment selection (Kendall et al., 1992; Mash & Barkley, 1989). It is therefore essential that despite overlapping symptomology, differential diagnoses be made.

Relationship between Reporter Ratings in Non-ASD Samples. While the reliability, validity, and clinical usefulness of rating scales among the typical population has been established above, the purpose of the proposed study is not only to determine

the usefulness of self-report forms among the ASD population, but also to determine the relationship between self-, parent-, and teacher-report forms. It is therefore necessary to first define this relationship among the typically developing population.

In non-ASD populations, differences in child and parent or teacher reports are sometimes thought to result from reliance on the child's ability to read and understand language, comprehend and label their own emotions, and their willingness to answer questions about themselves in an honest manner (Kazdin, 1988; Reynolds & Johnson, 1994). In parents and teachers, possible sources of variance result from the fact that items can be rated based on their understanding of the child and not the actual symptoms witnessed (Renk, 2005), or the symptoms may not be exhibited by the child in the environment in which they see the child (Comer, 2004). Additionally, due to the internalized nature of anxiety, it is possible that the adults caring for the child may be unable to see symptoms of anxiety, or they may be masked as other more behavioral diagnoses (Evans et al., 2005).

Despite these concerns, while sometimes weak, the correlations between raters among non-ASD samples are typically significant (Achenbach et al, 1987; Cole, Garrison and Earls, 1985; Cowen et al., 1965; Cole, Hoffman, Tram, & Maxwell, 2000; Sourander and Piha; 1997). For example, in a meta-analysis of 119 existing studies on the agreement of reports between parents, teachers, mental health workers, observers, peers, and non-ASD subjects themselves, the correlation between child and parent assessments of a child's symptoms and behaviors was found to be significant (average $r=.25$), as was the correlation between parents and teachers (average $r=.27$) (Achenbach et al, 1987). Studies for this meta analysis assessed the ability of parents, teachers, and children to report a

variety of symptoms and behaviors, including emotional concerns such as anxiety and depression; behavioral problems; positive behavior; temperament; anger; aggression; adaptability; popularity; delinquency; adjustment; and hyperactivity. It should be noted, however, that only three of these studies were specific to the topic of anxiety. A sampling of these and more recent available studies were chosen for review below.

In one included study on anxiety, Cowen, Zax, Klein, Izzo, and Trost (1965) compared the reports of 394 teachers and children enrolled in three public third grade classrooms in Rochester, NY. Assessment measures consisted of the Children's Manifest Anxiety Scale (CMAS), as well as intellectual, achievement, behavioral, and sociometric assessment measures. Results indicated a significant correlation ($r=.25$) between child reports of anxiety on the CMAS, and teacher reports of adjustment on a 17-item checklist.

While this study was chosen for review because it was one of very few studies specific to the construct of anxiety, it has several downfalls. First, child ratings of anxiety were not correlated with teacher ratings of anxiety. Instead, child ratings of anxiety were correlated with teacher ratings of adjustment based on the theory that anxiety is highly correlated with maladjustment. In doing this, the researchers are assessing the correlation between anxiety and maladjustment rather than assessing various raters of anxiety. Second, although it is unclear in the description, it appears as though the measure that was used by teachers to assess adjustment was not assessed in terms of psychometric properties. In other words, validity and reliability were not established.

In one more recent study, Sourander and Piha (1997) compared ratings from parents, teachers, and clinicians on 101 non-ASD, inpatient psychiatric patients using the

Achenbach Child Behavior Checklist (CBCL/6-18), Rutter's Parental Questionnaire, Achenbach Teacher Report Form (TRF/6-18), Rutter's Teacher Questionnaire, and the Children's Global Assessment Scale (CGAS). Children were assessed on both internalizing and externalizing symptoms. The sample had a mean age of 9.8 years. Analysis of results indicated that the correlation between the clinician and parent scale was reported to be significant ($r=.30$). The correlations between the parent and teacher total scores and clinician and teacher total scores were not significant. Researchers concluded that correlations between global functioning as evaluated by the clinician, and total symptom scores evaluated by the parent showed significance.

This study had several notable drawbacks, including the fact that the subjects participated in an inpatient program. This suggests that subjects may have an overall higher level of presenting symptoms. Additionally, the subject's parents and teachers may not spend as much time with the children as they would if they were living at home, and therefore may not be familiar with their current level of presenting symptoms. Correlations among clinicians, teachers, and parents who saw their children on a regular basis may therefore be arguably higher. Generalization of this research should therefore be done with caution.

Finally, in a study more closely aligned with the proposed investigation, Garrison and Earls (1985) assessed the screening utility of the Child Behavior Checklist (CBCL/6-18) (Achenbach, 1978, 1979) using a sample of 62 typically-developing children ages six and seven years old. Reports of behavior problems from mothers, fathers, and teachers were compared to a blind clinician assessment of the children. Clinician assessments included the Wechsler Intelligence Scale for Children (WISC-R), the Perceived

Competence Scale for Children (PCS), the Wide Range Achievement Test (WRAT), and a behavior rating along eight dimensions. These dimensions included eye contact with peers, anger expressed, frustration tolerance, withdrawn social behavior, aggressiveness displayed, activity level, anxiety level, and overall sociability at play. Results suggested agreement, although somewhat low at times, between parent and teacher ($r=.16$, $r=.10$), parent and clinician ($r=.11$, $r=.17$), and teacher and clinician ($r=.27$) ratings.

This study was chosen for review because it is closely related to the current investigation in that parent and teacher ratings were correlated with a clinician's perspective. However, there are a few points that should be considered. First, externalized behaviors were again rated, which may result in more accurate reports among parents than raters of symptoms of anxiety. Secondly, the age range of the children involved in this study was extremely small. This should be expanded upon in future research. Finally, self-ratings were not included as a factor in the investigation. It is therefore unknown how the children would have rated themselves, which is a frequent component when assessing for an anxiety diagnosis.

In summary, while results are somewhat variable, among non-ASD samples there are typically significant correlations between parent-, teacher-, clinician-, and self-reports of behaviors and psychiatric symptoms. With well over 100 studies assessing these correlations and finding similar results, it is appropriate to conclude that this data is an accurate representation of the larger population.

Use of Rating Scales among the ASD Population. While the reliability, validity, and clinical utility of rating forms among the typical population, and the relationship between raters have been established, rating forms assessing complex emotions, such as

anxiety, are potentially problematic for children on the autism spectrum, as theory suggests that individuals with ASD lack the ability to identify and report emotions (Baron-Cohen, Leslie & Frith, 1985; Berthoz & Hill, 2005; Capps et al., 1992; Heerey, Keltner & Capps, 2003; Hobson, 1986; Silani et al., 2008; Yirmiya, Sigman, Kasari & Mundi, 1992). Additionally, individuals on the autism spectrum often experience deficits in communication (American Psychiatric Association, 2000), which may ultimately produce deficits in their ability to self-report. Finally, research suggests that individuals with ASD exhibit more externalizing behaviors that are correlated to specific anxieties. This could potentially lead to a masking of symptoms as various externalizing disorders, causing inaccuracy in reports made by observers such as parents or teachers (Evans et al., 2005).

At the current time, there is one available study that broaches the topic of the self-reporting abilities of individuals on the autism spectrum. Berthoz and Hill (2005) examined the validity of using self-reports to assess emotion regulation abilities in 32 adults with autism spectrum disorders by analyzing self report data from three alexithymia questionnaires, including the Bermond and Vorst Alexithymia Questionnaire Form B (BVAQ-B), the 20-Question Toronto Alexithymia Questionnaire (TAS-20), and the Beck Depression Inventory (BDI). Data was analyzed using observed test comprehension, convergent validity, and test-retest reliability. Results relevant to the current investigation indicated that individuals with autism spectrum disorders were able to report on their own emotions using self-report ratings.

While a widely cited study in the current literature, results of this study should be interpreted with caution. While convergent validity and test-retest reliability were

established, many of the researcher's conclusions relevant to the current investigation were based on the observed item comprehension of the respondents. For example, researchers argued that participants with ASD were thought to have comprehended the questions asked of them regarding emotions on the BVAQ-B because, of the 32 subjects involved in the study, 27 (84.4 percent) returned the questionnaire fully completed, and only two of the 27 phoned to ask questions about the directions for the task during the first administration. No individuals phoned to ask questions during the second administration. Additionally, participants were reported to understand and appropriately answer questions about their feelings because no questions were asked about the meaning of items on either the BVAQ-B or the TAS-20. While these conclusions provide insight into the procedure of the study, it is somewhat of a leap to conclude that because no questions were posed in regards to the instructions or meanings of individual items, that individuals were able to comprehend the meaning of emotion-related items. These results should therefore be interpreted with this information in mind. Additionally, the subjects involved in this study were adults on the autism spectrum, which decreases the study's relevance to the current investigation.

Relationships among Reporters in ASD Samples. Weak but significant correlations have been established between raters of anxiety among samples of children without Autism Spectrum diagnoses. As outlined above, theory suggests that self-reports among individuals with ASD should have lower correlations and greater mean differences with other raters than their typically developing peers, due to a lack of second order representation and Theory of Mind. Additionally, due to an increase in externalizing behaviors correlated to specific anxieties among individuals on the autism

spectrum, differences in the ability of parents and teachers to report symptoms among the ASD population is also likely. While data from one available study does not reflect this theory, results of the study lacked scientific rigor. It is therefore necessary to dig deeper into the research base to compare the reporting abilities of individuals on the autism spectrum with their parent's and teacher's reports.

At the current time, there are four available studies that compare rating scale results of individuals on the autism spectrum and their caregivers in regards to symptoms of anxiety. All four studies examine the relationship between parent- and child-reports, leaving a gap in research regarding teacher-reports. In the first, conducted by Gillott et al. (2001), the parent- and self-reports of fifteen children with high functioning autism between the ages of eight and 12 were compared using the Spence Children's Anxiety Scale (SCAS; Spence, 1997) and the Spence Social Worries Questionnaire (SWQ; Spence, 1995). The SWQ was administered to both the children and the parents, while the SCAS was administered to the children only. Correlations between the self- and parent-reports were found to be weak but significant ($r=.28$). Data was analyzed using Kruskal-Wallis Analysis of Variance to evaluate the overall significance between groups. Mann-Whitney U-tests were used to make pair wise comparisons. Overall, parents gave higher ratings of their child's social worries than the children gave themselves, with the mean of parent's ratings being 10.67, and the mean of the child's ratings being 9.27. This is compared to the normally developing sample, in which the parents rated their children at a mean score of 4.33, and the children rated themselves higher, with a mean score of 6.80. This data is presented in figure 1. Results suggest the presence of increased anxiety among the ASD population. Parents rated children with

ASD higher than the children rated themselves, which was not true among the typical population; however the magnitude of the differences between parent and child ratings was larger among the non-clinical sample.

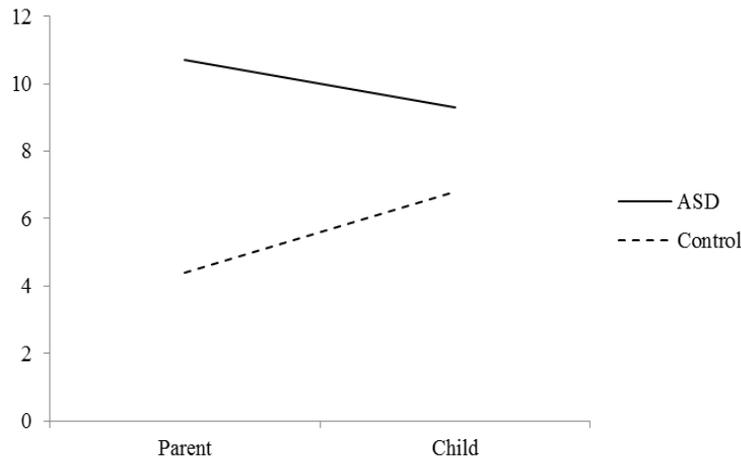


Figure 1

Mean Anxiety Scores in the Existing Literature (Gillott et al.,2001)

This study had limitations. The sample size was small, making generalizability difficult. Also, the sample was specific to children with high functioning autism, leaving a void in the literature in terms of differences in self-reporting abilities among children with Asperger’s Disorder and PDD, NOS. Additionally, children above 12 years of age were not included in the study, making results applicable only to younger populations. Finally, ratings of parents and children were not compared to the formal diagnoses of a trained professional, therefore making it impossible to determine which informant was most similar to the clinician’s diagnostic impressions.

In a second study, conducted by Russell and Sofronoff (2005) a sample of 65 children with ASD ages 10-13 years were assessed using the Spence Children’s Anxiety

Scale (SCAS; Spence, 1997) and the Spence Social Worries Questionnaire (SWQ, Spence, 1995). T-tests and Analysis of Variance (ANOVA) were used to analyze the data. Similarly to Gillot et al. (2001), parents rated children's symptoms of separation anxiety, social phobia, and generalized anxiety disorder higher than the children rated themselves. Post hoc comparisons revealed significant differences between parent and child ratings of separation anxiety, obsessive compulsive symptoms, social phobia, and generalized anxiety disorder; with parent ratings higher on all occasions less obsessive compulsive symptoms.

The sample size of this study was relatively large, making the results more generalizable than the study by Gillot et al. (2001). Additionally, 13-year-olds were included in the sample, slightly broadening the range of the children represented in the study. Ratings of parents and children were again not compared to clinical ratings and formal diagnoses of a trained professional, therefore making it impossible to determine which reporter is most closely aligned with the given diagnosis.

In the third study, Chow (2008) compared 32 high functioning individuals with autism spectrum disorders ratings of their own anxiety and depression to their parent's ratings, as well as to a non-clinical control group. Researchers employed the Children's Depression Inventory (CDI; Kovacs, 2001), the Multidimensional Anxiety Scale for Children (MASC), and the Behavior Assessment System for Children – Second Edition Parent Rating Scales (BASC-2 PRS), and the child and parent versions of the Children's Interview for Psychiatric Syndromes (ChIPS/P-ChIPS; Weller, Weller Teare, & Fristad, 1999). Data was analyzed using Repeated Measures Analysis of Variance (ANOVA) and Analysis of Covariance (ANCOVA). While significant differences were found between

parent and children with ASD's ratings on symptoms of depression, there were no significant differences between parent and children with ASD's ratings of symptoms of anxiety, as measured by the Child MASC and the Parent BASC-2. Specifically, the mean T-score for parents of children with ASD was 55.31, whereas the mean T-score for children with ASD was 52.34. These results are presented in figure 2. This is consistent with the findings of Gillott, Furriss, & Walter (2001). While Gillot et al.'s findings showed clinically significant differences between populations, with individuals with ASD having significantly more anxious symptoms than individuals without ASD, parents in both studies rated children with ASD higher than the children rated themselves, which was not true among the typical population. However the magnitude of the differences between parent and child ratings was larger among the non-clinical sample in both studies.

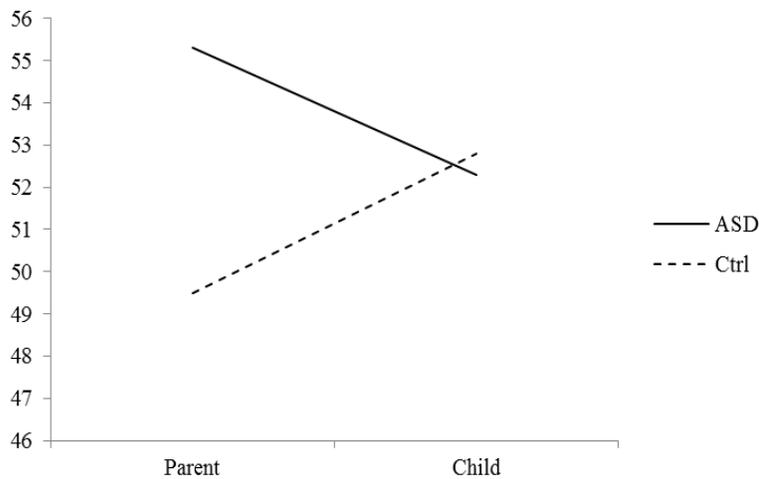


Figure 1

Mean Anxiety Scores in the Existing Literature (Chow, 2008)

Again, this study had several limitations. The sample was relatively small and correlations between the two measures were not provided. Because correlations were not provided, it is possible that the item content may have skewed the results and should therefore be interpreted with this in mind.

In a fourth and final study, Kuusikko et al. (2008) examined social anxiety and internalizing symptoms among 54 high functioning subjects with Autistic Disorder and Asperger's Disorder using the Social Phobia and Anxiety Inventory for Children (SPAI-C), the Social Anxiety Scale for Children Revised, (SASC-R), and the Child Behavior Checklist (CBCL/6-18). Participants were between the ages of eight and 15 years old. Research questions included correlations between individual measures among individuals with and without ASD, correlations between individuals with HFA and Asperger's Disorder in terms of symptom presentation, correlations between parent and child reports among subject with and without ASD, correlations between age of subject among reporters with and without ASD (children were divided into two groups including children above 12 years old and children below 12 years old), and correlations between genders with and without ASD.

Each assessment was adapted to remove symptom overlap between ASD and social anxiety. For example, several items that were thought to measure social avoidance were removed from the SPAI-C, including statements such as, "I usually do not speak to anyone unless they speak to me, I try to avoid social situations," and, "I leave social situations." Additionally, items were removed from the SASC-R including, "It is hard for me to ask other kids to play with me." Finally, items were removed from the CBCL/6-18, such as, "Would rather be alone than with others, refuses to talk," and, "Doesn't get

involved with others.” The items left were intended to focus on emotional and cognitive reactions to social situations rather than behaviors of social avoidance often considered to be associated with an autism spectrum disorder.

Data in this study was analyzed using Multivariate Analysis of Variance (MANOVA), Univariate Analysis of Variance (ANOVA), Pearson’s Coefficient Correlation, and T-tests. Nonparametric tests such as Chi Square analyses were also used. Results of the study suggested low but significant correlations ($r=.264$, $r=.253$) between child reports on the SPAI-C and SASC-R and parent reports on the CBCL/6-18. No statistically significant differences were found between reports of children with HFA as compared to Asperger’s Disorder. This was the only available study that examined the differences in child reports as a product of age. Statistical significant results were found in terms of age using both the SPAI-C ($T=3.9$) and the SASC-R ($T=3.6$), where subjects with ASD above 12 years old ($M= 18.1$, 48.2) reported more symptoms of social anxiety than those below 12 years of age as compared to their typically developing counterparts ($M=9.3$, 36.6).

One limitation of this study was that due to the changes made in the test measures, such as deleting individual items, reliability and validity of the assessments cannot be assumed. Also, due to the covariance of symptoms associated with ASDs and Anxiety, the deletion of items considered to be associated with ASD may have lead to an inaccurate representation of the reporter’s symptoms. Another limitation was a lack of statistical power among the gender groups. The female population was substantially lower than males, drawing the analysis of this specific area of research into question. Researchers argued that gender proportions in the sample were similar to that of the

general population. Furthermore, child self-reports were not examined in terms of age as related to correlation with parent report. For example, would the self-report of teens with ASD be more closely correlated to their parents' reports than the self-reports of younger children? Also, all items on the child self assessment were read aloud to the children. As a result, it is possible that the children would answer in a socially appropriate manner as opposed to how they actually felt. Finally, ratings of parents and children were not compared to the formal diagnosis of a licensed psychologist, making it impossible to determine which report was most closely aligned with diagnostic formulation.

Overall, results of available data on the relationship between parent and self-reports among individuals on the autism spectrum suggest that while parent and child reports are typically significantly correlated, parents were consistently found to rate their children higher on symptoms of anxiety than the children's self-reports. The one exception to this finding was symptoms of Obsessive Compulsive Disorder, which was rated higher by individuals with ASD as compared to the ratings provided by their parents. Additionally, children with ASD reported increased symptoms of anxiety as their age increased. Findings suggest that children on the autism spectrum may under report symptoms of most types of anxiety. It is important to note; however, that the magnitude of the difference between parent and child ratings was small in each case, and the differences between reports among children with ASD and their parents was consistently smaller than differences between control samples and their parents. Teacher ratings were not included in any of the studies, therefore allowing for no comparison between caregiver reports. Based on results of the available research, it appears necessary to investigate parent, teacher, and child ratings as related to specific types of anxiety, the

age of the child, and the diagnosis made by a licensed psychologist in order to create a complete picture of the reporting tendencies of children with ASD, their parents, and their teachers.

Summary

Individuals with autism spectrum disorders have deficits in communication, socialization, and/or stereotyped behaviors. Some theorists argue that anxiety is secondary to ASD, while others believe that anxiety is a core feature of ASD, which results in the preoccupations and stereotyped behaviors found among these individuals (Kanner, 1943). Whether anxiety is a contributing factor in, or a symptom of ASD, there is a high clinical rate of comorbid anxiety disorders among individuals with ASD (Bellini, 2004; Benjamin, Costello & Warren, 1990; Bird, 1996; Cath, 2008; Gillott, Furniss, & Walter, 2001; Green, Gilchrist, Burton, & Cox, 2000; Kim, Szatmari, Bryson, Streiner, & Wilson, 2000; Klin & Volkmar, 1997; Lainhart, 1999; Matson & Love, 1990; Tantum, 2000). It is with self-, parent-, and teacher-report measures that anxiety disorders are most often diagnosed (Tsai, 2006), making it essential that clinicians are clear on how best to interpret the results.

Children on the autism spectrum experience considerable difficulty identifying emotions in themselves and others, due to a lack of second order representation and Theory of Mind. Higher functioning individuals are typically able to identify simple emotions such as happy, sad, and angry, but experience deficits in their ability to identify and report more complex emotions, such as the anxiety (Capps et al., 1992). Lower functioning individuals have emotional identification deficits that are more pervasive and severe (Hobson, 1986; LaBar & LeDoux, 2006; Ozanoff, Pennington, & Rogers, 1990).

Additionally, theorists suggest that smaller vocabularies, under-developed comprehension skills, difficulty communicating feelings, and deficits in abstract thinking skills suggests that children's affective experiences and abilities to communicate emotions become more differentiated with age (Cicchetti & Hesse, 1982; Lewis & Michaelson, 1983; Capps et al., 1992).

Significant but weak inter-rater correlations have been established through a limited number of studies between individual informants, including parents and children with autism spectrum disorders. This is similar to the significant but weak correlations typically found between raters in non-ASD populations. Differences exist; however, in the mean differences between parent and child reports of anxiety, where children with ASD most often report fewer symptoms than their parents, with the exception of symptoms of Obsessive Compulsive Disorder. While fewer symptoms are generally reported, the magnitude of the differences is small. Additionally, research shows that children report an increased number of symptoms of anxiety as their age increases.

In typical populations, differences in child and parent or teacher reports are often thought to result from reliance on the child's ability to read and understand language, comprehend and label their own emotions, and their willingness to answer questions about themselves in an honest manner (Kazdin, 1998; Reynolds & Johnson, 1994). In parents and teachers, possible sources of variance result from the fact that items can be rated based on their understanding of the child and not the actual symptoms witnessed (Renk, 2005), or the symptoms may not be exhibited by the child in the environment in which they see the child (Comer & Kendall, 2004). Additionally, due to the internalized

nature of anxiety, it is possible that the adults caring for the child may be unable to see symptoms of anxiety, or they may be masked as other more behavioral diagnoses.

In addition to these challenges, among children on the autism spectrum, a lack of socioemotional understanding related to deficits in Theory of Mind is typically theorized to lead to deficits in the individual's ability to self-report symptoms. Additionally, children on the autism spectrum have varying communication abilities ranging from severe deficits in some children with autistic disorder, to quite advanced vocabularies in other children with Asperger's Disorder (Klin, McPartland, & Volkmar, 2005; Klinger, Dawson, & Renner, 2003). These factors also likely play a part in the self-reports of children in the autism spectrum.

By comparing rater's responses regarding symptoms of anxiety, and examining the relationship between self-, parent-, and teacher-reports with a professional's diagnosis, the trends in informant group reports will be more clear. In addition, by examining relationships based on the child's age, a better understanding of informant groups will be achieved. This study will also fill a gap in the current literature by including data provided by teachers and expanding the age range of studies utilizing self-report measures. Procedures for the completion of this study will be outlined in the following chapter.

Chapter III

Methods

Participants

Participants in this study were children ages 6 to 18 years old who were assessed at an outpatient clinic in southwestern PA. The children were referred for comprehensive psychological or neuropsychological assessments for the purpose of diagnostic clarification. Participants were diagnosed with an Autism Spectrum Disorder by a licensed psychologist using accepted criteria of the DSM-IV-TR (American Psychiatric Association, 2000). The originally-proposed criteria for participation in this study also included the completion of the Revised Children's Manifest Anxiety Scale (RCMAS), Achenbach Child Behavior Checklist (CBCL/6-18), and Achenbach Teacher Report Form (TRF/6-18); however, completion of the Revised Children's Manifest Anxiety Scale – Second Edition (RCMAS-2) was later included, as the outpatient clinic providing the database replaced the RCMAS with the updated Revised Children's Manifest Anxiety Scale – Second Edition (RCMAS-2; Reynolds & Richmond, 2008) in the fall of 2009. Exclusionary criteria for all groups was a diagnosis of mental retardation.

Data used in this study was extracted from a pre-existing database maintained by the outpatient clinic. Data provided by the institution included descriptive information such as participant age and gender; primary diagnosis; secondary diagnosis (if applicable); and scores on the RCMAS or RCMAS-2, CBCL/6-18, and TRF/6-18.

The institution's database was prepared retrospectively through chart reviews, and was maintained by research assistants. All identifying information was removed from data prior to entry into the database. Participants were referred for clinical rather than

research purposes, and all parents completed informed consent procedures for assessment prior to the evaluation.

Power Analysis

To determine the number of subjects necessary to achieve adequate power when conducting ANOVAs and ANCOVAs, an a priori power analysis was conducted using *G*Power 3.1.2* (Faul, Erdfelder, Lang, & Buchner, 2007). Power represents the probability that existing effects have a chance of producing statistical significance through data analysis (Tabachnick & Fidell, 2007). According to criteria discussed in Stevens 2002, power greater than or equal to .80 is considered to be adequate with a medium effect size of .50.

According to *G*Power 3.1.2*, for the three initially proposed One-Way ANOVAs with five groups each, a sample size of 55 participants was needed in order to achieve a medium effect size of .50 with adequate power of .80 at $\alpha = .05$. According to *G*Power 3.1.2*, for the proposed ANCOVA with five groups, a sample size of 74 participants was needed in order to achieve a medium effect size of .50 with adequate power of .80 at $\alpha = .05$. However, as will be discussed below, the conducted analyses consisted of one One-Way ANOVA with three groups, one 3x2 Two-Way ANOVA, an ANCOVA with three groups, and an ANCOVA with two groups. As such, required sample sizes ranged from 42 to 53.

Measures

Revised Children's Manifest Anxiety Scale. The Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1985) is one of the most widely used self-report measures of anxiety in children and adolescents (Dadds, Perrin, & Yule,

1998). The RCMAS is a 37-item self-report measure designed to assess the level and nature of anxiety in children and adolescents ages six to 19 years of age. The RCMAS is intended to measure chronic, manifest anxiety, independent of state or situational anxiety. During administration, the child responds to each of the 37 statements by circling “Yes” or “No.” A “Yes” response is intended to indicate that the item is descriptive of the child’s feelings or actions, where a “No” is intended to indicate that the symptom is not representative of the child’s feelings or actions.

Administration of the RCMAS can be completed in an individual or group format; however, for the purposes of this study, administration was completed on an individual basis only. The assessment is not timed. If the child or adolescent has difficulty with reading, the assessment can be read aloud to the individual (Reynolds & Richmond, 1985).

Scoring is completed by counting “Yes” responses to four subscales, and to the Total Anxiety composite. Subscales consist of Physiological Anxiety, Worry/Oversensitivity, Social Concerns/Concentration, and Lie. The Total Anxiety Composite consists of the 28 items on the Physiological Anxiety, Worry/Oversensitivity, and Social Concerns/Concentration subscales. The remaining nine items make up the Lie subscale. Each of the four subscale totals are reported using Standard Scores, and the Total Anxiety Score is reported in T-Score format (Reynolds & Richmond, 1985).

The Physiological Anxiety subscale is an index of the child’s expression of physical manifestations of anxiety. According to the authors, a high score on this subscale suggests that the child has certain kinds of physiological responses that are typically experienced during anxiety (Reynolds & Richmond, 1985). Example items

include, “It is hard for me to get to sleep at night,” and, “Often I feel sick in my stomach.”

The Worry/Oversensitivity subscale suggests that the person is worried, afraid, nervous, or oversensitive to environmental demands. A high score on this subscale may suggest a child who internalizes the anxiety they experience (Reynolds & Richmond, 1985). Example items on this scale include, “I worry a lot of the time,” and, “My feelings get hurt easily.”

The Social Concerns/Concentration subscale suggests that the child is experiencing anxiety in relation to other people, or difficulty concentrating. Children scoring high on this subscale may feel some anxiety that they are unable to live up to the expectations of the people around them (Reynolds & Richmond, 1985). Example items on this subscale include, “A lot of people are against me,” and, “It is hard for me to keep my mind on my schoolwork.”

Taken together, these three subscales form the Total Anxiety composite. This score represents the total number of symptoms of anxiety experienced by the individual. Internal and external studies alike have supported the presence and usefulness of the overall General Anxiety factor created by the compilation of the three subscales (Reynolds & Paget, 1981).

The RCMAS also contains a Lie subscale. Endorsement of these items is not included in the Total Anxiety composite; however the subscale does provide information relevant to diagnosis. The Lie subscale contains items that create an “ideal” behavioral pattern that is not generally characteristic of anyone. Example items consist of “I am always kind,” and “I never get angry.” There are several possible reasons for an elevated

Lie scale, including that the child is trying to “fake good,” or that they have an idealized view of the self.

The standardization sample for the RCMAS consisted of 4,972 children ages six through 19 years. Demographics for age, sex, ethnicity, and geographic location of participants are available; however the socioeconomic status of participants is not. Of the 4,972 children included in the standardization sample, 600 were labeled as mentally retarded, learning disabled, or gifted. Individuals with developmental delays, such as ASDs, were not reported to be in the standardization sample.

Reliability of the RCMAS was assessed using internal consistency and test-retest reliability. For the Total Anxiety score, the internal consistency was reported to be .83 using the test development sample of 329 children. Other studies using various samples have reported reliability estimates between .79 and .84. For the Physiological Anxiety subscale reliability estimates are between .60 and .70, except above age 15 when the reliability drops into the .50's. Reliability estimates for the Worry/Oversensitivity subscale have been reported to be between .70 and .80. For the Social Concerns/Concentration subscale, estimates are around .60. Finally, coefficient alpha reliability estimates for the Lie subscale are between .70 and .90. In a study conducted by Reynolds (1981), the test-retest reliability coefficient for the Total Anxiety score was reported to be .68.

Factor analysis was used by the authors of the RCMAS to determine the construct validity of the test score interpretations. Researchers used iterations, varimax rotation, scree plots, and eigenvalues to propose a five-factor structure consisting of three Anxiety subscales, a Lie subscale, and a Total Anxiety scale. Convergent and divergent validity

were assessed using the State-Trait Anxiety Inventory for Children (STAIC; Spielberger, 1973), and the Walker Problem Behavior Identification Checklist (WPBIC; Walker, 1970). The magnitude of the relationship between the RCMAS and the STAIC Trait scale was large and significant ($r=.85$), while the magnitude of the relationship between the RCMAS and the STAIC state scale was not ($r=.24$). According to the authors, this data provided support for the construct validity of the RCMAS, as it is intended to measure chronic, manifest anxiety, independent of state or situational anxiety.

Revised Children’s Manifest Anxiety Scale – Second Edition. Although not in the original proposal, the outpatient clinic providing the database replaced the RCMAS with the updated Revised Children’s Manifest Anxiety Scale – Second Edition (RCMAS-2; Reynolds & Richmond, 2008) in the fall of 2009. As a result, children in this study received either the RCMAS or the RCMAS-2.

The RCMAS-2 is a 49-item self-report measure designed to assess the level and nature of anxiety in children and adolescents ages six to 19 years of age. The RCMAS-2 features an updated standardization sample, improved psychometric properties, and broadened content coverage. According to Denzine and Stein (2008), 89 percent of the RCMAS was retained in the RCMAS-2. The largest content changes include the addition of an Inconsistent Responding index and a 10-item Short Form for assessing anxiety in children. Also, a 10-item content cluster was developed to measure children's performance anxiety. Finally, all previously used double negatives were deleted from items.

During administration, the child responds to each of the 49 statements by circling “Yes” or “No.” In line with the RCMAS, a “Yes” response is intended to indicate that the

item is descriptive of the child's feelings or actions, where a "No" is intended to indicate that the symptom is not representative of the child's feelings or actions.

Administration of the RCMAS-2 can also be completed in an individual or group format; however, for the purposes of this study, administration was completed on an individual basis only. The assessment is not timed. If the child or adolescent has difficulty with reading, the assessment can be read aloud to the individual (Reynolds & Richmond, 2008).

Scoring is completed by counting "Yes" responses to three anxiety subscales, two validity scales, and the Total Anxiety composite, except for three items for which the "No" response is counted. Subscales consist of Physiological Anxiety, Worry, and Social Anxiety. Validity Scales consist of the Inconsistent Responding Index and the Defensiveness Index. The Total Anxiety Composite consists of the items on the Physiological Anxiety, Worry, and Social Anxiety subscales. The remaining items make up the Validity Scales. Each score on the RCMAS-2 is reported in T-Score format (Reynolds & Richmond, 2008).

The Physiological Anxiety, Worry, and Social Anxiety scores are combined to create the Total Anxiety Composite that will be used in this study. The Physiological Anxiety subscale is composed of 12 items addressing somatic complaints. According to the authors, a high score on this subscale suggests that the child has certain kinds of physiological responses that are typically experienced during anxiety (Reynolds & Richmond, 2008). Example items include, "I am tired a lot," and, "Often I feel sick in my stomach."

The Worry subscale contains 16 items that ask about a variety of obsessive concerns. A high score on this subscale suggests that a person is afraid, nervous, or in some way oversensitive to environmental pressures (Reynolds & Richmond, 1985). Example items on this scale include, “I worry that others do not like me,” and, “I often worry about something bad happening to me.”

The Social Anxiety scale contains 12 items focusing on social or performance situations. Children scoring high on this subscale may feel some anxiety that they are unable to live up to the expectations of the people around them (Reynolds & Richmond, 2008). Example items on this subscale include, “I fear other kids will laugh at me in class,” and, “I fear someone will tell me I do things the wrong way.”

Taken together, these three subscales form the Total Anxiety composite. The Total Anxiety composite is considered by the authors to be the primary focus of the RCMAS-2 results and is useful in determining the child’s overall level of anxiety. Internal and external studies alike have supported the presence and usefulness of the overall General Anxiety factor created by the compilation of the three subscales (Reynolds & Paget, 1981).

The RCMAS-2 also contains Defensiveness and Inconsistent Responding Indexes. Nine distinct items create the Defensiveness Index, which are not included in the Total Anxiety composite. The Defensiveness subscale contains items that create an “ideal” behavioral pattern that is not generally characteristic of anyone. Example items consist of “I like everyone I know,” and “I am always good.” Similar to the Lie scale, there are several possible reasons for an elevated Defensiveness scale, including that the child is trying to “fake good,” or that they have an idealized view of the self.

The Inconsistent Responding Index is calculated by transferring endorsements on nine specific pairs of items and indicating if they differ from one another. Scores of six differences or higher suggest the need for further inquiry (Reynolds & Richmond, 2008).

The standardization sample for the RCMAS-2 consisted of 3,086 children ages six through 19 years. Similar to the RCMAS, demographics for age, sex, ethnicity, and geographic location of participants are available; however the socioeconomic status of participants is not. Information regarding the inclusion of individuals with developmental delays, such as ASDs, was not reported.

Similar to the RCMAS, reliability of the RCMAS-2 was assessed using internal consistency (Cronbach's Alpha) and test-retest reliability. For the Total Anxiety score, the internal consistency was reported to be .93 and the test-retest reliability was reported to be .76 for the full-referenced sample (N=3,086). For the Physiological Anxiety subscale, coefficient alpha was reported to be .75 and the test-retest was reported to be .73. The Cronbach's Alpha for the Worry subscale was .86 while the test-retest was .71. For the Social Anxiety scale, Cronbach's Alpha was reported to be .80 and test-retest was .64. Finally, the coefficient alpha reliability estimate for the Defensiveness scale was .79 and test-retest was .67. Reliability estimates for the RCMAS-2 are not yet available for "special samples," such as individuals with psychiatric diagnoses.

In regards to validity, Reynolds and Richmond (2008) most often refer to previous empirical evidence gathered for the RCMAS. According to Denzine and Stein (2008), there is a long history of factor analytic studies that can be traced back to a study conducted in 1974 on the CMAS factor structure (Finch, Kendall, & Montgomery, 1974). The manual contains detailed information about the factor analysis procedures conducted

on the RCMAS-2, which ultimately resulted in the interpretation of a five-factor solution. Outside reviewers have also cited a study investigating the relationship between scores on the RCMAS-2 and the Children's Measure of Obsessive-Compulsive Symptoms (CMOS; Reynolds & Livingston, in press) and the RCMAS-2's moderate correlations with the Conners' Rating Scales (CRS; Conners, 1989) for both parent and teacher ratings.

Achenbach Child Behavior Checklist. The Achenbach Child Behavior Checklist (CBCL/6-18) is one of the most widely used parent rating scale measures, and has been used to make significant contributions to the present day understanding of child symptomology (Lengua, Sadowski, Friedrich, & Fisher, 2001). The CBCL/6-18 is a rating form that is completed by parents or other adults who see the child in the family context (Achenbach & Rescorla, 2001). The CBCL/6-18 is comprised of 112 items, rating behavioral, social, and emotional problems in the child. When completing the form, respondents are asked to think about the child's functioning in the home over the past six months. The respondent rates each item based on a Likert scale with the following descriptors: "0" is circled when the item is not true, "1" is circled when the item is somewhat or sometimes true, and "2" is circled when the item is very true or often true (Achenbach & Rescorla, 2001). Ratings result in eight symptom scales, including the Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints, Social Problems, Thought Problems, Attention Problems, Rule Breaking Behavior, and Aggressive Behavior scales. The measure also provides DSM-Oriented scales consisting of Affective Problems, Anxiety Problems, Somatic Problems, Attention Deficit Hyperactivity Problem, Oppositional Defiant Problems, and Conduct Problems. Finally, the measure provides three broad scales consisting of Internalizing Problems, Externalizing Problems,

and Total Problems. Scores are reported in T score format. Of note, the scoring program for the Achenbach scales truncates scores at 50, meaning that a child cannot receive a score lower than 50 on the CBCL/6-18.

For the purposes of the current investigation, the DSM-Oriented Anxiety Problems Composite will be discussed in detail. Rather than using factor analysis, the DSM-Oriented Anxiety Problems Composite was constructed based on the diagnostic formulation of the DSM-IV. Twenty two psychiatrists and psychologists were asked to rate the 112 items on the CBCL/6-18 in terms of their consistency with DSM criteria for Affective Problems, Anxiety Problems, Somatic Problems, Attention Deficit Hyperactivity Problem, Oppositional Defiant Problems, and Conduct Problems. Items that were rated as “very consistent” by at least 14 of the 22 raters were grouped into the corresponding DSM-Oriented composites. According to the authors, high scores on a DSM-Oriented Composite scales suggest that the diagnosis should be considered by the psychologist or psychiatrist (Achenbach & Rescorla, 2001).

Similar to the RCMAS and the RCMAS-2, administration of the CBCL/6-18 can be completed in an individual or group format; however, for the purposes of this study, administration was completed on an individual basis only. Also like the RCMAS and RCMAS-2, the assessment is not timed. If a respondent is unable to complete the form due to inadequate reading abilities, the test creator suggests that a copy of the rating form be given to the respondent, while an additional form is retained by the evaluator. The evaluator should then read the questions and record the individual’s responses. This issue did not arise in the current investigation.

The CBCL/6-18 was normed on 1,753 non referred individuals using gender-specific norms, with the norming groups ranging from children ages six through 11, and 12 through 18 years old. Individuals excluded from the normative sample included those receiving mental health services, those endorsing substance use, and those receiving special education services.

As one of the research questions in the current investigation relates to age, it is important to discuss effects of age within the norming sample of the CBCL/6-18. Using ANCOVAS, test creators determined several significant effects related to age. According to the authors, the largest effect size was a nonlinear effect on the number of sports that the child plays, with the fewest sports being reported for the youngest and oldest subjects. Eleven other effects related to age were reported, however all were small and lacked relevance to the current investigation.

Reliability of the CBCL/6-18 is considered to be good. According to Flanagan and Watson (2004), internal consistency for the CBCL/6-18 ranged from .55 to .90 for Competence and Adaptive scales, from .71-.97 for the Empirically Based Syndrome scales, and from .67 to .94 for the DSM-Oriented scales. Test-retest data was collected at mean intervals of 8 and 16 days, and ranged from .88 to .90. Specific to the current investigation, the test-retest reliability of the Anxious/Depressed Empirically Based Syndrome scale was found to be .82 (Achenbach & Rescorla, 2001). Cross informant data was collected using the CBCL, TRF, and YSR. For the Competence and Adaptive scales of the CBCL/6-18, the mean cross-informant agreement value was .69. For the Empirically Based Syndrome scales, the mean cross-informant agreement value was .76.

For the DSM-Oriented scales, the mean cross-informant agreement was .73 (Flanagan & Watson, 2004).

Content, criterion, and construct validity of the CBCL/6-18 was strong. Data pertaining to content validity was based on over 30 years of research using repeated correlational studies, consultation with mental health professionals, and pilot testing. Items that failed to differentiate between referred and non-referred children were excluded from the CBCL/6-18 (Achenbach & Rescorla, 2001; Flanagan & Watson, 2004). Criterion-related validity for demographically matched referred and non-referred children was based on multiple regression analyses. Results indicated that explained variance accounted for by referral status (ranging from 2 to 33 percent for the individual scales) greatly outweighed all other demographic variables, suggesting that effect sizes for all other demographic variables (e.g. gender, socioeconomic status, ethnicity) were small. Finally, construct validity for the ASEBA scales as a whole was evaluated on the basis of correlations with similar instruments, such as the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992), the Conners' Rating Scales-Revised (Conners, 1997), and the DSM-IV Checklist (Hudziak, 1998). Results indicated that correlations with the DSM-IV Checklist ranged from .43 to .80. Correlations with the Conners' Rating Scales ranged from .71 to .85, and correlations with the BASC ranged from .38 to .89. Specific to the ASEBA Anxious/Depressed Empirically Based Symptom scale, the correlation with the DSM-IV Checklist for symptoms of anxiety was .51 (Achenbach & Rescorla, 2001).

Of specific relevance to the current investigation, the ASEBA scales as a whole (including the CBCL, TRF, and YSR) were also correlated to clinician's diagnoses based

on formal clinical evaluations. Using a sample of 134 individuals, the correlation between the Anxious/Depressed scale on all of the ASEBA measures and clinician's formal diagnoses was found to be .27 (Achenbach & Rescorla, 2001).

Achenbach Teacher Report Form. The Achenbach Teacher Report Form (TRF/6-18) is a rating scale completed by teachers and other personnel who are familiar with the child's school functioning. This may include the teacher's aide, counselors, administrators, and special educators. The TRF/6-18 is comprised of 113 items, rating behavioral, social and emotional problems in the school setting. When completing the form, respondents are asked to think about the child's school performance over the past two months. Similar to the CBCL/6-18, the respondent rates each item based on a Likert scale with the following descriptors: "0" is circled when the item is not true, "1" is circled when the item is somewhat or sometimes true, and "2" is circled when the item is very true or often true. In line with the CBCL/6-18, ratings result in eight symptom scales, including the Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints, Social Problems, Thought Problems, Attention Problems, Rule Breaking Behavior, and Aggressive Behavior scales. The measure also provides DSM-Oriented scales consisting of Affective Problems, Anxiety Problems, Somatic Problems, Attention Deficit Hyperactivity Problem, Oppositional Defiant Problems, and Conduct Problems. Finally, the measure provides three broad scales consisting of Internalizing Problems, Externalizing Problems, and Total Problems. Scores are reported in T score format. As indicated above, the Achenbach scales truncates scores at 50, meaning that a child cannot receive a score lower than 50 on the CBCL/6-18.

Again, due to the nature of the current investigation, the DSM-Oriented Anxiety Scale on the TRF/6-18 is of particular importance. The DSM-Oriented Anxiety Problems Composite for the TRF/6-18 was constructed in the same manner as the DSM-Oriented Anxiety Problems Composite of the CBCL/6-18. Twenty two psychiatrists and psychologists were asked to rate the 113 items on the TRF/6-18 in terms of their consistency with DSM-IV-TR criteria. Items that were rated as “very consistent” by at least 14 of the 22 raters were grouped into the corresponding DSM-Oriented composites (Achenbach & Rescorla, 2001).

The TRF/6-18 was normed on 976 non referred individuals using gender-specific norms, with the norming groups ranging from children ages six through 11, and 12 through 18 years old. Children were excluded from the norming sample if they had received mental health or substance use services in the last twelve months, or received special education services for behavioral, emotional, or developmental problems.

As one of the research questions in the current investigation relates to age, it is again important to discuss effects of age within the norming sample of the TRF/6-18. Using ANCOVAs, researchers determined that effects of age were all equal to or less than one percent, suggesting no significant effects related to age on the TRF/6-18.

Similar to the CBCL/6-18, reliability for the TRF/6-18 is considered to be good. Test-retest data was collected at mean intervals of 8 and 16 days, and ranged from .85 to .90. Cross informant data was collected using the CBCL, TRF, and YSR. For the Competence and Adaptive scales of the TRF/6-18, the mean cross-informant agreement value was .49. For the Empirically Based Syndrome scales, the mean cross-informant

agreement value was .60. For the DSM-Oriented scales, the mean cross-informant agreement was .58 (Flanagan & Watson, 2004).

Content, criterion, and construct validity of the TRF/6-18 were considered to be strong. As indicated when discussing the CBCL/6-18, data pertaining to content validity of all ASEBA scales was based on over 30 years of research using repeated correlational studies, consultation with mental health professionals, and pilot testing. Items that failed to differentiate between referred and non-referred children were excluded from the TRF/6-18 (Achenbach & Rescorla, 2001; Flanagan & Watson, 2004). Criterion-related validity for demographically matched referred and non-referred children was based on multiple regression analyses. Results indicated that explained variance accounted for by referral status (ranging from 2 to 33 percent for the individual scales) greatly outweighed all other demographic variables, suggesting that effect sizes for all other demographic variables (e.g. gender, socioeconomic status, ethnicity) were small. Finally, construct validity for the ASEBA scales as a whole was evaluated on the basis of correlations with similar instruments, such as the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992), the Conners' Rating Scales-Revised (Conners, 1997), and the DSM-IV Checklist (Hudziak, 1998). Results indicated that correlations with the DSM-IV Checklist ranged from .43 to .80. Correlations with the Conners' Rating Scales ranged from .71 to .85, and correlations with the BASC ranged from .38 to .89.

Relationship between Measures

At the current time there are no available studies that examine the relationship between the RCMAS/RCMAS-2 and the Achenbach scales. Because all four measures (RCMAS, RCMAS-2, CBCL/6-18, and TRF/6-18) have been found to be reliable, valid,

and clinically useful in measuring the construct of anxiety, and each measure produces standardized T-Scores, the conclusion can be made that self-, parent-, and teacher ratings on the RCMAS, RCMAS-2, CBCL/6-18, and the TRF/6-18 can be compared.

Research Design

This study used Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), and Logistic Regression to examine relationships between variables. Analysis of Variance is conducted when a researcher wants to assess whether means on a dependent variable are significantly different among groups (Green & Salkind, 2005). In the originally-proposed analysis of research question number one, ANOVA was to be used to determine how children with ASD, their parents, and their teachers differ in their reports of the child's symptoms of the most common anxiety diagnoses among the ASD population. However, when the data was obtained from the outpatient clinic, it was determined that the number of children who met criteria for the five specific types of anxiety was low, as most children in the database were diagnosed with ASD alone, or ASD and comorbid Anxiety Disorder, NOS. As a result, one One-Way ANOVA and one Two-Way ANOVA were run. In the One-Way ANOVA, the independent variable was the rater group, which consisted of parents, teachers, and children. The dependent variable was the anxiety score given to the child by each of the raters. In the Two-Way ANOVA, the independent variables were rater group (as described above) and the presence or absence of an Anxiety, NOS diagnosis. The dependent variable was the anxiety score given to the child by each of the raters.

Analysis of Covariance was proposed for the second part of the first research question. In the proposed methodology, the ANCOVA examined the impact of the child's age on the

reports of parents, teachers, and children. However, similar to the ANOVA, analyses were changed based on the lack of diagnostic groups. As a result, two ANCOVAs were run. In the first, the independent variable was rater group, the dependent variable was the anxiety score given to the child by each of the raters, and the covariate was age. In the second ANCOVA, the independent variable was the presence or absence of an Anxiety Disorder, NOS diagnosis, the dependent variable was the anxiety score given to the child by each of the raters, and the covariate was age.

Logistic regression was used for the proposed and executed analysis of the second research question. Logistical regression is used to predict group outcomes from a set of variables that may be continuous, discrete, dichotomous, or mixed (Tabachnick & Fidell, 2007). Logistic regression answers research questions in a similar way to discriminant analysis, but is considered to be more flexible. Logistic regression was used in the second research question to determine if the report of symptoms by children with ASD, their parents, or their teachers were predictive of the psychologist's diagnosis. The three independent variables were the child-reported Total Anxiety score on the RCMAS or RCMAS-2, the parent-reported DSM-Oriented Anxiety Composite score on the CBCL/6-18, and the teacher-reported DSM-Oriented Anxiety Composite score on the TRF/6-18. The dependent variable was the presence or absence of an Anxiety Disorder diagnosis.

Procedures

As indicated above, participants in this study were children and adolescents between the ages of six and 18 years old who were assessed at an outpatient clinic in southwestern PA. Participants in the ASD sample were included if they had an ASD diagnosis and had completed RCMAS or RCMAS-2, CBCL/6-18, and TRF/6-18.

Exclusionary criteria was a diagnosis of mental retardation. Prior to data analysis, an ANOVA was conducted to screen for differences between the mean self-ratings of children diagnosed with Autistic Disorder, children with Asperger's Disorder, and children with PDD, NOS.

For the purpose of this study, the RCMAS or RCMAS-2 Total Anxiety score was used as the measure of self-reported anxiety. This is because each item on the RCMAS and RCMAS-2 embodies a description of a feeling or action that reflects an aspect of anxiety (Gerard & Reynolds, 1999). Therefore, comparing one subscale score alone would not be representative of the individual's perceived symptoms of anxiety as a whole. Also, internal and external studies alike have supported the presence and usefulness of the overall General Anxiety factor created by the compilation of the three subscales (Reynolds & Paget, 1981).

When analyzing parent- and teacher-reported anxiety, the DSM-Oriented Anxiety Problems scales were used. This score was chosen for analysis because it is considered to represent the core symptoms most consistent with the diagnostic categories of anxiety disorders (Achenbach & Rescorla, 2001) and is therefore likely to be the best predictor of an anxiety disorder diagnosis.

Data Analysis

Data analysis for this study was conducted using *SPSS version 17.0*. Means and standard deviations were calculated for each group as well as the total sample for all variables included in the study. Univariate outliers, or extreme-values on one variable (Tabachnick & Fidell, 2007), were identified using histogram plots, as well as analyzing standardized scores greater than or less than three standard deviations above and below

the mean. Multivariate outliers, or unusual combinations of scores on two or more variables (Tabachnick & Fidell, 2007), were analyzed using Mahalanobis distance, or the distance of a case from the centroid of the remaining cases. Mahalanobis distance is evaluated as a chi square statistic with degrees of freedom equal to the number of variables in the analysis (Tabachnick & Fidell, 2007).

Assumptions of Analysis of Variance

Statistical assumptions are necessary considerations when conducting statistical analyses. Distribution assumptions applicable to Analysis of Variance will be discussed in this section. Other assumptions that are specific to ANCOVA and Logistic Regression will be addressed in subsequent sections.

Normally Distributed Dependent Variables. When conducting an ANOVA, the first assumption is that the dependent variable is normally distributed for each of the populations as defined by the different levels of the factor (Green & Salkind, 2005). A lack of normality can affect the Type I error rate, as well as the power of a study (Tabachnick & Fidell, 2007). Normality can be determined by examining outliers, skewness, and kurtosis. The definition and methods for identifying outliers were discussed above. Skewness has to do with the symmetry of the distribution. Kurtosis has to do with the distribution's peakedness. The variable is considered to be normally distributed if the skewness and kurtosis values are equal to zero. Absolute values greater than 1.5 are considered to be non-normal and should be considered for removal (Stevens, 2002).

Homogeneity of Variance. The second assumption when conducting an ANOVA is that the variances of the dependent variables are the same for all populations (Green &

Salkind, 2005). If the group sizes are equal or approximately equal, then the F statistic is robust for unequal variances. If the group sizes are largely unequal and a statistical test shows that the population variances are unequal; however, then the F statistic is considered to be liberal and may falsely reject the null too often (Stevens, 2002). While Bartlett's, Cochran's, Hartley's and Levene's tests are all available to test for homogeneity of variance, all but one (Levene's test) are considered to be overly sensitive to non-normality (Stevens, 2002). For this reason, Levene's test was run to assess for homogeneity of variance.

Independence. The third assumption when conducting an ANOVA is that the cases represent random samples from the populations and the scores on the test variable are independent of one another (Green & Salkind, 2005) in other words, the participants' responses are unrelated. Violations of this assumption result in effects on both the level of significance and the power of the F statistic (Stevens, 2002). In the current investigation, data was gathered from psychological evaluations in which each participant was assessed individually. As a result, the independence assumption was satisfied.

Assumptions of Analysis of Covariance

The assumptions required to conduct an ANOVA are also necessary when using ANCOVA. However, there are three additional assumptions that must be met, including reliability of covariates, linearity between covariates and the dependent variable, and homogeneity of regression (Stevens, 2002). These assumptions will be discussed below.

Reliability of Covariates. When conducting an ANCOVA, it is necessary for the covariates to be measured without error and to be reliable (Tabachnick & Fidell, 2007).

For the purposes of this study, the covariate was the age of the child, which justifies this assumption.

Linearity. The ANCOVA also assumes that the relationship between each covariate and dependent variable are linear. In other words, there is a straight line relationship between the two variables. Linearity was tested by inspecting bivariate scatter plots.

Homogeneity of Slope (Regression). According to Tabachnick & Fidell (2007), the adjustment of scores in an ANCOVA is made based on an average within-cell regression coefficient. Therefore, it is necessary for the slope of the regression between the covariate and the dependent variable within each cell to be equal. This assumption was tested by examining the interaction between the covariate and the independent variable in the prediction of the dependent variable. A significant interaction between the covariate and the independent variable suggests that the differences in the dependent variable among groups vary as a function of the covariate. As a result, if a significant interaction was found, the ANCOVA would not have been run, as it would not be meaningful.

Assumptions of Logistic Regression

Logistic Regression is similar to, and answers the same questions as Discriminant Analysis; however, Logistic Regression is more flexible and has no assumptions about the distributions of the predictor variables (Mertler & Vannatta, 2005; Tabachnick & Fidell, 2007). With that said, although not required, meeting the assumptions of independence and linearity may enhance power within the analysis (Tabachnick & Fidell, 2007). Both of these assumptions were discussed above.

Analysis of Research Question One

The first research question examined how various raters, including children with ASD, their parents, and their teachers differed in their reports of the child's symptoms of anxiety. Self-report data was collected using the RCMAS and RCMAS-2. Parent-report data was collected using the CBCL/6-18. Teacher report data was collected using the TRF/6-18. Based on existing data, it was hypothesized that children with ASD would not differ significantly from their parents and teachers in their reports of the child's symptoms of anxiety; however, the parent and teacher ratings would be higher for all types of anxiety except Obsessive Compulsive Disorder. Additionally, the self-reports of older children with ASD would be more aligned with the reports made by their parents and teachers than the self-reports of younger children.

As outlined above, the proposed analysis was to include three separate ANOVAs and one ANCOVA. Based on the discussed limitations of the data set, however; data was instead analyzed using a One-Way ANOVA to determine if there were statistically significant differences between the means of the three rater groups and a Two-Way ANOVA to evaluate mean differences between rater groups and children with and without an Anxiety, NOS diagnosis. Two ANCOVAs were also run to evaluate the relationships between age, rater group, diagnosis, and anxiety scores.

When conducting ANOVAs, the estimate of variance among scores within each group (random error variance) was compared to the differences in group means (group differences plus error) to produce an *F* distribution. The *F* distribution is a ratio in which the numerator reflects the variance between groups while the denominator reflects variance within groups (Tabachnick & Fidell, 2007). The larger the ratio of the between-

group variance to the within-group variance, the more likely a significant difference exists. Degrees of freedom were $N-1$ for each ANOVA.

When significant differences were found in the ANOVAs, post-hoc tests were conducted. A variety of post-hoc tests are available including Fisher's LSD, Duncan, Newman-Keuls, Tukey, and Scheffe. In the provided list, Fisher's LSD is considered to be the most liberal, adjusting least for Type I error, while Scheffe is considered to be the most conservative. Although more conservative tests make it more difficult to find significant differences, the Tukey test was chosen for post-hoc analysis in an effort to avoid most possible Type I error.

The second part of research question one examined the continuous variable of age. While the proposed analysis included one ANCOVA, data was analyzed using two ANCOVAs, as outlined in the Research Design section above. An ANCOVA is considered to be an extension on an ANOVA, where main effects of the independent variable (rater group for one and anxiety diagnosis for the other) are assessed after dependent variable scores (anxiety score) are adjusted for differences associated with the covariate (age). As a result, running an ANCOVA is similar to running an ANOVA except that in addition to the methodology discussed above, the differences between the covariate and its grand mean are partitioned into differences between groups and differences within groups. Additionally, the covariate is partitioned into sum of products associated with the covariance between groups and sums of products associated with covariance within groups (Tabachnick & Fidell, 2007). An F statistic is again obtained. If the F statistic suggests significant differences, post-hoc tests are necessary.

Analysis of Research Question Two

The second research question examined whether or not the reports of symptoms of anxiety by children with ASD, their parents, and their teachers were predictive of the psychologist's diagnosis of an anxiety disorder. It was hypothesized that the self-reports of children with ASD would be equally predictive of an anxiety disorder diagnosis as parent and teacher ratings. Further, each would contribute meaningful variance to the prediction equation. Data for this analysis was analyzed using Logistic Regression to predict categorical group membership (anxiety diagnosis or no anxiety diagnosis) from the set of continuous variables (child, parent, and teacher scores).

When conducting Logistic Regression, there are three main outputs that require interpretation. First, the statistics for overall model fit were analyzed using chi-square goodness-of-fit tests. Here, the actual value for a case on the dependent variable was compared with the predicted value on the dependent variable (Mertler & Vannatta, 2005). A significant comparison indicated that the independent variable is an important predictor of the dependent variable. Also in the first part of the analysis, one must evaluate the percentage of correct classification of each variable as it is added into the equation; where a high percentage of correct classification is desired. Also, the model fit indices including the -2 Log Likelihood and the Goodness of Fit statistic were examined. A perfect -2 Log Likelihood has a value of zero (George & Mallery, 2000). As a result, the lower this value is, the better the model fit. The Goodness of Fit statistic should also, ideally, be small.

Second, the classification table for the analysis must be reviewed. The classification table compares the predicted values of the dependent variable with the actual observed values from the data. The predicted values were obtained by computing

the probability for a particular case and classifying it into one of two possible categories based on that probability. If the calculated probability was $<.50$, the case was classified into the first value on the dependent variable (Mertler & Vannatta, 2005). The percent of subjects correctly classified served as another indicator of model fit (Mertler & Vannatta, 2005).

Finally, the summary of model variables must be analyzed to determine the significance of each predictor variable. Here, the Wald statistic and the associated significance value are used to determine the significance of each variable in its ability to contribute to the model (Mertler & Vannatta, 2005). The Wald statistic is considered to be conservative (Tabachnick & Fidell, 2007), so a liberal significance level ($p<.05$ or $p<.1$) was used for interpretation. The odds ratio, or $\text{Exp}(B)$ was also interpreted as the increase in odds of being classified into a category when the predictor variable was increased by one (Mertler & Vannatta, 2005).

CHAPTER IV

Results

This chapter presents the findings of statistical analyses that were conducted to examine this study's two research questions; for children with autism spectrum disorders, how do parents, teachers, and children rate symptoms of anxiety? Additionally, is the report of anxiety symptoms by children with ASD, their parents, or their teachers predictive of an anxiety disorder diagnosis, as documented by trained examiners? Prior to running these analyses, descriptive statistics were obtained and preliminary analyses were conducted in order to evaluate statistical assumptions.

Descriptive Statistics

The data based provided by the outpatient clinic consisted of 57 children who had a completed RCMAS or RCMAS-2, as well as a CBCL/6-18, and TRF/6-18. The sample ranged in age from 6 to 16 years ($M=10.32$) and was comprised of three children with Autistic Disorder, 27 children with Asperger's Disorder, and 27 children with PDD, NOS. Of the 57 children, 43 were male and 14 were female. This is roughly consistent with research suggesting that the presence of an ASD is four to five times more common in males than females (Centers for Disease Control and Prevention, 2010). Twenty eight of the children were diagnosed with Anxiety Disorder, NOS, while 29 were not. Of the children with an Anxiety Disorder, NOS diagnosis, 19 were male and 8 were female, suggesting that a higher percentage of females were diagnosed with a comorbid anxiety disorder. The age range of individuals with an Anxiety Disorder, NOS diagnosis was 7 to 16 years ($M=10.89$). The age range of individuals without an Anxiety Disorder, NOS

diagnosis was 6 to 16 years (M=9.76). Descriptive statistics for all three groups are reported in Table 1.

Table 1

Descriptive Statistics

	Total Sample	ASD Only	ASD and Anxiety Disorder, NOS
Sample size	57	28	29
Male	43	23	19
Female	14	6	8
Age range	6-16	6-16	7-16
Mean age	10.32	9.76	10.89

Prior to conducting formal analyses, an ANOVA was conducted to screen for differences between the self-ratings of children diagnosed with Autistic Disorder, children with Asperger’s Disorder, and children with PDD, NOS. No significant differences were found. The three groups were therefore combined into one group of children with ASD for all analyses.

Correlations

Although not specifically included in the research questions, correlations were run as a preliminary analysis to evaluate the relationship between child, parent, and teacher reports. Dependent measures included scores on the CBCL/6-18, TRF/6-18, and RCMAS/RCMAS-2. Results indicated that there were no statistically significant relationships between variables at the $p < .05$ or $p < .01$ levels. Still, it is worth noting that

the relationship between parent and teacher reports was modest and positive; indicating that higher scores on the CBCL/6-18 were associated with a higher scores on TRF/6-18.

Bivariate Pearson correlations for these measures are presented in Table 2.

Table 2
Pearson Correlations

Measure	1	2	3
1. CBCL/6-18	1		
2. TRF/6-18	.532	1	
3. RCMAS/RCMAS-2	.121	.120	1

Note: RCMAS = Revised Children’s Manifest Anxiety Scale; RCMAS-2 = Revised Children’s Manifest Anxiety Scale Second Edition; CBCL/6-18 = Achenbach Child Behavior Checklist; TRF/6-18 = Achenbach Teacher Report Form

Preliminary Analyses for ANOVA Assumptions

Prior to conducting the first ANOVA, the dataset was examined for outliers to ensure no cases were exerting undue influence on the analyses. In order to ensure the assumption of normality, histogram plots were used to assess for univariate outliers. This was accomplished by visually examining the plots, as well as reviewing skewness and kurtosis values. The distribution of all histograms appeared to be normal and calculated values for skewness and kurtosis were within acceptable limits (less than an absolute value of 1.5), indicating normal distribution for each of the dependent variables. Range, skewness and kurtosis for each measure are reported in Table 3. In addition to reviewing histograms, standardized scores were analyzed to identify those greater than or less than three standard deviations above and below the mean. No scores met this criteria.

Table 3

Range, Skewness, and Kurtosis for Dependent Measures

Measure	Range	Skew	Kurtosis
RCMAS/RCMAS-2	23-74	-.187	-.174
CBCL/6-18	50-80	-.396	-1.19
TRF/6-18	50-79	-.048	-.880

Note. RCMAS = Revised Children's Manifest Anxiety Scale; RCMAS-2 = Revised Children's Manifest Anxiety Scale Second Edition; CBCL/6-18 = Achenbach Child Behavior Checklist; TRF/6-18 = Achenbach Teacher Report Form; Scores are reported as *T-scores* (Mean = 50; SD = 10).

Prior to conducting both ANOVAs, Levene's tests were also run to assess for homogeneity of variance. In both of the analyses, the *F* statistics were not significant at the .05 level (.067 and .138 respectively), indicating that the second assumption was met for each of the analyses.

Research Question One, Part One Results

The first research question utilized two ANOVAs to examine relationships between rater groups regarding reported symptoms of anxiety. The first ANOVA was conducted with rater group (children, parents, and teachers) as the independent variable and the child's anxiety scores on the RCMAS or RCMAS-2, CBCL/6-18, and TRF/6-18 as the dependent variable. A significant *F* was obtained ($F(2, 168) = 35.22, p < .01$), indicating that there is a significant difference between the means of the three groups. Results of this calculation yielded strong power (Observed Power = 1.00) and a medium effect size (Partial Eta Squared = .30). These results are presented in table 4.

Table 4

ANOVA - Rater Groups with Child's Anxiety Score as the Dependent Variable

	Sum of Squares	<i>df</i>	Mean Squares	<i>F</i>	Sig
Between Groups	6156.25	2	7	35.22*	0.000
Within Groups	14681.86	168			
Total	20838.11	170			

* $p < .01$

Given the significance of the ANOVA, a follow-up Tukey test was conducted to determine which groups scores differed significantly from one another. Results of the follow-up Tukey HSD indicated significant mean differences between parents (M=64.91, 95% CI [62.17, 67.65]) and children (M=50.93, 95% CI [47.65, 54.21]), $p=.000$ as well as teachers (M=61.84, 95% CI [59.54, 64.14]) and children (M=50.93, 95% CI [47.65, 54.21]), $p=.000$. The difference between teachers (M=61.84, 95% CI [59.54, 64.14]) and parents (M=64.91) was not statistically significant. Group means are displayed in table 5 and are displayed in figure 3. Follow-up results are displayed in table 6.

Table 5

Rater Group Means

Rater Group	Mean Anxiety Score
Children	50.93
Teachers	61.84
Parents	64.91

Note. All scores are reported in T scores, M=50, SD=10

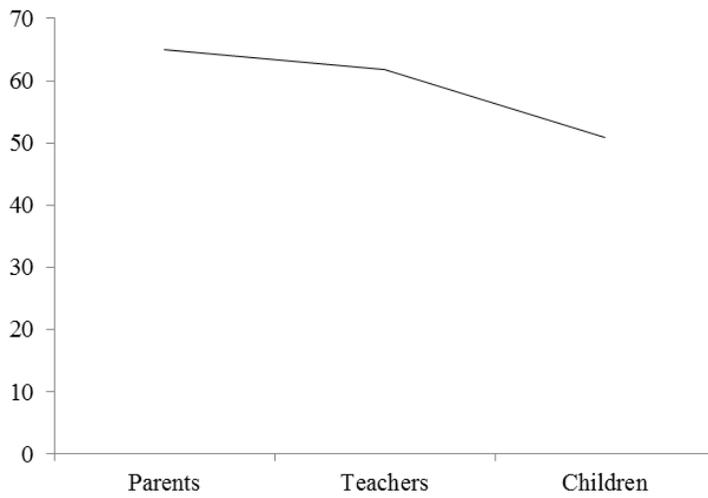


Figure 3

Mean Anxiety Scores by Rater Group

Table 6

Follow-up Tukey Tests for Rater Groups with Child's Anxiety Score as the Dependent Variable

(I) Group	(J) Group	Mean Difference	Std. Error	Sig
Parent	Teacher	3.07	1.751	.189
	Child	13.98*	1.751	.000
Teacher	Parent	-3.07	1.751	.189
	Child	10.91*	1.751	.000
Child	Parent	-13.98*	1.751	.000
	Teacher	-10.91*	1.751	.000

* $p < .01$

The second ANOVA was conducted with rater group (children, parents, and teachers) and anxiety diagnosis (none or Anxiety Disorder, NOS) as the independent variables and the child's anxiety scores on the RCMAS or RCMAS-2, CBCL/6-18, and TRF/6-18 as the dependent variable. The main effect for rater group was significant, as discussed above. The main effect for anxiety diagnosis was also significant ($F(1, 165) = 6.87, p = .01$), as children who were given diagnoses of Anxiety Disorder, NOS had higher anxiety scores ($M=61.10$) than children who were not given an Anxiety Disorder, NOS diagnosis ($M=57.43$). However, it should be noted that while the power was strong (Observed Power = .741), the effect size for this analysis was small (Partial Eta Squared = .04). Overall mean differences for children with and without Anxiety Disorder, NOS diagnoses are reported in table 7. Mean differences by rater group are presented in figure

4. Finally, the interaction between rater group and anxiety diagnosis was not significant ($F(2, 165) = 1.74, p > .05$), suggesting that the effect of the rater group was not influenced by whether or not the child had an anxiety diagnosis. These results are presented in table 8.

Table 7

Mean Ratings by Anxiety Diagnosis

Anxiety Diagnosis	Mean Anxiety Score
No Anxiety Diagnosis	57.43
Anxiety Disorder, NOS	61.10

Note. All scores are reported in T scores, M=50, SD=10

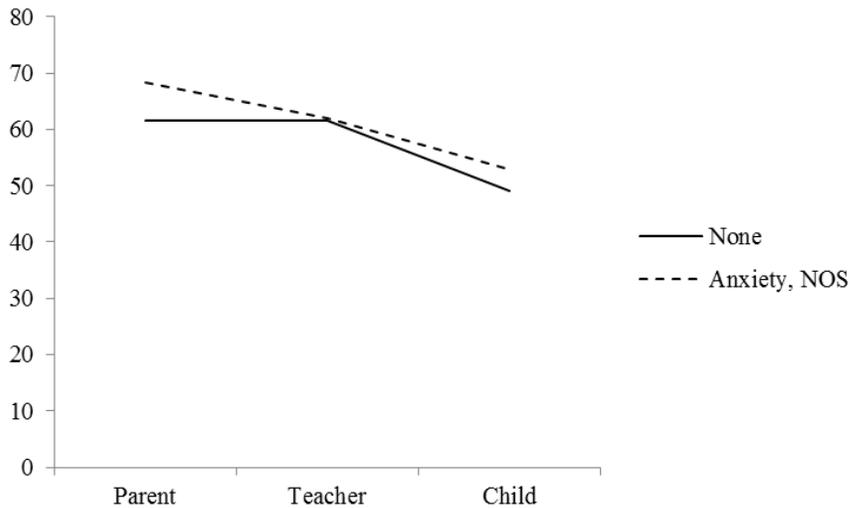


Figure 4

Reported Anxiety Scores for Children with and without an Anxiety Diagnosis

Table 8

ANOVA - Rater Group/Diagnosis with Score as Dependent Variable

	Sum of Squares	<i>df</i>	Mean Squares	<i>F</i>	Sig
Rater Groups	6163.65	2	3081.83	36.81*	.00
Anxiety Dx	575.60	1	575.60	6.88*	.010
Rater Group x Anxiety Diagnosis	290.92	2	145.46	1.74	.179
Error	13815.33	165			

* $p < .01$

Preliminary Analyses for ANCOVA Assumptions

Prior to running the analyses for the second part of research question one, additional statistics were needed in order to meet the assumptions of linearity and homogeneity of slope. First, a bivariate scatter plot was examined to test for linearity. This scatter plot is displayed in figure 1. Given the results of the bivariate scatterplot, as well as the reasonably balanced distributions of the dependent variables, it is determined that the assumption of linearity was upheld.

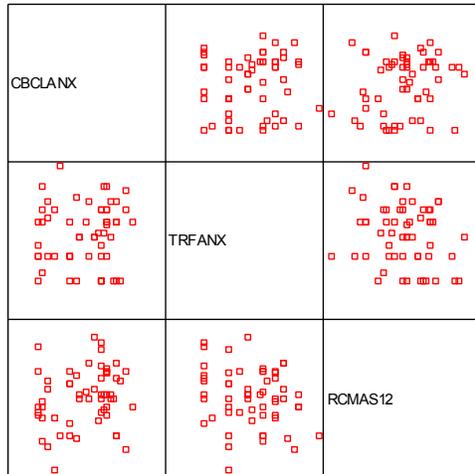


Figure 5. Bivariate scatterplots of anxiety scores by rater group

Prior to conducting the ANCOVAs, the slope of the regression was evaluated using a factorial ANOVA. The ANOVA evaluated the interaction between the covariate (age) and the independent variable (rater group for the first ANCOVA and Anxiety Disorder, NOS diagnosis for the second ANCOVA) in the prediction of the dependent variable (child scores on the RCMAS or RCMAS-2, CBCL/6-18, and TRF/6-18).

Because the interactions were not significant ($F(2, 165) = 1.92, p > .05$) and ($F(1, 167) = .39, p > .05$) respectfully, the ANCOVA could be run.

Research Question One, Part Two Results

The first One-Way Between Subjects ANCOVA evaluated if the child's anxiety scores differed between rater groups after accounting for age. In other words, the analysis answered the question; how do rater's scores differ when holding age constant. Results of this ANCOVA were not significant ($F(1, 167) = 2.24, p > .05$). A significant portion of the total variance in rater group anxiety scores was not accounted for by the age of the child. These results are displayed in table 9.

Table 9

ANCOVA - Rater Group scores with Age as a Covariate

	Sum of Squares	<i>df</i>	Mean Squares	<i>F</i>	Sig
Age	193.99	1	193.99	2.24	.137
Rater Groups	6156.25	2	3078.12	35.48*	.000
Error	14487.87	167	86.75		

* $p < .01$

The second One-Way Between Groups ANCOVA evaluated the differences in mean scores between children with an Anxiety Disorder, NOS diagnosis and children without an Anxiety diagnosis when holding age constant. Although not addressed directly in research questions, this analysis was important in gathering additional information regarding the reporting trends of raters. Similar to the first ANCOVA, results of this ANCOVA were not significant ($F(1, 168) = .76, p > .05$). A significant portion of the total variance between children with and without an Anxiety Disorder, NOS diagnosis was not accounted for by the age of the child. These results are displayed in table 10.

Table 10

ANCOVA – Anxiety Diagnosis with Age as a Covariate

	Sum of Squares	<i>df</i>	Mean Squares	<i>F</i>	Sig
Age	90.65	1	90.65	.76	.39
Anxiety Diagnosis	472.26	1	472.26	3.93	.049
Error	20171.86	168	120.07		

**p* < .05

Research Question Two Results

The second research question utilized Logistic Regression to determine if the report of anxiety symptoms by children with ASD, their parents, or their teachers was predictive of an anxiety disorder diagnosis, as documented by trained examiners. This was done by determining the impact of independent variables (parent, child, and teacher anxiety scores) presented simultaneously to predict membership in one or the other of the two dependent variable categories (the presence or absence of an Anxiety Disorder, NOS diagnosis). As indicated in Chapter 3, logistic regression uses binomial probability theory, where the probability is either “0” or “1.” In other words, each rater’s score either belongs to one group (no Anxiety Disorder, NOS diagnosis) or the other (Anxiety Disorder, NOS diagnosis).

The initial analysis in the logistic regression compared the full model against a constant only model. Based on this model, if a person knew nothing about the child and guessed at their diagnosis, they would be correct 50.9 percent of the time. These statistics are consistent with chance and are provided in table 11. More importantly, of the

variables not in the equation (parent, child, and teacher ratings), the parent ratings on the CBCL were the only ratings to significantly improve the model. These results are presented in table 12.

Table 11

Logistic Regression Classification Table with No Variables Entered

Observed		Predicted			
		Anxiety Diagnosis		Percent Correct	
		No Anxiety Diagnosis	Anxiety Disorder, NOS		
Step 0	Anxiety Diagnosis	None	29	0	100.00
		Anxiety, NOS	28	0	.0
Overall Percentage					50.9

Table 12

Model Improvements of Variables not in the Equation

			Score	df	Sig
Step 0	Variables	Child Scores	1.68	1	.195
		Parent Scores	8.13*	1	.004
		Teacher Scores	.05	1	.823
Overall Statistics			8.67	3	.034

* $p < .01$

The second portion of the logistic regression added parent, child, and teacher scores into the model in one step. When rater's scores are added into the model, the correct prediction of the presence or absence of an Anxiety Disorder, NOS diagnosis increases from 50.3 percent to 64.9 percent. These results are provided in table 13. Additionally, the Omnibus Test of Model Coefficients indicates that the model has a poor fit and one or more of the predictors has a significant effect on the model. This data is presented in table 14. Finally, based on the Wald Statistic, the parent's scores on the CBCL/6-18 were the only scores that made a significant contribution to the model ($p < .05$), where according to Exp(B), one unit change in score resulted in the child being 1.09 times more likely to be diagnosed with Anxiety Disorder, NOS. These results are provided in table 15.

Table 13

Logistic Regression Classification Table with All Variables Entered

		Predicted			
		Anxiety Diagnosis		Percent Correct	
Observed		No Anxiety Diagnosis	Anxiety Disorder, NOS		
Step 1	Anxiety Diagnosis	None	17	12	58.6
		Anxiety, NOS	8	20	71.4
Overall Percentage					64.9

Table 14

Omnibus Tests of Model Coefficients

		Chi-Square	Df	Sig
Step 1	Step	9.14	3	.028
	Block	9.14	3	.028
	Model	9.14	3	.028

* $p < .05$

Table 15

Omnibus Tests of Model Coefficients for All Raters

		B	S.E.	Wald	df	Sig	Exp (B)
Step 1	Child Scores	.02	.03	.59	1	.44	1.02
	Parent Scores	.09	.03	6.32*	1	.01	1.09
	Teacher Scores	.01	.04	.03	1	.86	1.01
	Constant	-7.24	3.58	4.09	1	.04	.00

* $p < .05$

With these results in mind, additional one-step models were run with each of the raters added into the model individually. Results indicated that the parent's scores on the CBCL/6-18 most often predicted the presence of an Anxiety Disorder, NOS diagnosis (64.9 percent), followed by children's ratings on the RCMAS or RCMAS-2 (61.4 percent). Teachers were least likely to correctly predict the presence of a diagnosis using

the TRF/6-18 (56.1 percent). On the other hand, teachers were most likely to predict the absence of an anxiety disorder diagnosis (75.9 percent) followed by children (69.0 percent). Parents were least likely to predict the absence of an anxiety disorder diagnosis (58.6 percent). These statistics are provided in table 16.

Table 16

Percentages of Correctly Predicted Diagnoses

Rater Group	Total Percentage Correct	Percentage of No Diagnosis Correctly Predicted	Percentage of Anxiety Disorder, NOS Correctly Predicted
Parents	64.9	58.6	71.4
Children	61.4	69.0	53.6
Teachers	56.1	75.9	35.7

Note. All scores are reported in T scores, M=50, SD=10

CHAPTER V

Discussion

In order to better understand the usefulness of self-, parent-, and teacher-reports when measuring the presence and severity of anxiety symptoms in individuals on the autism spectrum, data from each group was compared using the CBCL/6-18, TRF/6-18, and RCMAS or RCMAS-2. The goal of this study was to inform clinicians as to how differences in reported symptoms of anxiety in children with ASD can be traced to the source of the rating. The following is a brief review of the results followed by their connection to the current literature.

Prior to examining specific research questions, correlations were run to determine the relationship between child, parent, and teacher reports. Results indicated that there were no statistically significant relationships between variables. However, the relationship between parent and teacher reports was modest and positive; indicating that higher scores on the CBCL/6-18 were associated with higher scores on TRF/6-18. These results were inconsistent with the results of previous studies, which generally found significant positive correlations between child and parent scores.

The first research question examined the differences in parent(s), teacher(s), and child ratings of the child's symptoms of anxiety. Results indicated that scores reported by parents and teachers were significantly higher than those reported by children with ASD. Parent and teacher scores were not significantly different. The ANOVA yielded adequate power and a medium effect size, indicating that differences are not likely due to chance.

Next, the differences among raters were evaluated when comparing children with ASD who do or do not also carry an anxiety disorder diagnosis. Results indicated that, as

would be expected, children who carry a diagnosis of Anxiety Disorder, NOS had higher anxiety scores than children who do not have an Anxiety Disorder, NOS diagnosis. However, the interaction between rater group and anxiety diagnosis was not significant. Simply put, differences between raters (e.g., parent, teacher or child) were not influenced by whether or not the child was given an anxiety diagnosis. The effect size of this analysis was small.

The influence of age was also considered. Specifically, the study evaluated whether or not the child's age affected the mean differences between raters. Results indicated that for children with ASD ages 6 to 16, age does not have a significant effect on the reporting trends of children, parents, and teachers. For example, parent ratings of young children were not significantly different than parent ratings of older children. Additionally, age does not have a significant effect on scores of children with and without an anxiety diagnosis. In other words, scores reported for young children with an anxiety diagnosis were not significantly different than scores reported for older children with an anxiety diagnosis. It should be noted that the effect sizes dropped significantly when adding the covariate of age, decreasing the magnitude of possible effects.

Research question two examined whether or not the report of anxiety symptoms by children with ASD, their parents, or their teachers was predictive of an anxiety disorder diagnosis, as documented by the evaluating psychologist. Results indicated that when all three rater's scores were factored into the model, the correct prediction of the presence or absence of an Anxiety Disorder, NOS diagnosis increased from chance; however, the parent ratings were the only ratings to significantly improve the model. Parent's scores most often predicted the presence of an Anxiety Disorder, NOS diagnosis.

Children's ratings were second, and teachers were least likely to correctly predict the presence of a diagnosis. On the other hand, teachers most often predicted the absence of an Anxiety Disorder, NOS diagnosis, followed by children.

Conclusions

Reporting Trends of Children with ASD. Baron Cohen et al. (1985) theorized that, independent of intellectual ability, individuals with ASD lack Theory of Mind, or the ability to impute mental states to one's self and others. As a result, individuals with ASD are sometimes able to comprehend and identify basic emotions such as happy and sad, but struggle with emotions that are more complex. Leslie (1987) expanded this theory to include the concept of Second Order Representation, providing support for the idea that deficits in the individual with ASD's ability to think about one's own and other people's thoughts result in deficits in their social and emotional understanding.

This theory was supported by previous research, which indicated that individuals with ASD were able to identify basic emotions such as happy and sad, but struggled with complex emotions such as embarrassment, shame, and empathy (Baron-Cohen, Leslie & Frith, 1985; Berthoz & Hill, 2005; Capps et al., 1992; Heerey, Keltner & Capps, 2003; Hobson, 1986; Silani et al., 2008; Yirmiya, Sigman, Kasari & Mundi, 1992). However, when previous researchers looked specifically at the use of rating scales among individuals with ASD, they concluded that individuals with ASD were able to accurately self-report (Berthoz & Hill; 2005). Additionally, correlations between child and parent reports were significant, suggesting that as parent reports of symptoms increased or decreased, child reports followed suit (Gillott et al, 2001; Kussiko et al., 2008). Finally, although mean differences existed between parent and child reports, the differences were

not typically significant (Chow, 2008; Gillott et al., 2001; Kuusikko et al., 2008; Russell & Sofronoff, 2005).

Contrary to data provided from past research, results of the current study supported Premack and Woodruff's (1978) theory. Individuals with ASD reported significantly fewer symptoms of anxiety than their parents and teachers, their reports were not correlated to those of parents and teachers, and their reports were not significantly predictive of the presence of an anxiety diagnosis. This suggests that children with ASD may be under reporting their symptoms of anxiety. As a matter of fact, the only time children with ASD were able to predict the anxiety diagnosis at a rate better than chance was when an anxiety diagnosis was not given. In other words, children with ASD were only able to self-report their symptoms of anxiety when there were few to no symptoms to report.

Age as a Covariate. According to many theorists (Achenbach et al., 1997; Langley et al., 2004; White et al., 2009), young children experience greater difficulty communicating their feelings than older children because younger children have less developed vocabularies, limited comprehension skills, and may experience difficulty expressing their feelings. In contrast, older children and adolescents are thought to have better developed abilities to think abstractly and consider hypotheticals that allow them to describe their experiences (Soto, John, Gosling, & Potter, 2008). As a result, children's affective experiences and abilities to communicate emotions are thought to become more differentiated with age (Cicchetti & Hess, 1982; Lewis & Michaelson, 1983; Capps et al., 1992). While little research is available on this topic when looking at reports of anxiety specifically, Kuusikko et al. (2008) found that teenagers with ASD reported more

symptoms of social anxiety than younger children. This suggests that individuals with ASD may be better able to identify symptoms of anxiety as they grow older.

Results of the current study did not support the theory that age was related to symptom reporting for children with ASD ages 6 to 16. Age did not have a significant effect on the reporting trends of any of the three groups, nor did it have a significant effect on scores of children with and without an anxiety diagnosis. This may suggest that while typical children develop communication skills and the ability to describe their feelings throughout the course of development, symptoms of ASD are pervasive across the lifespan and as such these skills do not develop similarly in adolescents with ASD. As indicated above, it is important to note that the effect sizes dropped significantly when adding the covariate of age, decreasing the magnitude of possible effects.

Reporting Trends of Parents. A large majority of the extant literature concerning the reporting trends of symptoms that individuals with ASD experience focus on parents input. As indicated above, previous research has suggested that parent and child ratings are correlated (Gillott et al, 2001; Kussiko et al., 2008), and while parents report more symptoms of anxiety than the children report in themselves, the means are typically not significantly different (Chow, 2008; Gillott et al., 2001; Kuusikko et al., 2008; Russell & Sofronoff, 2005). These results were refuted in the current investigation. Parent and child ratings were not significantly correlated. Additionally, significant mean differences were found between the two rater groups with parents consistently reporting more symptoms of anxiety. When examining child, parent, and teacher data, parents were the only raters to make significant predications as to the presence of an Anxiety Disorder, NOS diagnosis. That is, their data contributed the most information in the prediction

model. Based on the idea that child with ASD experiences deficits in Theory of Mind, it is logical that parents would more accurately identify symptoms of anxiety than their children and also possess the ability to more accurately predict the presence of an anxiety disorder diagnosis. This is because Theory of Mind difficulties can impair an individual with ASD's experience and expression of their own emotions (Premack & Woodruff, 1978). In summary, results of this study suggest that when reviewing data from report forms, information provided by parents is the best predictor of an anxiety diagnosis.

It is important to note that based on the design of this study, it may be hypothesized that information provided by parents was simply weighed more heavily than information provided by other raters, resulting in diagnoses that are most closely aligned with parent ratings. However, data was collected over the course of seven years and diagnoses were made by at least five independent clinicians. As a result, it is unlikely that each clinician gave favor to parent reports resulting in similar outcomes.

Reporting Trends of Teachers. Previous studies evaluating the reporting trends of individuals with ASD and their caregivers did not address the reporting trends of teachers. As a matter of fact, there is no available research on the topic to date. As a result, the current study filled a gap in the available literature by including teacher reports in analyses. Existing literature does caution that differences in parents and teachers reports may result from the fact that items can be rated based on the individual's understanding of the child and not the actual symptoms witnessed (Renk, 2005), or the symptoms may not be exhibited by the child in the environment in which the individual sees the child (Comer & Kendall, 2004). Additionally, due to the internalized nature of anxiety, it is possible that the adults caring for the child may be unable to observe

symptoms of anxiety, or in the case of the current study, anxiety symptoms may be masked by behavioral symptoms related to ASD.

Results of the current study found that, contrary to the theories suggested above, teacher's reports were significantly higher than the children's own reports; suggesting that teachers observe more anxiety in the children than the children reported. However, despite their higher mean scores, teacher reports were the least predictive of a diagnosis of Anxiety Disorder, NOS. In other words, although teachers reported more symptoms of anxiety in children with ASD than the children reported in themselves, the children were better able to predict when an Anxiety Disorder, NOS diagnosis was appropriate. This is consistent with results of Pearson correlations between the groups, which were not significant.

On the other hand, despite having a mean score that was ten points higher than the children's mean rating and only two points lower than parent's mean rating, teachers were best able to predict the absence of an anxiety disorder diagnosis. This suggests that, in addition to parents, teachers are able to provide useful diagnostic information. In other words, when forming diagnostic impressions, clinicians should use elevated parent ratings to confirm a diagnosis and low teacher ratings to rule out a diagnosis. Because this study is the first to address this area of research, additional research is needed in this area.

Limitations

When discussing the results of this study, there are a number of limitations that should be considered. First, the scoring program used for the CBCL/6-18 and the TRF/6-18 truncates standard t-scores at 50, while scores on the RCMAS and RCMAS-2 are not

cut off. As a result, it is possible that mean parent and teacher ratings are somewhat inflated. Additionally, the power of the study was likely affected, as variance was restricted. It should be noted, however, that the score distributions were found to be within normal limits for each measure. If this study were to be conducted in the future, it is recommended that the Achenbach Youth Self Report (YSR/11-18) be used so that a consistent endpoint is established. The YSR/11-18 was not chosen for use in the present study because it would have substantially limited the sample size. Additionally, the use of the YSR/11-18 rather than the RCMAS and RCMAS-2 would have decreased the age range of the sample from 6-18 to 11-18. Information regarding the self-reporting trends of school-aged children would therefore be unavailable. Alternatively, future researchers may wish to utilize the CBCL/6-18, TRF/6-18, and RCMAS/RCMAS-2, but convert all raw scores to Z scores prior to analysis. This was not possible in the current study because raw scores were not available to the researcher.

Second, although there are five types of anxiety identified as being commonly diagnosed in children with ASD, the sample used in this study was limited to children diagnosed with Anxiety Disorder, NOS. Due to this study limitation, the researcher was forced to alter the analyses from those that were originally proposed and not all research questions could be answered. It is possible that the specific diagnostic practices used at the outpatient clinic where the sample was obtained may reflect the prevalence of the NOS category.

Third, the sample used in the study has specific limitations. The size of the overall sample was relatively small, which lowered the overall power and increased the likelihood of Type II error. Additionally, the sample of children with ASD was from one

outpatient clinic in southwestern Pennsylvania. Therefore, results of this study are not generalized to all groups of children with autism spectrum disorders. Future studies should obtain a larger sample size and focus on a wider demographic in an effort to increase generalizability.

Finally, the CBCL/6-18 and TRF/6-18 do not contain subscales for specific types of anxiety. Additionally, total anxiety scores were used on the RCMAS and RCMAS-2, rather than individual subscale scores. As a result, it is unknown how children, parents, and teachers scores would compare to the psychologists diagnosis if scores for specific types of anxiety were used. For example, are the child's ratings of a specific phobia more closely aligned with the psychologist's diagnosis than the child's ratings of social phobia? While the Achenbach scales were chosen because the measures are widely used and their psychometric properties are strong, future research should investigate reporting trends among raters when specific types of anxiety are measured.

Recommendations for Future Research

A limited body of research exists that examines the reporting trends of individuals with ASD and their caregivers. As a matter of fact, this study was the first to date to compare ratings to a psychologist's diagnosis. Additionally, to date, no other study has included teacher ratings in the study sample, or has attempted to investigate the ratings of specific types of anxiety commonly diagnosed in children with ASD. As a result, there is a great need for additional research.

Based on this study's limitations reported above future research should focus on the use of a larger and more geographically and diagnostically diverse sample that would allow for greater generalizability and a more complete picture of reporting trends.

Additionally, future researchers should either consider using all or no measures that truncate T scores, or utilize raw scores when conducting analyses. Finally, based on the limitations of the current study, future researchers should consider using rater's scores on individual anxiety subscales rather than total anxiety scores, which would provide a more complete picture of reporting trends.

Also, although anxiety and depression are considered to have many diagnostic correlates and are therefore thought to be closely related (Vasey & Ollendick, 2000), the treatment needs of individuals with the two diagnoses vary significantly. In past, researchers have found differences between parent and child ratings of the two diagnoses, with mean scores being more closely aligned for anxiety than depression (Chow, 2008). The reporting trends of children, parents, and teachers should therefore be examined in relation to depression in order to clarify this relationship. Moreover, following similar methodology to the current study, future researchers should examine rater's scores of depression as compared to the psychologist's diagnosis.

Finally, Theory of Mind suggests that individuals with ASD experience deficits in their ability to identify complex emotions in themselves and others (Premack & Woodruff, 1978). Based on the current study, individuals with ASD indeed reported fewer symptoms of anxiety than both their parents and teachers, and their scores were less predictive of a diagnosis than their parent's reports. If children with ASD struggle to report emotions on a scale created and normed for the general population, perhaps a new scale is necessary. Future research should therefore focus on creating a scale that would allow children with ASD to more accurately report symptoms of anxiety.

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