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Anxiety and Social Skills in Children with High Intellectual Ability and Attention-Deficit/Hyperactivity Disorder

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Anxiety and Social Skills in Children with High Intellectual Ability and Attention-Deficit/Hyperactivity Disorder

by

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Abstract

The current study investigated the relationship between anxiety and social skills in high intelligent (HI) children with Attention-Deficit/Hyperactivity Disorder (ADHD) aged 8 to 11 years old. Fifteen HI children with ADHD (twice-exceptional) were matched one-to-one on age to children with HI (FSIQ ≥ 120), those with ADHD-C (average intelligence), and typically-developing children. Overall, results indicated no significant differences between self-reported anxiety and social skills; however, ADHD parent-reports of anxiety were significantly higher than typical parent-reports of anxiety. Twice-exceptional self-reports and HI self-reports were significantly lower than their parent's reports of anxiety. For social skill abilities, twice-exceptional self-reports were significantly higher than their parents' reports. It was also determined that anxiety was a significant predictor of twice-exceptional children's social skills. Results of this study suggest that additional research should focus on HI as a possible risk factor for the development of anxiety and poor social skills in children with ADHD.

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List of Abbreviations

ADHD	Attention-Deficit/Hyperactivity Disorder
ADHD-C	Attention-Deficit/Hyperactivity Disorder Combined Presentation
ADHD-HI	Attention-Deficit/Hyperactivity Disorder Hyperactive/Impulsive Presentation
ADHD-I	Attention-Deficit/Hyperactivity Disorder Inattentive Presentation
BASC-2	Behaviour Assessment System for Children – Second Edition
CHC	Catell-Horn-Caroll Theory
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, 5th edition
FSIQ	Full Scale Intelligence Quotient
HI	High Intelligence
ODD	Oppositional-defiant Disorder
PIB	Positive Illusory Bias
SES	Socioeconomic status
SSIS	Social Skills Improvement System
WASI	Wechsler Abbreviated Scale of Intelligence

Chapter One: Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most commonly diagnosed childhood neurodevelopmental disorders (American Psychiatric Association, 2013). On average, more boys are diagnosed than ADHD than girls with an approximate ratio of 3:1 (Barkley, 1997) and prevalence rates are estimated at 5 to 10% in school-aged children in Canada (Scahill & Schwab-Stone, 2000). Children who are inattentive, highly active, and impulsive often demonstrate more difficulties when compared to same age peers in their abilities to effectively cope with the steps required in developing self-regulation, and in their ability to successfully prepare for their future (Mash & Barkley, 2003). Furthermore, these children often experience challenges across multiple domains including academics or social relationships and may be more susceptible to emotional disorders such as anxiety and depression (American Psychiatric Association, 2013; Fisak, Richard, & Mann, 2011). ADHD accounts for the majority of referrals to psychological, mental health, school, and community-based educational support services (Bussing, Zima, Perwien, Belin, & Widawski, 1998).

The purpose of the present study was to gain an understanding of the anxiety levels of high intelligent (HI) children with ADHD and examine how these levels impact their social abilities. There is limited research on HI children with ADHD. Thus, the relation between social skills abilities affected by anxiety within this population is unclear. Further research is needed to understand how HI children with ADHD and varying degrees of anxiety socially interact with others. Understanding the behaviours of HI children and youth with ADHD can help researchers to develop successful and appropriate interventions designed to decrease anxiety and increase social skills specifically for HI children with ADHD, and successfully aid in the ability to support children who are struggling to develop these skills.

Attention-Deficit/Hyperactivity Disorder

It is common for typically developing children to be energetic and active, to explore their environment, and to respond on impulse to events that occur (Mash & Barkley, 2003). However, when children's self-regulation lags behind their developmental level and their excessive energy levels and attention are variable, they may no longer express typical behaviours that characterize childhood (Mash & Barkley, 2003). Instead, these children are at greater risk to be impaired in their cognitive, social, and familial domains due to their poor self-regulation and as a result, are often diagnosed as having ADHD (Mash & Barkley, 2003).

Young children often display behavioural symptoms of ADHD (e.g., limited attention span or excessive movement; American Psychiatric Association, 2013; Barkley, 1997). However, children younger than four or five years of age tend to be very active and are rarely required to exhibit sustained attention, thus making it difficult to differentiate between the age-appropriate behaviours of a young child and those behaviours that may be more in alignment with an ADHD diagnosis (American Psychiatric Association, 2013). Therefore, valid diagnosis of ADHD typically occurs during early middle childhood, in which several of the symptoms must be present before the age of twelve (American Psychiatric Association, 2013). ADHD symptomatology tends to arise in early childhood and in most cases can be persistent throughout development (Barkley, 2003). However, as some children mature, symptoms, or symptom severity, may begin to diminish over time (American Psychiatric Association, 2013). Adolescents and adults with this disorder often develop coping mechanisms that help them to control or manage their symptomology (American Psychiatric Association, 2013). For example, many individuals with ADHD often lose or misplace items, are easily distracted, and are forgetful. To help manage these symptoms adolescents and adults may develop coping methods

that include using an agenda, posting reminder notes on doors, and placing items such as keys and wallets in a designated place at home. It is important to note that symptoms typically vary depending on the situation and context (American Psychiatric Association, 2013). Symptoms of the disorder may be minimal or absent when an individual is under close supervision, is engaged in an interesting activity, is playing video games, is in a novel situation, and is receiving frequent rewards for appropriate behaviour (American Psychiatric Association, 2013).

Initially, ADHD symptoms were believed to arise from deficits in moral regulation of behaviour and inhibition (Still, 1902). In a later reconceptualization of attentional difficulties, Douglas (1972) claimed that poor impulse control and sustained attention best explained the symptoms of this disorder. Specifically, Douglas (1972) suggested that there were four major deficits: difficulties in modifying behaviours to meet situational demands, difficulties with maintenance of effort, difficulties with impulse control, and a strong desire to seek immediate reinforcement. Following, Douglas (1988) suggested that these deficiencies were better explained by the impairment in self-regulation. Currently, ADHD is believed to be a neurological condition in which one displays developmentally inappropriate levels of hyperactivity, and or impulsivity (American Psychiatric Association, 2013; Barkley, 1997).

The primary deficits experienced by children with ADHD are related to executive function impairments (Barkley, 1997). Executive functions are

Lezak, Howieson, and Loring (2004) suggest that executive functions are important in helping to regulate and manage an individuals' goal-directed behaviour (as cited in Antshel, 2008a). Impairments can lead to deficits in processing speed (i.e., the inability to process information quickly), attention (i.e., poor sustained attention), and inhibitory control (i.e., the failure to inhibit one's actions; Antshel, 2008a; Barkley, 1997). As a result of these

impairments, individuals with ADHD often have difficulties completing tasks that require these functions (Barkley, 1997). For example, in school children with ADHD may have difficulty completing timed tests, organizing ideas to write a paper, or sitting in a desk for long periods of time.

The predominant model of ADHD in the current literature has been advanced by Barkley (1997). Many children with ADHD demonstrate deficiencies such as self-regulation, inhibitory control, and planning (Barkley, 1997). The main focus of this model is that response inhibition is a core deficit of ADHD. Response inhibition is the ability to stop actions that may interfere with a goal-driven behaviour or are inappropriate in a given situation (Barkley, 1997). A deficit in response inhibition can lead to impairments in four separate domains of executive function: (1) self-regulation/ motivation (i.e., an individual's ability to control their emotions and behaviours in response to external stimuli, and poor social perspective taking), (2) working memory (i.e., the ability to temporarily hold auditory information or visual perceptions in mind and sense of time), (3) reconstitution (i.e., analysis and synthesis of either verbal or non-verbal behaviour) (4) internalization of speech (i.e., moral reasoning, self-reflection, and impaired reading comprehension; Barkley, 1997). These deficits can result in difficulty with processes such as planning, carrying out goal-directed behaviour, attending to relevant information, or inhibiting actions that are inappropriate in a given context (Barkley, 1997). In addition, deficits in working memory and inhibition can often lead to off-task behaviour and distractibility (Barkley, 1997).

In addition, children with ADHD have been found to have approximately a two-year developmental lag in executive functions such as the ability to organize information, plan, and solve problems based on previous learning and in adaptive behavior compared to typically

developing children (Semrud-Clikeman, 2007). These children tend to typically display developmental lags on tasks that need to be mastered at various stages (Semrud-Clikeman, 2007). Furthermore, these children appear to learn these skills at different stages, therefore causing a mismatch between a child with ADHD and their peers in appropriate behavior and in social understanding (Semrud-Clikeman, 2007).

Every individual will experience moments when they have difficulties paying attention, completing tasks, and are remembering. It is important to determine whether these difficulties are more frequent and severe than typical and interfere with developmentally appropriate academic, social, or occupational functioning (American Psychiatric Association, 2013). The *Diagnostic and Statistical Manual – 5th edition* (DSM-5; American Psychiatric Association, 2013) provides specific criteria to aid in the identification and diagnosis of ADHD.

ADHD Subtypes

ADHD is characterized by symptoms of inattention, hyperactivity, and/or impulsivity that are more severe than same-aged peers (American Psychiatric Association, 2013). The presentation and pattern of these symptoms is related to the subtype identification indicated in the DSM-5. It is often the case that, for each child, the symptoms and the presentation of the intensity of the symptoms are unique (Leroux & Levitt-Perlman, 2000).

Attention-Deficit/Hyperactivity Disorder Predominately Hyperactive/Impulsive Presentation (ADHD-HI). Children with ADHD-HI are characterized by behaviours related to hyperactivity and impulsivity. These children often display restlessness, excessive running or climbing, spontaneous actions, excessive noise, and the inability to wait (American Psychiatric Association, 2013; Leroux & Levitt-Perlman, 2000). Hyperactive symptoms include difficulties waiting one's turn, often blurting out answers before questions have been completed, and often

interrupting or intruding when others are speaking (American Psychiatric Association, 2013; Leroux & Levitt-Perlman, 2000). Impulsivity symptoms are characterized as not listening to others, frequently interrupting or intruding on others, initiating conversations at inappropriate times, and frequent shifts in conversation (American Psychiatric Association, 2013). To meet diagnostic criteria for ADHD-HI, children must have six or more symptoms of hyperactivity-impulsivity and less than six symptoms of inattention. These symptoms must be both impairing and pervasive, meaning they persist for at least six months and in two or more settings (e.g., at home and at school; American Psychiatric Association, 2013).

Attention-Deficit/Hyperactivity Disorder Predominately Inattentive Presentation (ADHD-I). This subtype is related to symptoms of inattention in which children typically display a general inability to sustain attention, excessive daydreaming, forgetfulness, social withdrawal, and a lack of focus (American Psychiatric Association, 2013). These behaviours may result in a child forgetting to do something or appearing as though he or she is disorganized (American Psychiatric Association, 2013). In addition, children with inattentive difficulties are often forgetful in daily activities, do not follow through on instructions, and avoid or are reluctant to engage in activities that require sustained mental effort (e.g., homework; American Psychiatric Association, 2013). To meet diagnostic criteria, these children must have six or more symptoms of inattention but do not have enough hyperactive-impulsive symptoms to meet a combined diagnosis as outlined in the DSM-5. These symptoms must be present for at least six months in two or more settings (American Psychiatric Association, 2013).

Attention-Deficit/Hyperactivity Disorder Combined Presentation (ADHD-C). This subtype is the most commonly diagnosed subtype of ADHD and is characterized by both inattention and hyperactivity/impulsivity symptoms (American Psychiatric Association, 2013).

Children are identified as having ADHD-C if they meet the diagnostic criteria if they have at least six symptoms of hyperactivity-impulsivity and at least six inattentive symptoms (American Psychiatric Association, 2013). In other words, if a child meets criteria for both ADHD-H and ADHD-I, they would be identified as ADHD-C.

Comorbidities

Regardless of subtype, individuals with ADHD often experience secondary impairments associated with this disorder (i.e., difficulties associated with this disorder that are not attributed to the core executive function deficits; Barkley, 2006). Specifically, children with ADHD are at greater risk for poor school performance, low academic achievement, school expulsions and suspensions, early substance experimentation and abuse, emotional disorders such as anxiety, speeding tickets, or poor social and family relations (Barkley, 1997). The majority of these risks may be intensified by the presence of comorbid disorders (Barkley, Guevremont, Anastopoulos, DuPaul, & Shelton, 1993).

Individuals with ADHD have an increased risk for developing comorbid behavioural and emotional disorders as compared to typically developing children (Wilens et al., 2002). Up to 87% of children clinically diagnosed with ADHD may have at least one other disorder (Kadesjo & Gillberg, 2001). The most common comorbid conditions are oppositional defiant disorder, Tourette's disorder and other tic disorders, and anxiety and mood disorders (Kadesjo & Gillberg, 2001). Comorbid disorders can contribute to rejection by peers, poor self-esteem, conflict with family and school authorities, and oppositional behavior among children with ADHD (Mikami, Ransone, & Calhoun, 2010). Of primary importance to the current research project is the co-occurrence of anxiety symptoms in children with ADHD.

ADHD and Anxiety

In general, anxiety disorders have been found to negatively impact a number of areas of functioning, including social interactions, the ability to enjoy daily life experiences, self-confidence, and academic performance (Fisak et al., 2011). These disorders are characterized by feelings of excessive tension and worry even though there is little or no cause for it (Bloemsma et al., 2012). If left untreated, childhood anxiety disorders may lead to adult anxiety disorders and depression, as well as substance use problems, hospitalization, and suicide attempts (Kendall et al., 2010). Although approximately 25% of children with ADHD also meet criteria for comorbid anxiety, there are surprisingly few studies that have examined the influence of anxiety on children with ADHD (Jensen, Martin, & Cantwell, 1997; Pfiffner, Calzada, & McBurnett, 2000; Schatz & Rostain, 2006).

Pliszka (1992) found that children with ADHD and comorbid anxiety show less hyperactive and off-task behavior, and tend to have a later age of ADHD onset when compared to children with ADHD without comorbid anxiety. Furthermore, Biederman, Faraone, and Keenan (1991) found that children with ADHD and comorbid anxiety did not differ in their school performance when compared to children with ADHD only. However, they did find that children with ADHD and comorbid anxiety self-reported more difficulties in their academic performance than children with ADHD only.

Researchers suggest that youth with ADHD and comorbid anxiety have more working memory difficulties and a sluggish cognitive tempo (Carlson & Mann, 2002; Tannock & Schachar, 1995) and experience poorer relationships with siblings and parents, than do youth who have ADHD and no comorbid anxiety (Mikami & Pfiffner, 2007; Pfiffner & McBurnett, 2006). Sluggish cognitive tempo is a cluster of symptoms believed to be distinctly different than

those typically found in ADHD-H and ADHD-C (Carlson & Mann, 2002; Tannock & Schachar, 1995). Symptoms include greater impairment in focused attention and mental alertness, physical hypoactivity, and increased error-prone information processing (Carlson & Mann, 2002; Tannock & Schachar, 1995). Furthermore, working memory problems, sluggish cognitive tempo, and poor family relationships may all be risk factors for peer difficulties in individuals with ADHD (Mikami, Huang-Pollock, Pfiffner, & Hangai, 2007). Therefore, comorbid anxiety may be a predictor for increased social difficulties for youth with ADHD (Mikami et al., 2011).

Karustis, Power, Rescorla, Eiraldi, and Gallagher (2000) examined the relationship between anxiety and social abilities of youth with and without ADHD. Parent ratings of anxiety symptoms of youth with ADHD positively predicted teacher reports of social difficulties. In a similar study, children with ADHD self-reported anxiety symptoms were associated with parent reports of poorer social skill abilities (March et al., 2000). Bowen, Chavira, Bailey, Stein, and Stein (2008) also found that youth with ADHD and comorbid anxiety reported lower social competence than youth with ADHD only or youth with anxiety only.

Mikami et al. (2011) also investigated the contribution of anxiety and the social functioning of children with and without ADHD. Social functioning was measured through parent and teacher reports, peer nominations, and observations of social behaviors during a lab-based playgroup with unacquainted peers. All children with anxiety were slightly more likely to be identified by adults as having poorer social functioning after controlling for ADHD and oppositional-defiant disorder (ODD). The results suggest that anxiety may influence the social functioning of children both with and without ADHD. However, this relationship has not yet been explored in children with high levels of intelligence.

Previous studies that have included children with HI and ADHD did not examine the possible relationship of anxiety and social skills (Antshel, 2008; Leroux & Levitt-Perlman, 2000). Therefore, the relationship between social skills abilities affected by anxiety within this population is unclear. Further research is needed to understand how HI children with ADHD and varying degrees of anxiety socially interact with others.

Social Competence

Social competency is the ability to regulate one's behavior, cognition, and affect when interacting in a social situation (Curby, Rudasill, Rimm-Kaufman, & Konold, 2008). Peer relationships and adequate social functioning are two primary factors that may contribute to optimal child development (de Boo & Prins, 2007). Children's social impairment has been found to be a predictor of long-term adjustment problem across multiple domains of functioning such as academics, social, occupational, and marital (Greene, Biederman, Faraone, Sienna, & Garcia-Jetton, 1997), and higher incidences of school maladjustment, childhood psychopathology, and suspensions/expulsions (Curby et al., 2008).

Children with ADHD often experience social difficulties, struggle to make and keep friends (American Psychiatric Association, 2013), and are often immature (Leroux & Levitt-Perlman, 2000). These issues can become more problematic as there are increased social demands placed on children after they begin school (Ladd, Herald, & Kochel, 2006). For example, children are expected to participate in classroom activities, work in groups, collectively participate in activities, and interact positively with peers (Curby et al., 2008).

Furthermore, children with ADHD are often more critical than their peers and have limited awareness of proper social conduct or how their behaviours may impact others (Maedgen & Carlson, 2000). As a result, children with ADHD often have few friends, are less liked by

other children, and are often rejected as a consequence (Mash & Barkley, 2003). It has been estimated that it takes only 30 minutes for typically developing children to identify children with ADHD as aggressive and disruptive; this identification may lead to criticism and rejection of the child with ADHD (Milich & Landau, 1982). Poor peer adjustment of children with ADHD has been shown to have negative effects on their self-esteem, the behavior of those around them, and their adult prognosis (Wheeler & Carlson, 1994).

Barkley (2000) claims there are four aspects of development that are important for social functioning. The first aspect includes a child's ability to learn to represent an event mentally that can be used later. This representation is typically exhibited in the form of a linguistical encoding of what happened and what he or she should do in that specific situation. For example, before grabbing a toy out of a friend's hands a child may think to themselves "I have to ask before playing with my friends' toys because he or she may get mad and I won't get to play with the toy." This encoding would allow the child to remember the "rules" of interacting with others that could be later applied to similar situations.

Secondly, the child needs to apply what he or she learned in stage one (i.e., asking to play with a friend's toy). In the third stage, the child needs to learn how to wait for a reward and to anticipate the reward if the behavioural rules are implemented appropriately (Barkley, 2000). For example, if a child's friend is playing with a desired toy, the child may have to wait patiently until the friend is finished playing with it and if the child asks to play with the toy the friend will hopefully share the toy. Lastly, the child needs to be able to not only live in the present but be able to anticipate the future. In other words, the child must realize that if he or she takes a friend's toy without asking, the friend may not want to play with him or her in the future. All of these stages are linked and are important for an individual to be able to socialize with others.

Children with ADHD tend to accomplish these stages later than their peers, which may cause significant impairments in their social functioning with children and adults.

Although children with ADHD frequently have few friends or a limited awareness of appropriate social conduct (American Psychiatric Association, 2000; Maedgen & Carlson, 2000; Mash & Barkley, 2003), they often overestimate their social competencies and rate themselves as being as equally socially competent as their peers (Foley-Nicpon, Rickels, Assouline, & Richards, 2012; Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007). These responses demonstrate a "positive illusory bias" (PIB; Foley-Nicpon et al., 2012; Owens et al., 2007). A PIB is defined as the discrepancy between actual competence and self-reported competence (Owens et al., 2007). This means that the child's perception of their own performance is significantly higher than their actual performance as rated by parents or teachers (Owen et al., 2007).

Children with ADHD may use PIB to help reduce or ameliorate internal and external traits that may lead to greater impairment in social-emotional functioning (Maedgen & Carlson, 2000). In other words, these children may use PIB as a self-protective factor that shields them from recognizing their social difficulties (Owens et al., 2007). Understanding the factors associated with positive development in children with ADHD may help in the development of intervention strategies.

Resilience

Resilience is a process in which individuals exhibit positive behavioural adaptation when they encounter significant trauma or adversity (Masten, 2001). Identified risk factors are those that may predict negative outcomes and thus prevent one from obtaining achievable goals (Shannon, Beauchaine, Brenner, Neuhause, & Gatzke-Kopp, 2007). For example, adversity may

result from childhood illness or disease, poverty, maternal depression, or circumstances that are out of one`s control (Shannon et al., 2007). In contrast, protective factors may help reduce risks and allow one to succeed despite facing negative risk factors (Shannon et al., 2007). For example, access to healthcare, a strong and healthy family support, and intelligence has been found to contribute to the development of resilience in children (Shannon et al., 2007).

ADHD protective factors are those that moderate the relationship between the primary deficits and the secondary behaviours associated with this disorder. For example, intelligence is believed to contribute to the resilience in HI adolescents with ADHD (Antshel et al., 2008). Specifically, these individuals are less likely to smoke cigarettes or have a substance related diagnosis (Antshel et al., 2008). In other words, higher levels of intelligence may reduce the chance that an individual with ADHD may experience the difficulties and impairments typically associated with ADHD.

Intelligence

Intelligence is a broad construct that refers to the ability to think abstractly, learn quickly, reason, solve problems, plan, learn from experiences, and comprehend complex ideas (Antshel, 2008b). Sternberg's theory of intelligence (2000) defines intelligence as the cognitive ability to think rationally, to remember important information, to learn from experiences, and to deal with the demands of everyday life. Sternberg's theory proposes that all individuals have three separate but related abilities but often one ability is stronger than the others. The three abilities include analytic intelligence (e.g., the mental steps used to solve problems), creative intelligence (e.g., the use of experience and past learning to help foster insight), and practical intelligence (e.g., the ability to adapt to everyday situations). The theory claims that in order to have "successful intelligence" one must be able to integrate these three abilities. The main focus of

the theory is for individuals to adapt to their environment and to find a balance of the three abilities (Sternberg, 2000).

Gardner (1983) proposes that there are eight multiple intelligences (see Table 1). Gardner (1983) believed that the majority of children have an area of intelligence that can be supported and that the goal is to focus on a students' strengths rather than identify him or her as "gifted." Gardner's theory proposes that these multiple intelligences or "giftedness" result from inborn abilities that interact with a supportive environment. He claimed that schools generally value only verbal-linguistic and logical-mathematical intelligences and emphasized that schools should include other approaches to learning (i.e., other intelligences) to allow all students to benefit.

Table 1

Gardner's (1983) Eight Multiple Intelligences

Intelligence	Definition
Verbal-Linguistic	The ability to use words effectively in either written or oral expression.
Mathematical	The ability to see logical patterns and relationships and the ability to use numbers.
Visual-Spatial	The ability to orient and visualize oneself in the world.
Musical-Rhythmic	The capacity to perceive, discriminate and transform, and express musical forms.
Bodily-Kinesthetic	The ability to develop physical skills, to make things with their hands, and to express ideas.
Interpersonal	The ability to make and perceive distinctions in one's mood, motivations, intentions, and feelings in others.
Intrapersonal	The ability and self-knowledge to act adaptively based on that knowledge such as a psychotherapist or religious leader
Naturalist	The ability to identify and appreciate different categories of vegetation or wildlife.

In comparison to the previous theories, the Cattell-Horn-Carroll (CHC) theory of intelligence claims that intelligence can be organized into a hierarchy of abilities comprised of three separate levels or strata (Narrow Stratum I, Broad Stratum II, and General Stratum III; Carroll, 1996). The theory suggests that there is a single general factor known as General Intelligence (*g*) and eight broad categories of abilities referred to as Stratum II abilities (Keith & Reynolds, 2010). These abilities include Fluid Intelligence (e.g., the ability to think logically and solve problems in novel situations), General Working Memory and Learning (e.g., the ability to hold and manipulate information in mind), and Processing Speed (e.g., the ability to process information quickly; Keith & Reynolds, 2010). These abilities are arranged within the three strata with specific abilities at the lowest stratum and the *g* at the highest stratum (Keith & Reynolds, 2010).

Lastly, Wechsler (1958) defined intelligence as the ability to reason well, to act with purpose, and to effectively thrive in one's environment. Wechsler viewed intelligence in terms of one's performance not capacity. In other words, he believed that the ability to successfully adapt to one's environment is linked to how well one *uses* his or her intelligence, and not how much intelligence one has. Thus, the Wechsler scales (e.g., Wechsler Adult Intelligence Scale-Fourth Edition; Wechsler, 2008; Wechsler Intelligence Scale for Children- Fourth Edition; Wechsler, 2003) are designed to measure an individual's intellectual performance and adhere to the CHC theory (Keith & Reynolds, 2010). Specifically, the Wechsler intelligence scales measure cognitive abilities (e.g., Fluid intelligence and General Working Memory) that are based on the hierarchical CHC theory (Wechsler, 1958).

Most individually administered tests of intelligence (e.g., Wechsler scales) are based on the CHC theory or adhere to the theory (Keith & Reynolds, 2010). Furthermore, the *g* factor is

believed to represent the core of human intelligence (Gottfredson & Saklofske, 2009; Keith & Reynolds, 2010). Therefore, for the purposes of this study, high intelligence refers to children with high cognitive intelligence which can be measured through a standardized test of cognitive intelligence (Prifitera, Saklofske, & Weiss, 2008).

Relative to the abundance of literature on deficits and negative behaviours of children with ADHD, there is limited research on children with ADHD who also have high intellectual abilities or "giftedness." High intelligence can be defined as a Full Scale Intelligence Quotient (FSIQ) of equal to or greater than 120, representing approximately 10% of the population (Antshel, 2008b). Although high intelligence cutoffs vary, this definition is a commonly used benchmark in the intelligence literature (Antshel et al., 2007b).

Characteristics of Children with High Intelligence

Children with HI often have an unequal balance between advanced intellectual ability and an emotional level that has not developed to the same degree (Leroux & Levitt-Perlman, 2000). These children tend to have a heightened sense of self and are vulnerable to the self-knowledge that they are different from their peers; as a result, they may experience anxiety from self-criticism (Altman, 1983; Barber & Mueller, 2011). Difficulties may also occur when children with HI have a conceptual understanding of knowledge that they are not emotionally able to deal with (Leroux & Levitt-Perlman, 2000). Furthermore, these children may have uneven motor and intellectual development that can cause stress, which can lead to emotional outbursts and frustration (Leroux & Levitt-Perlman, 2000).

A common characteristic observed in HI children is over-excitabilities **(**Rinn & Reynolds, 2012**).** Over-excitabilities are the ways in which a person responds to a situation and allows one to take in and process larger amounts of stimulation from the environment (Gallagher, 1985).

Over-excitabilities have been characterized in five dimensions: psychomotor (e.g., excessive energy, rapid speech, and impulsivity), sensual (e.g., great pleasure in particular foods, sights, and sounds), intellectual (e.g., critical observation and use of theoretical analysis), imagination (e.g., detailed daydreams and use of imagery), and emotional (e.g., seeking physical comfort and attention from others; Rinn & Reynolds, 2012). The most dominant over-excitability will determine how a person responds to a situation (Rinn & Reynolds, 2012). For example, a highly emotional and intellectual child who has a school project due in a week may plan to complete a certain amount of work each day to complete the project by the due date. Although the child knows that he/she must finish the project, if asked by friends to go out and play, the child will impulsively go out because emotional (i.e. impulsivity) is his/hers most dominant over-excitability.

Researchers suggest that HI children tend to score higher than typically developing children on measures of emotional and intellectual over-excitabilities (Rinn & Reynolds, 2012). Specifically, HI children with intellectual over-excitabilities may interrupt and continually ask questions when interested in a topic. Furthermore, HI children often display high energy levels, experience emotional outbursts, and are highly emotional and sensitive. As with children who have ADHD, these behaviours may negatively impact HI children's social relationships (American Psychiatric Association, 2013; Leroux & Levitt-Perlman, 2000; Rinn & Reynolds, 2012).

At the present time, there is some controversy as to whether the relationship between HI and peer interactions is positive or negative. Indeed, some researchers (e.g., Cohen, Duncan, & Cohen, 1994) note that HI children tend to have strong peer relationships, while others report that this relationship tends to be negative (e.g., Morelock & Feldman, 2003 as cited in Kao,

2011). Although there is no clear resolution to this debate, strong arguments have been made for each side.

Cohen et al., (1994) report consistent findings that support the relationship between HI and positive peer acceptance and relations. Children who are considered "popular" tend to have good social skills, few behaviour problems, strong leadership skills, high academic success, and high self-esteem (Frentz, Gresham, & Elliott, 1991; Jackson & Bracken, 1998; Kennedy, 1990). Bain and Bell (2004) report that these characteristics are often noticed in individuals who have high intelligence. For example, Cohen et al., (1994) examined peer relations of HI students (grades 4-6) enrolled in a pull-out academic enrichment program. Compared to other classmates, children in the enrichment program were categorized more often as being popular and less often as being rejected by peers, received fewer dislike ratings, and were evaluated as higher in social preference and greater social competence. These findings suggest that there may be a positive association between intelligence and peer relations. In accordance with these findings, Rimm (2002) suggests that children with HI may actually be more popular than their peers (as cited in Bain & Bell, 2004).

In addition, Bain and Bell (2004) examined peer relationships based on teacher judgments. No significant differences were found between students identified as having HI and the comparison group (high achievers not identified as gifted or HI) on the teacher rating of peer relationships. However the group identified as having HI scored higher than the comparison group on social success and lower on the attributes for social failure. These results suggest that these children with HI appear to be functioning in a way that promotes positive social interactions.

In contrast, some studies suggest that HI individuals are more susceptible to social difficulties (e.g., Solano, 1987). For example, Brody and Benbow (1986) claimed that HI students rated themselves as being less popular than their peers, while other more recent studies claim that HI adolescents tend to report feeling "different" from their peers (Hertzog, 2003; Adams-Byers, Whitsell, & Moon, 2004). Students who feel different from their peers may develop positive coping strategies (e.g., using talents to help others) to help feel that they fit in, while others may develop negative coping strategies (e.g., avoiding social situations that may require them to use their talents) that may result in more negative social interactions (e.g., feeling that they're unable to relate to others in general; Swiatek, 1995). Furthermore, these children may feel more comfortable forming social relationships with adults compared to same-age peers (Barber & Mueller, 2011). Rimm (2002) suggests that HI students are more likely to seek out social supports from older students and adults with whom they feel they have more in common when compared to typically developing children.

Based on the literature, it is apparent that HI children and children with ADHD have several similar difficulties and characteristics (Leroux & Levitt-Perlman, 2000; Rinn & Reynolds, 2012). For example, both groups of children tend to have high energy levels, experience emotional outbursts (Leroux & Levitt-Perlman, 2000; Rinn & Reynolds, 2012), and may experience social difficulties (Morelock & Feldman, 2003 as cited in Kao, 2011; Solano, 1987; Swiatek, 1995). These difficulties may be further exasperated with the coexistence of HI and ADHD traits and characteristics.

Twice-Exceptional Children

Individuals who have high areas of intellectual ability and are diagnosed with a disability (e.g., HI and a learning disability) are often referred to as twice-exceptional (Barber & Mueller,

2011; Foley-Nicpon, Allmon, Sieck, & Stinson, 2011; Schultz, 2012). It is estimated that within the HI population, 20% of students may also meet the criteria for twice-exceptionality (Ziemann, 2009). These children face a number of challenges such as the susceptibility to academic difficulties, low self-esteem, peer rejection, disruptive behaviour disorders, and emotional difficulties (Cohen, et al., 1994; Leroux & Levitt-Perlman, 2000). For example, HI students with a learning disability often develop anxiety and fear of failure due to their high expectations for their academic achievement (Vespi & Yewchuk, 1992).

Although the majority of research on twice-exceptional populations focuses on individuals who have HI and a learning disability, there are a number of other twice-exceptional individuals who may have attention difficulties or other learning difficulties (Barber & Mueller, 2011). The current study investigated twice-exceptional children who were identified as HI and ADHD. Researchers suggest that for HI children, there is a greater likelihood of negative social outcomes (e.g., social isolation) when an ADHD diagnosis co-occurs (Mendaglio, 1995).

HI children and children with ADHD are believed to have similar social and emotional development (Mendaglio, 1995). Researchers suggest that having both HI and ADHD may result in maladaptive social and emotional behaviours and produce an increased sense of overreaction, anxiety, and peer rejection (Leroux & Levitt-Perlman, 2000). The social isolation that many children with HI experience combined with the peer rejection that many children with ADHD experience may contribute to feelings of alienation. This alienation may affect achievement and attitude toward school and self-esteem (Leroux & Levitt-Perlman, 2000). Furthermore, the emotional overreaction, irritable mood, and frustration associated with children who have ADHD in combination with the sensitivity associated with children with HI may cause self-centered and manipulative reactions (Mendaglio, 1995). Without acquiring the skills for

social and emotional development, these difficulties may become lifelong difficulties (Leroux & Levitt-Perlman, 2000).

Moon, Zentall, Grskovic, Hall, and Stormont (2001) conducted a multiple-case study (individual case, within group, and cross group) to examine the social and emotional characteristics of HI boys and HI boys with ADHD. Findings suggested that HI boys with ADHD had more difficulties with peer relationships, problems regulating their emotions, and and lived with stressed families. Furthermore, HI appeared to negatively affect the social and emotional difficulties commonly associated with ADHD.

Despite the association between ADHD and poor emotion regulation and social skills, not all children with HI and children with ADHD experience social and emotional difficulties (Lee, Lahey, Owens, & Hinshaw, 2008; Owens, Hinshaw, Lee, & Lahey, 2009). Many children are able to make and keep friends and are successful in many domains. Researchers have yet to investigate whether low levels of anxiety are a protective factor that moderates the risk for negative social outcomes in twice-exceptional children (HI children with ADHD).

The Present Study

The present study was conducted as part of a larger ongoing study of strengths and resilience in children with ADHD at the University of Calgary. The current study examined the relationship between anxiety and social skills in twice-exceptional children (children with high intelligence and ADHD). Specifically, the present study examined whether twice-exceptional children with low levels of anxiety would have higher social skill abilities than typical HI children, children with ADHD, and typically developing children with high levels of anxiety. The comparison groups were used to determine whether ADHD or HI moderates the relationship between anxiety and social skills in children. Understanding what protective factors (e.g.,

intelligence) allow children to be successful can aid in the ability to support children who are struggling to develop these skills, and can allow for early identification of children most vulnerable and at risk for negative outcomes (Rhee, Furlong, Turner, & Harari, 2001).

At the present time all literature review on the PsychInfo database identifies no previous research that has investigated the relationship between anxiety and social skills in HI children with ADHD. Therefore, the research questions and hypotheses stated for the current study are based on a review of the literature. The study aims to address the following questions:

1. What are the levels of anxiety and social skills in twice-exceptional children, children with ADHD, typical developing children with HI, and typically developing children? Are there differences in the level of anxiety and social skills between the four groups and between self and parent reports of anxiety and social skills?
2. Is there a moderating effect of anxiety on social skills and does this differ between twice-exceptional children, children with ADHD, typical children with HI, and typically developing children?

In relation to the first research question, twice-exceptional children and children with ADHD have been found to have significantly higher rates of anxiety and peer rejection when compared to typically developing children (Foley-Nicpon et al., 2012). In addition parents tend to rate their children as being less socially competent than their peers (Foley-Nicpon et al., 2012). Therefore, it is expected that twice-exceptional children will score higher on anxiety measure and have lower social competence than either typical children with HI, children with ADHD, and typically developing children.

Furthermore, previous research using the Social Skills Improvement System (Gresham & Elliot, 2008) has found inconsistencies between self and parent ratings of children with ADHD (Gresham, Elliott, Cook, Vance, & Kettler, R. 2010), possibly due to the positive illusory bias that often exists in children with ADHD (Foley-Nicpon et al., 2012; Owens et al., 2007). Thus, it is hypothesized that twice-exceptional children and children with ADHD will rate themselves as having lower levels of anxiety and higher social skills than their parents. Furthermore, it is hypothesized that twice-exceptional children and children with ADHD will rate themselves as having higher scores on anxiety and lower social competence than typical HI children and typically developing children.

In regards to the second research question, researchers suggest that anxiety may negatively impact social interactions in HI children and children with ADHD (Bowen et al., 2008; Fisak et al., 2011). In addition, having both HI and ADHD may result in an increased sense of anxiety and peer rejection (Leroux & Levitt-Perlman, 2000). In contrast, there is conflicting evidence on whether HI children have more difficulties making and keeping friends than typically developing children (Bowen et al., 2008; Fisak et al., 2011). Based on the extant literature, it is hypothesized that low anxiety levels will reduce the risk of poor social skill abilities in twice-exceptional children and children with ADHD more so than typical children with HI or typically developing children.

Chapter 2: Methods

Participants

The children who took part in the study were required to meet specific criteria to be eligible for participation. Inclusionary criteria for the children were determined through pre-screening interviews and assessment measures administered by researchers during the testing sessions. Children were included in the final sample if they had lived with their parents or guardians for at least the 5 past years to ensure that guardians could provide adequate descriptions of the family history. Children must have attended school full-time within an Alberta Education school district; homeschooled children were excluded from participation. In addition, children were included if they had no diagnosis of psychosis, Autism Spectrum Disorder or motor deficits. Lastly, participants' cognitive abilities had to fall within the Average range or higher (Full Scale Intelligence Quotient ≥ 85) to ensure that performances were not limited to low cognitive abilities as measured by the Wechsler Abbreviated Intelligence Scale of Intelligence (WASI; Wechsler, 1999).

Additionally, participants with ADHD had to meet specific criteria to be included in the study. Specifically, these participants must have received a previous diagnosis of ADHD from a psychologist or medical doctor (e.g., family physician or psychiatrist). In addition, they must have obtained a T-score of equal or greater than 70 (Very Elevated) on the *Diagnostic and Statistical Manual – 4th edition, text revision* (DSM-IV-TR, 2000) inattentive and hyperactive/impulsive scales on the Conners-3 Rating Scale on at least one scale from at least one parent or teacher informant. Lastly, to be identified as ADHD-C, children must have met on DSM-IV-TR symptom counts for ADHD criteria for both ADHD-H and ADHD-I.

The collaborative *Strengths in ADHD: Promoting Positives in Challenging Children* project recruited 105 families of children with ADHD and 26 families of typically-developing children. Eleven of the children with ADHD and four of the typically developing children were excluded from the total sample due to not meeting the required average full-scale IQ assessed by the WASI. For the purposes of the current study, participants were grouped based on FSIQ score into twice-exceptional (FSIQ $\geq$ 120), HI (FSIQ $\geq$ 120), ADHD (85 $\geq$ FSIQ $\leq$ 110), and typically-developing (85 $\geq$ FSIQ $\leq$ 110). One participant in the twice-exceptional group was identified as an extreme outlier and was excluded from the analysis to prevent skewing of the results.

The participants in the final sample included 15 twice-exceptional children who had received a previous diagnosis of ADHD-Combined Type. These participants were matched one-to-one with 15 typical children with HI, 15 children with ADHD, 15 typically-developing children based on age (+/- four months). Matching of participants helped to control for participant characteristics (e.g., ADHD subtype) and reduced possible bias from unknown confounders (Sisk, 2005). Information regarding participants' age and intelligence scores is provided in Table 2 and demographic information is outlined in Table 3.

Table 2

Age and Cognitive Characteristics of Participants by Group

	Twice-Exceptional		HI		ADHD		Typical	
Variable	*M (SD)*	Range	*M (SD)*	Range	*M (SD)*	Range	*M (SD)*	Range
Age (years)	9.20 (1.08)	8.00-11.70	9.73 (1.10)	8.00-11.11	9.27 (1.10)	8.00-11.11	9.40 (1.24)	8.00-11.11
WASI								
VIQ	122.53 (12.24)	105-144	125.53 (10.82)	108-143	103.13 (10.23)	85-127	108.67 (10.78)	92-132
PIQ	127.47 (12.21)	101-144	123.40 (10.53)	109-145	103.40 (6.99)	93-116	104.33 (10.17)	90-118
FSIQ	128.00 (8.00)	121-143	127.33 (7.79)	120-147	102.73 (5.33)	91-109	106.20 (3.95)	98-111

Notes. n = 15 for each group. *M*= mean. *SD* = standard deviation.

Table 3

Demographic Characteristics of Participants by Group

	Twice Exceptional		HI		ADHD		Typical	
	n	%	*n*	%	*n*	%	*n*	%
Gender								
Male	14	93%	11	73%	13	87%	11	73%
Female	1	7%	4	28%	2	13%	4	27%
Comorbidities								-
Learning Disability	1	7%	1	7%	2	13%	0	-
Anxiety	1	7%	0	-	1	7%	0	-
Oppositional Defiance Disorder	2	13%	0	-	2	13%	0	-
Language Disorder	1	7%	0	-	1	7%	0	-
Obsessive Compulsive Disorder	1	7%	0	-	0	-	0	-
Developmental Coordination Disorder	0	-	0	-	1	7%	0	-

Note. n = 15 for each group.

Measures

Parents and children completed a number of measures independently of one another that examined the children's abilities across a number of areas. The current study examined data

gathered through the administration of the WASI (Wechsler, 1999), Conners Rating Scale – 3rd edition (Conners, 2008), Behaviour Assessment System for Children- 2nd edition (Reynolds & Kamphaus, 2004), and the Social Skills Improvement System (Gresham & Elliot, 2008). These measures were used to determine inclusionary and exclusionary criteria and to provide the information needed to answer the specific research questions of this study.

Parent-report measures. Parents completed several parent rating measures to obtain information about the child's behaviour in the home environment as well as a demographic questionnaire to gather information regarding the child's developmental history and family make-up.

Conners Rating Scale – 3rd edition – Parent Form. The Conners Rating Scale – 3rd edition (Conners-3; Conners, 2008) was used to determine participants' eligibility to participate in the ADHD-C sample. This scale is a standardized assessment tool that used parent's observations to assess inattention, hyperactivity/impulsivity, peer relations, learning problems, and executive functions in their child's behaviour.

Psychometrically, the technical manual indicates that the Conners-3 (parent report) demonstrates strong reliability and validity estimates. Both internal consistency (.85 to .94) and test-retest reliability (.72 to .98) coefficients are within the acceptable range. The discriminant validity suggests that the measure is able to adequately identify children and youth with ADHD (77.61% accuracy) from those in the general population. Furthermore, the assessment identifies the most common co-morbid problems in children and the report provides a total score which is indicative of an attention or behavioral disorder (Conners, 2008).

Social Skills Improvement System – Parent Form. The Social Skills Improvement System (SSIS; Gresham & Elliott, 2008) is a standardized rating scale that aides in the

identification of negative behaviours that may interfere with the child's ability to acquire or perform specific social skills and assist in the development of interventions for students with social skill difficulties. The SSIS is a multi-rater scale that, for the purposes of this study, included ratings from both parents and students. The Social Skill composite is reported as a standard score (M= 100, SD= 15) and is comprised of seven subscales: Communication, Cooperation, Assertion, Empathy, Responsibility, Engagement, and Self-control. The scale also measures Academic Competence, which assesses Math Achievement, Reading Achievement, and Motivation to Learn. Lastly, it also measures Problem Behaviours that may impact the development of social skills, such as, Hyperactivity/Inattention, Externalizing, Internalizing, and Bullying. For the purposes of the current study the Social Skill composite score was used. Parents completed 46-items related to the Social Skill composite score and were required to provide ratings from: Never, Seldom, Often, to Almost Always on how his or her child performed on the target behaviour (e.g., "Starts conversations with peers").

The Social Skill composite on the SSIS- Parent report is reported to have adequate reliability and validity data with an internal consistency of .95. Across composite scores the test-retest correlations were reported to fall between .74 and .86. In terms of convergent validity, consistency has been found between similar composite scores among different versions of the SSIS (e.g., Parent and Student-report; Gresham & Elliot, 2008).

Behaviour Assessment System for Children – 2nd edition – Parent-Form. The Behaviour Assessment System for Children (BASC-2; Reynolds & Kamphaus, 2004) is a standardized scale developed to evaluate the aspects of behaviour of children and adolescents four to eighteen years of age. This scale can aid in the identification of clinical disorders that are common in childhood and adolescence. The scale assesses broad domains of Externalizing

Problems, Internalizing Problems, and Adaptive Skills. The scale is also comprised of specific subscales that measure clinical and adaptive functioning.

The Internalizing Problems domain examines if the child has elevated levels of anxiety, depression, and somatization. Anxiety levels will be specifically examined for this study. For example, T scores of 60 to 64 on this scale are in the at-risk range, and may indicate chronic distress, and T scores of 65 or higher are considered clinically significant and may indicate a more significant emotional or psychological distress. This domain includes items such as excessive worries, nervousness, fears, self-depreciation, and phobias. Parents completed 160 items related to the Internalizing Problems composite (e.g., "Worries about what other children think") and were required to provide ratings from: Never, Sometimes, Often, or Almost Always.

The BASC-2 (parent-report) demonstrates strong reliability and validity estimates. Furthermore, both internal consistency (.85 to .94) and test-retest reliability (.80s to .90s) coefficients are within the acceptable range (Reynolds & Kamphaus, 2004). Lastly, convergent and discriminant validity were demonstrated by assessing the correlation between BASC-2 scores and scores from other behaviour rating scales. The three measures compared to the BASC-2 included the original version of this measure, the Achenbach System of Empirically Based Assessment Child Behavior Checklist (Achenbach, 1991), and the Conners' Parent Rating Scale-Revised (Conners, 1997). Consistency was found between similar composite and subscale scores (correlations ranged from .70 to .90) among the three measures.

Child-report measures. In addition to the parent rating measures, child participants completed a number of assessment measures that assessed their cognitive abilities, social abilities, and anxiety levels.

Wechsler Abbreviated Intelligence Scale of Intelligence. The Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999) was used to assess the participant's cognitive abilities. The WASI is a brief standardized measure of intelligence designed to measure the intellectual functioning of individuals aged 6.0 to 89.11 years as compared to same-age peers. This intelligence measure is comprised of three composites: Verbal Intelligence Quotient (VIQ), Performance Intelligence Quotient (PIQ), and Full Scale Intelligence Quotient (FSIQ), derived from the combination of results from the four core subtests (Vocabulary, Block Design, Similarities, and Matrix Reasoning). The WASI was administered to determine eligibility to participate in the study (FSIQ $\geq$85) as well as distinguish those children with high cognitive capabilities (FSIQ $\geq$120).

The WASI has been found to demonstrate strong reliability and validity in estimating FSIQ in children within the general population, children with ADHD, as well as Canadian children (Saklofske, Caravan, & Schwartz, 2000). The IQ scores internal consistencies are high and range from .92 and .98 (Wechsler, 1999). Furthermore, the WASI exhibits a strong correlation with other measures that examine child cognitive abilities such as the Wechsler Intelligence Scale for children, 3rd edition (WISC-III; Wechsler, 1991). These correlations range from .76 to .87 for IQ scores, and .69 to .74 on subtests. Although the scale is normed on a United States population, a Canadian study that examined the validity of the WASI for use in Canadian populations supports the use of the measure as a measure of cognitive ability (intelligence) for Canadian individuals (Saklofske et al., 2000).

Social Skills Improvement System – Self-Report Form. The child participants also completed the SSIS (Student form), which provided self-reported social behaviour. Similar to the parent form, the Social Skill composite was used. Children completed 46-items related to the

Social Skill composite score and were required to choose ratings that ranged from: Not true, A Little True, A Lot True, or Very True on questions to determine how true each statement was for them (e.g., "I look at people when I talk to them").

The technical manual reports adequate reliability and validity for the SSIS-Student report. The internal consistency for the Social Skills composite is reported at .94, and the test-retest correlations fall between .58 and .80 across composite scores. In regards to convergent validity, consistency has been found between similar composite scores from different versions of the SSIS (e.g., parent and student-report; Gresham & Elliott, 2008).

Behaviour Assessment System for Children-2nd edition – Self-Report Form. The child participant also completed the BASC-2 self-report form to provide information on their anxiety levels. The same Internalizing composite and subscale (Anxiety) as the parent form was used. Specifically, the subscale measured excessive worry, oversensitivity, and generalized fears. The children completed 46 items related to the Internalizing composite score and rated either: Never, Sometimes, often, or Almost Always (e.g., "I worry about what is going to happen") to determine how true each statement is true for them. High scores on this scale may indicate bothersome or obsessive thoughts or dread. Similar to the parent Anxiety rating subscale, T scores of 60 to 64 are in the at-risk range and may indicate acute distress and T scores of 65 or higher are considered clinically significant which may indicate emotional or psychological distress.

Adequate reliability and validity scores were reported in the technical manual for the BASC-2-student report. In regards to internal consistency scores range from .80 to .90. Lastly, test-retest correlations were reported to fall between .70 to .80 across composite scores and .71 to .84 across subscale scores.

Procedure

Approval from the University of Calgary Conjoint Faculties Research Ethics Board was obtained for all aspects of this study. Information about the study was advertised throughout the Calgary community with permission and support from school boards, ADHD agencies, and child-friendly psycho-educational assessment clinics. Information was distributed via community newsletters, local media, brochures, and the study's website. Interested families contacted the researchers via email or phone and were provided with additional information about the study and participation requirements. Once verbal consent to participate was obtained, parents completed a phone-based pre-screener questionnaire that provided information on age, gender, grade, diagnoses specifications, and relevant demographic information. Children who met criteria were invited to participate in the study.

Testing sessions took place over two 3-hour sessions at the University of Calgary. Parking passes were provided to all families and participants were provided with refreshments. On day one, the researcher reviewed participatory consent to ensure that the parent/guardian and child understood the research project and what participation entailed. The consent process also included a voluntary option to be contacted for future follow-up data. Following the consent process, assessment measures were administered to the child in a random order. The WASI was administered on day one to determine if the child's cognitive abilities fell within the Average range or higher (FSIQ $\geq$85), as stated in the inclusionary criteria. For self-report scales, the researcher read the items to the child. During the child's assessment, the parent completed parent-rating scales and any incomplete scales were taken home and returned at the second session or were completed on day two. Lastly, as an acknowledgement of their participation,

families were given a $25 gift card (e.g., bookstore, restaurant, or movie theatre) and the child was able to select a small toy from a prize box after each session.

Chapter 3: Results

Levels of Anxiety and Social Skills

In regards to the first research question on the levels of anxiety measured by the BASC-2, results showed that, overall, twice-exceptional children (M = 48.33, SD = 9.84) and their parents (M = 55.87, SD = 8.77) and HI children (M = 45.67, SD = 7.90) and their parents (M = 52.60, SD = 9.42) reported average anxiety levels. Similarly, children with ADHD (M = 52.67, SD = 10.51) and their parents (M = 59.47, SD = 11.46) reported average anxiety levels. Lastly, typical children (M = 51.13, SD = 10.64) reported average anxiety levels and their parents (M = 46.00, SD = 9.16) reported below average anxiety. Mean scores and standard deviations for each group on the BASC-2 are provided in Table 4.

The first research question also addressed social skill abilities measured by the SSIS. Twice-exceptional children self-reported (M = 95.93, SD = 12.19) average social skill abilities. In comparison their parents reported below average social skills (M = 82.33, SD = 9.26). Lastly, HI children (M = 103.60, SD = 12.25) and their parents (M = 95.00, SD = 8.50), children with ADHD (M = 93.73, SD = 12.37) and their parents (M = 87.07, SD = 9.74), and typical children (M = 99.27, SD = 9.42) and their parents (M = 99.87, SD = 10.47) reported average social skills. Mean scores and standard deviations for each group on the SSIS are outlined in Table 4.

Table 4

Levels of Anxiety and Social Skills in all Groups

	Twice-Exceptional		HI		ADHD		Typical	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
BASC-2 Anxiety								
Self-report	48.33	9.84	45.67	7.90	52.67	10.51	51.13	10.64
Parent- report	55.87	8.77	52.60	9.42	59.47	11.46	46.00	9.16
SSIS Social Skills								
Self-report	95.93	12.19	103.60	12.25	93.73	12.37	99.27	9.42
Parent-report	82.33	9.26	95.00	8.50	87.07	9.74	99.87	10.47

Notes. n= 15 for all groups. For the BASC-2 M= mean of t-scores. For the SSIS M= standard scores. SD= standard deviation.

Group Differences in Parent and Self-Reported Anxiety and Social Skill Ratings

To answer the second part of the first research question, a series of one-way Analysis of Variance (ANOVA) were conducted to examine whether or not the level of anxiety and social skill abilities differed between groups as reported by the child and parent. These analyses were planned a priori, therefore Bonferroni corrections were applied to all one-way ANOVA to reduce the likelihood of Type 1 Error (rejecting the null hypotheses when it is true) due to multiple comparisons. The critical p-value of equal or less than .0083 ($\alpha = .05/6$) were considered significant.

A one-way ANOVA indicated no significant difference in self-reported anxiety levels observed between groups, $F(3,56) = 1.48$, $p = .23$. After conducting a one-way ANOVA and considering necessary Bonferroni corrections, there was still no significant differences in self-reported anxiety levels between twice-exceptional children ($M = 48.33$, $SD = 9.84$) and HI children ($M = 45.67$, $SD = 7.90$; $p = 1.00$), between twice-exceptional children ($M = 48.33$, $SD = 9.84$) and children with ADHD anxiety levels ($M = 52.67$, $SD = 10.51$; $p = 1.00$), and between twice-exceptional children ($M = 48.33$, $SD = 9.84$) and typical children ($M = 51.13$, $SD = 10.64$; $p = 1.00$). Results also indicated no significant differences on self-reported anxiety levels

between HI children (M = 45.67, SD = 7.90) and typically developing children (M = 51.13, SD = 10.64; p = .81), between HI children (M = 45.67, SD = 7.90) and children with ADHD anxiety levels (M= 52.67; p = .34), and between children with ADHD and typical children anxiety levels (M = 51.13, SD = 10.64; p = 1.00).

Similarly, a one-way ANOVA indicated no significant difference between self-reported social skill abilities observed between groups, $F(3,56) = 1.21$, p = .32. Again, there were still no significant differences in self-reported social skills after a one-way AONVA with Bonferroni corrections. Results indicated no significant differences in self-reported social skill abilities between twice-exceptional children (M = 82.33, SD = 9.26) and HI children (M = 95.00, SD = 8.50; p = 1.00), between twice-exceptional children (M = 82.33, SD = 9.26) and children with ADHD (M = 93.73, SD = 12.37; p = 1.00), and between twice-exceptional children (M = 82.33, SD = 9.26) and typical children (M = 99.27, SD = 9.42; p = 1.00) social skill abilities. In addition, there were no significant differences on self-reported social skills between HI children (M = 95.00, SD = 8.50) and typically developing children (M = 99.27, SD = 9.42; p = 1.00), between HI children (M = 95.00, SD = 8.50) and children with ADHD (M = 93.73, SD = 12.37; p = .48), and between children with ADHD (M = 93.73, SD = 12.37) and typical children (M = 99.27, SD = 9.42; p = 1.00) social skill abilities.

In comparison, a one-way ANOVA indicated a significant difference in parent-reported child anxiety levels observed between groups, $F(3, 56) = 5.16$, $p < .05$. A one-way ANOVA with a Bonferroni correction further indicated a significant difference between parent-reports of their child's anxiety. Specifically, results indicated that ADHD parent-reports of anxiety (M = 59.47, SD = 11.46) were significantly ($p < .0083$) higher than typical parent-reports (M =46.00, SD = 9.16) of their child's anxiety. However, there were no significant differences between

twice-exceptional parent-reports of their child's anxiety (M = 55.87, SD = 8.77) and typical parent-reports of their child's anxiety levels (M =46.00, SD = 9.16; p = .05), between twice-exceptional parent-reports (M = 55.87, SD = 8.77) and HI parent-reports (M = 52.60, SD = 9.42; p = 1.00) of anxiety levels, and between twice-exceptional parent-reports (M = 55.87, SD = 8.77) and ADHD parent-reports (M = 59.47, SD = 11.46; p =1.00) of their children's anxiety levels. Furthermore, there were no significant differences between HI parent-reports M = 52.60, SD = 9.42) and typical parent-reports of their children's anxiety levels (M =46.00, SD = 9.16; p = .42), and between HI parent-reports (M = 52.60, SD = 9.42) and ADHD parent-reports on their children's anxiety levels (M = 59.47, SD = 11.46; p = .42).

Lastly, a one-way ANOVA indicated a significant difference between parent-reported children's social skill abilities observed between groups, $F(3, 56) = 4.21$, p = .05. However, after conducting a one-way ANOVA with a Bonferroni correction, results indicated no significant differences between parent-reports of their child's social skill abilities observed between groups. There were no significant differences between twice-exceptional parent-reports (M = 82.33, SD = 16.26) and typical parent-reports of their child's social skill abilities (M = 99.87, SD = 10.47; p = .01), between twice-exceptional parent-reports (M = 82.33, SD = 16.26) and HI parent-reports (M = 95.00, SD = 8.50) on their child's social skill abilities (p = .14), and between twice-exceptional parent-reports (M = 82.33, SD = 16.26) and ADHD parent-reports (M = 87.07, SD = 9.74) on their child's social skill abilities (p = 1.00). There were no significant differences between HI parent-reports (M = 95.00, SD = 8.50) and typical parent-reports (M = 99.87, SD = 10.47; p = 1.00), and between HI parent-reports (M = 95.00, SD = 8.50) and ADHD parent-reports (M = 87.07, SD = 9.74) of their child's social skill abilities (p = .89). Results also

indicated no significant difference between ADHD parent-reports (M = 87.07, SD = 9.74) and typical parent-reports (M = 99.87, SD = 10.47) on their child's social skill abilities (p = .13).

Parent and Self-Reports on Anxiety and Social Skills

To examine whether or not there were differences between parent and self-reports, parent and self-reports of anxiety and social skills were compared using paired samples t-tests. Twice-exceptional children's self-reports (M = 48.33, SD = 9.84) of anxiety were significantly lower than their parent-reports (M = 55.87, SD = 8.77) of anxiety levels (t(14)= -3.94, p < .05). Similarly, there were significant differences between HI self-reports (M = 45.67, SD = 7.90) and HI parent-reports (M = 52.60, SD = 9.42) of child anxiety levels (t(14)= -2.36, p < .05). In contrast, ADHD self-reports (M = 52.67, SD = 10.51) were trending towards significantly lower than their parent-reports (M = 59.47, SD = 11.46) of child anxiety levels (t(14)= -1.84, p = .09), but did not reach the .05 level of significant. There were no significant differences between typical self-reports (M = 51.13, SD = 10.64) and typical parent-reports (M = 46.00, SD = 9.16) of child anxiety levels (t(14)= 1.20, p = .25).

In regards to differences between parent and self-reports of social skill abilities, there was no significant difference between ADHD self-reports (M = 93.73, SD = 12.37) and ADHD parent-reports (M = 87.07, SD = 9.74) on child social skill abilities (t(14)= -1.26, p = .23). Similarly, no significant differences were observed between typical self-reports (M = 99.27, SD = 9.42) and typical parent-reports (M = 99.87, SD = 10.47) on child social skill abilities (t(14)= .17, p = .87), and between HI self-reports (M = 103.60, SD = 12.25) and parent-reports (M = 99.87, SD = 10.47) on child social skill abilities (t(14)= -1.50, p = .16). In contrast, twice-exceptional self-reports (M = 95.93, SD = 12.19) were significantly higher than their parent-reports (M = 82.33, SD = 9.26) of child social skill abilities (t(14)= -2.50, p < .05).

Relationship between Anxiety and Social Skills

In regards to the second research question, four Pearson correlations were conducted to investigate the relationship between anxiety and social skills. Correlations are provided in Table 5. Interestingly, no significant relationships were found between child anxiety and social skills as rated by both children with ADHD ($r(13) = .35$, $p = .20$) and their parents ($r(13) = -.06$, $p = .84$), and typical children ($r(13) = -.23$, $p = .41$) and their parents ($r(13) = -.40$, $p = .14$). However, twice-exceptional children's anxiety and social skills ratings showed a strong, negative, statistically significant relationship ($r(13) = -.60$, $p < .05$). Similarly, high intelligent children's anxiety and social skills ratings showed a strong, negative, statistically significant relationship ($r(13) = -.51$, $p < .05$).

Table 5

Correlation between Anxiety and Social Skills for all Groups

Group and Measure	1	2	3	4
Twice-Exceptional				
1. BASC-2 Anxiety Self-Report	-			
2. SSIS Parent-Report Social Skills	-.19	-		
3. BASC-2 Parent- Report Anxiety	.65**	-.41	-	
4. SSIS Self-Report Social Skills	-.60*	-.02	-.27	-
High Intelligence				
1. BASC-2 Anxiety Self-Report	-			
2. SSIS Parent-Report Social Skills	-.04	-		
3. BASC-2 Parent- Report Anxiety	.14	.00	-	
4. SSIS Self-Report Social Skills	-.51*	-.17	.13	-
ADHD				
1. BASC-2 Anxiety Self-Report	-			
2. SSIS Parent-Report Social Skills	.08	-		
3. BASC-2 Parent- Report Anxiety	.15	-.06	-	
4. SSIS Self-Report Social Skills	.35	.33	.30	-
Typical				
1. BASC-2 Anxiety Self-Report	-			
2. SSIS Parent-Report Social Skills	-.10	-		
3. BASC-2 Parent- Report Anxiety	-.25	-.40	-	
4. SSIS Self-Report Social Skills	-.23	-.45	-.36	-

Note. $n = 15$ for each group.
*Significant at .05 level; **Significant at .01 level.

Furthermore, four hierarchical multiple regressions were conducted to examine whether anxiety predicted social skills abilities, after controlling for gender and ODD diagnoses. Specifically, gender and ODD was controlled for in twice-exceptional and ADHD regressions and only gender was controlled for in HI and typical regressions. Gender and ODD diagnosis were controlled for due to evidence that gender may influence a child's social functioning (Kao, 2011; Mikami et al., 2010) and the coexistence of ADHD and ODD has been found to increase the risk of negative social functioning (Reis & McCoach, 2002).

For the purpose of these analyses ODD was dichotomized and dummy coded (No ODD = 0; ODD =1). The twice-exceptional and ADHD regressions involved entering the dummy-coded ODD at Step 1. Table 6 presents results of the regression analyses for the four groups.

Table 6

Hierarchal Multiple Regression Analysis of Anxiety in Predicting Social Skills

Group and Step	Independent Variables	R^2	B	*SE*	*β*	*t*
Twice-exceptional						
Step 1		.11				
	Gender		-16.50	14.01	-.323	-1.18
	ODD		-3.50	10.28	-.093	-.34
Step 2		.39*				
	Gender		-6.26	12.92	-.12	-.49
	ODD		-5.97	8.95	-.16	-.67
	Anxiety		-.85	.38	-.57	-2.26
High Intelligence						
Step 1		.01				
	Gender		1.91	7.4	.07	.258
Step 2		.28				
	Gender		2.83	6.59	.43	.43
	Anxiety		-.81	.38	-2.12	-2.12
ADHD						
Step 1		.11				
	Gender		.32	16.00	.01	.02
	ODD		-18.68	16.00	-.32	-1.17
Step 2		.17				
	Gender		-1.25	16.17	-.02	-.08
	ODD		-13.61	16.98	-.24	-.80
	Anxiety		.53	.57	.27	.93
Typical						
Step 1		.15				
	Gender		11.23	7.51	.38	1.49
Step 2		.22				
	Gender		12.15	7.51	.41	1.62
	Anxiety		-.32	.30	-.28	-1.08

Notes. n = 15 per group. *SE* = Standard Error.
*Significant at .05 level

Twice-exceptional children. In the first step of the hierarchical multiple regression, two predictors were entered: gender and ODD. This model was not statistically significantly, however, with the addition of anxiety at Step 2, the model as a whole reached significance, $F(3, 11) = 2.34$, $p < .05$, and explained 39% of the variance in social skill abilities. The introduction of anxiety significantly explained an additional 28% of the variance in social skill abilities, after

controlling for gender and ODD (ΔR^2 = .28; F(2, 12) = 5.09; p < .05). In the final model, anxiety was the only predictor that was statistically significant (β = -.57, p < .05), whereas gender and ODD were not significant predictors of social skills in twice-exceptional children.

High intelligent children. Gender was entered as the first step of the hierarchical multiple regression (no participants had an ODD diagnosis). This model was not statistically significant. After entry of anxiety at Step 2, the total variance explained by the model as a whole was 28%, F(2, 12) = 2.28, p = .16. Anxiety explained an additional 27% of the variance in social skill abilities, after controlling for gender (ΔR^2 = .27; F(1, 12) = 4.47, p = .06). In contrast to the twice-exceptional group, both anxiety and gender were not significantly predictive of social skills in HI children.

Children with ADHD. As with the twice-exceptional regression, two predictors were entered at Step 1: gender and ODD. This model was not significantly significant. Once anxiety was entered at Step 2 the total variance explained by the model as a whole was 17%. Anxiety explained an additional 7% of the variance in social skill abilities after controlling for gender and ODD. However, anxiety, gender, and ODD did not significantly predict social skills in children with ADHD.

Typically developing children. For the final hierarchical multiple regression, gender was entered at Step 1 (no participants had an ODD diagnosis). This model was not significant; however, after the entry of anxiety at Step 2 the total variance explained by the model as a whole was 22%, but still did not reach significance. Therefore, gender and anxiety were not significant predictors of social skills in typically developing children.

Chapter 4: Discussion

The current study was completed as part of a larger research project focusing on resilience in children with ADHD and their families. The purpose of the current study was to explore the possible relationship between anxiety and social skills in high intelligent children with ADHD. There has been an increased focus on the examination of resilience in children. As a result, an interest in understanding protective factors in children with ADHD has grown. HI has been identified as a protective factor against some secondary symptoms in children with ADHD (Antshel, 2008). However, HI children have also been found to be at greater risk for developing anxiety (Altman, 1983; Barber & Mueller, 2011). Although anxiety is commonly observed in both children with ADHD and twice-exceptional children, it is unclear how anxiety may affect social skill abilities in twice-exceptional children. Overall, results of the current study suggest that HI may not be protective against the development of anxiety and poor social skills in children with ADHD. In addition, these results provide important implications for further research into the relation between anxiety and social skills within this at-risk population.

Based on a review of previous research, several hypotheses were formulated for the current study. Although some results were inconsistent with these hypotheses, some interesting findings were observed. A summary and interpretation of the results are discussed in the following sections.

Levels of Anxiety and Social Skills

Hypotheses one stated that twice-exceptional children would rate themselves as having significantly higher rates of anxiety and poorer social skills compared to HI children, children with ADHD, and typically-developing children. Some researchers suggest that twice-exceptional children and children with ADHD are more susceptible to emotional disorders such

as anxiety and peer rejections when compared to typically-developing children (e.g., Fisak et al., 2011; Foley-Nicpon et al., 2012). The results of the current study are inconsistent with these findings as twice-exceptional children rated themselves as having similar anxiety levels and social skills to HI children, children with ADHD, and typically-developing children. Specifically, both twice-exceptional and HI children and their parents reported average anxiety levels. These results further extend the literature suggesting that some children with HI have positive peer relationships (e.g., Cohen et al., 1994).

However, it is important to note that twice-exceptional parents reported below average social skill abilities in their children. This finding could be related to the over-excitability traits that are characteristic of individuals with over-excitabilities (Rinn & Reynolds, 2012). Specifically, HI children with emotional or intellectual over-excitabilities are often highly emotional and sensitive, display high energy levels, and may interrupt others (Rinn & Reynolds, 2012). These emotional or behavioural immaturities may negatively impact their social relationships (e.g., American Psychiatric Association, 2013; Leroux & Levitt-Perlman, 2000). Although over-excitabilities were not measured directly in this study, the relationship between over-excitabilities and social skills in children with HI and ADHD warrants future investigation.

Alternatively, twice-exceptional parent reports of below average social skills in their children could be related to the combination of having both HI and ADHD which may result in maladaptive social behavior. This combination may also produce an increased sense of overreaction and lead to peer rejection (Leroux & Levitt-Perlman, 2000). In addition, the irritable mood and frustration associated with children with ADHD in combination with the sensitivity associated with children with HI may cause self-centered reactions thus leading to poor social outcomes (Mendaglio, 1995).

Furthermore, children with ADHD reported average levels ofanxiety and social skills. These findings are somewhat unexpected given the highly documented reports of peer difficulties and internalizing disorders often experienced by children with ADHD (e.g., Jensen et al., 1997; Leroux & Levitt-Perlman, 2000). For children with ADHD, their average reports of anxiety and social skill abilities may be related to the relationship between anxiety and disruptive behaviours. Anxiety, in general, may reduce disruptive behaviours that would otherwise be present in children with ADHD, thus the potential influence of anxiety on social skill abilities may be moderated in children with ADHD (Antshel, 2008). Also, specific parenting practices have been linked to social functioning in children with ADHD and typically-developing children. Specifically, positive factors such as parental warmth have been found to show higher levels of peer acceptance and social skills and lower aggressive behaviour (Clark & Ladd, 2000).

For twice-exceptional children and children with HI their similar ratings to children with ADHD and typically-developing children may be related to being exposed to proper modelling of behaviour and parental influences that may help prevent them from developing maladaptive social skills and further development of anxiety (Mikami, Jack, Emeh, & Stephens, 2010). For twice-exceptional children and children with ADHD, interventions could also have great success in improving their appropriate behaviour in peer situations (Mikami, 2010). For example, stimulant medication for children with ADHD and the combination of behavioural management techniques may reduce intrusive and disruptive behaviours with peers (Chronis, Jones, & Raggi, 2006). As a result of intervention treatments, parents may rate their child's social skills as improved thus rating average social skill abilities (Klein & Abikoff, 1997). Alternatively, having a supportive school environment can have an impact on HI intelligent individuals' social and emotional outcomes (Vialle, Heaven, & Ciarrochi (2007). Specifically, children with HI may

have several opportunities to engage in competition to use and strengthen their social skill abilities (Udvari & Schneider, 2000). These authors also suggest that being task-oriented is related to less negative social interactions in HI children.

The non-significant differences observed between the four groups in regards to their anxiety and social skills, may be related to the presence of a positive illusory bias (PIB) in twice-exceptional children and children with ADHD. Previous research findings have indicated that children with ADHD have a PIB, meaning they are less aware of their areas of weakness, and less able to recognize where their difficulties lay (Foley-Nicpon et al., 2012; Owens et al., 2007). As a result, a child's perception of their own performance may be significantly higher than their actual performance as rated by their parents (Owen et al., 2007); thus, the comparable levels of anxiety and social skills may be related to the differing levels of perceptions between twice-exceptional children and children with ADHD.

A PIB may have impacted twice-exceptional children and children with ADHD self-reports' of anxiety levels. These children rated themselves significantly lower than their parent-reports of anxiety levels. Interestingly, there were no significant differences between ADHD self-reports and ADHD parent-reports on social skill abilities. Given the findings of previous research examining the presence of PIB in children with ADHD, this non-significant finding was unexpected. This finding may be related to the children's parent's own social competence (Mikami et al., 2010). For example, previous research on friendships of children with ADHD has found that parental behaviours such as social competence and opportunities to interact with other children may have a positive effect on a child's development of social skills (Mikami et al., 2010). Friendships provide children with opportunities to develop patience and empathy and learn to resolve conflicts, thus reducing the risk for negative social interactions (Hartup &

Stevens, 1997; Ladd, Kochenderfer, & Colemann, 1996). Although friendships were not measured directly in this study, the relationship between anxiety, social skills, and friendships in children with HI and ADHD warrants further research.

As expected, twice-exceptional children rated themselves significantly higher than their parents in terms of their social skill abilities. This finding is in accordance with previous research that indicates that children with ADHD tend to overestimate their social skills abilities and rate themselves as being as socially competent as their peers (Foley-Nicpon et al., 2012). Furthermore, parents are more likely to rate their children with ADHD as being less socially competent than their typically-developing peers (Foley-Nicpon et al., 2012).

Similar to twice-exceptional children, HI children rated themselves significantly lower than their parent-reports of anxiety levels; however, there were no significant differences between HI self and HI parent-reports in regards to their social skills. As expected there were no significant differences between typical self-reports and typical parent-reports of children's anxiety levels. Some researchers suggest that HI children are no more susceptible to emotional or social vulnerabilities than the general population (e.g., Bain & Bell, 2004; Cohen et al., 1994). These findings could be related to HI children having opportunities to pursue areas of interests and having pride in their accomplishments; thus leading to confidence in their abilities (Leroux & Levitt-Perlman, 2000). In addition, being exposed to flexible environments in which they are able to thrive and have their social and emotional needs met, can aid in adaptive social and emotional development in HI children (Leroux & Levitt-Perlman, 2000).

Lastly, there was a significant difference between ADHD parent and typical parent-reports of child' anxiety levels. However, there were no significant differences between twice-exceptional parent and typical parent-reports of child anxiety levels, between twice-exceptional

parent and HI parent-reports on child anxiety, between twice-exceptional parents and ADHD parent-reports on child anxiety, and between HI parent and ADHD parent-reports on child anxiety. Similarly, there were no significant differences between the other parent-reports of social skill abilities. The similar parent-reports of child anxiety levels and social skills could be related to the similar characteristics and traits shared between children with ADHD and HI children (Mendaglio, 1995). Researchers suggest that HI children and children with ADHD have similar social and emotional development (Mendaglio, 1995); therefore parents of children with ADHD and parents of children with HI may have similar perceptions of their child's anxiety levels and social skill abilities.

Relationship between Anxiety and Social Skills

Hypotheses two was based on the previous research findings suggesting possible links between anxiety and social skills in HI children and children with ADHD (e.g., Bowen et al., 2008; Fisak et al., 2011; Leroux & Levitt-Perlman, 2000). Researchers suggest that anxiety may negatively impact social interactions in HI children and children with ADHD (Bowen et al., 2008; Fisak et al., 2011). In addition, having both HI and ADHD may result in an increased sense of anxiety and peer rejection (Leroux & Levitt-Perlman, 2000).

Given the findings of previous research, it was predicted that low anxiety levels would reduce the risk of poor social skill abilities in twice-exceptional children and children with ADHD more so than typical children with HI and typically developing children. This hypothesis was not completely supported by the present research findings, with no significant relationship between anxiety and social skills for children with ADHD and typically-developing children and with anxiety not being a significant predictor of social skill abilities for these children. There was however, a negative relationship between anxiety and social skills for both twice-

exceptional children and HI children. In contrast to the children with ADHD and HI, anxiety was a statistically significant predictor of twice-exceptional children's social skill abilities. This suggests that as twice-exceptional children's and HI children's anxiety levels increase, their social competency decreases and vice versa. Collectively, these initial results suggest that the effect of anxiety on social skills may be stronger for children with HI and ADHD than for children with just ADHD or HI.

Although the results of this study did not show significant differences between levels of anxiety and social skills, it did offer additional evidence to support the relationship between anxiety and positive peer relationship in children with HI. Furthermore, results added to the literature on the presence of the PIB in twice-exceptional children and children with ADHD. Lastly, evidence that anxiety may be a predictor of social skill abilities in twice-exceptional children may have important implications for practice and future research.

Implications and Future Directions

As the presence of anxiety in twice-exceptional children may be predictive of future maladaptive social skills, it is important for parents and teachers to be aware of the early warning symptoms of anxiety. Early identification and or early prevention strategies can increase a child's social skills and possibly minimize the risk for anxiety in the future (Bain & Bell, 2004; Mikami, 2010). A major drawback however, is the lack of research on interventions that address a child's high intellectual ability as well as their disability (Crim, Hawkins, Ruban & Johnson, 2008).

For twice-exceptional children, there is a lack of research on whether HI affects treatments that are typically effective for children with ADHD. For example, it is unknown whether medication intervention and social/emotional skills training for children with ADHD are

as effective for twice-exceptional children with HI and ADHD (Antshel et al., 2008b; Leroux & Levitt-Perlman, 2000). Therefore, it is imperative that researchers and educators work together to develop and evaluate programs that are designed specifically for twice-exceptional children. These programs should focus on the strengths of these children and encourage social interactions with peers to further develop their social competence (Foley-Nicpon et al., 2012). In addition, twice-exceptional children should be provided with opportunities at home and through extracurricular activities to use their high abilities (Foley-Nicpon et al., 2012).

Additionally, it is important to note that parents can have a crucial rule in the development of their child's social skills (Mikami, 2010). As previously mentioned, parents can have a positive effect on a child's development of social skills by arranging opportunities to socialize with other children (Mikami et al., 2010). Furthermore, parents can assist in their children making friends by providing instruction for what constitutes appropriate behaviours when interacting with other children (Mikami et al., 2010). Researchers have suggested that friendships may reduce the risk for subsequent internalizing problems (Hoza 2007; Oh et al., 2008; Pedersen, Vitaro, Barker, & Borge, 2007). Therefore, parent-supported positive modeling of social relationships, opportunities for social interaction, and support for social difficulties may be particularly important for these children.

Another implication that is important to take into consideration is the parent and self-reports of children with ADHD. Not all children with ADHD were found to have high anxiety levels or below average social skills, but instead, most fell within the average range. Although 'average' is not usually interpreted as strength, it is important to recognize 'average' in an at-risk population. From a strengths-based perspective, the results further support the literature that not

all children with ADHD have poor social skills or high anxiety levels and suggest that there may be other factors that are promoting resilience within these children.

Limitations

There are a number of limitations in the current study that should be considered in the interpretations and implications of the current study's findings. Firstly, the small sample size (*n*= 15 per group) of this study may have restricted generalizability and the robustness of the current study's findings. Increasing the sample size may have increased the variability of the sample thus revealing relationships not found in the current study. Expanding the current study may also help control for the other known confounding variables such as comorbidity. Although ODD was controlled for, there was several other co-occurring conditions reported by both parents of twice-exceptional children and children with ADHD (Table 3) that may have impacted findings; however, high occurrences of comorbid disorders are not atypical for children with ADHD (Barkley, 2006).

In relation to the generalizability of the results, it is important to note that for the purposes of this study only twice-exceptional children (HI with ADHD) and typically-developing children with HI were used, not other forms of "giftedness" (e.g., creativity, musically). Therefore, the results of the current study do not generalize to other children with ADHD that have different areas of "giftedness." These children could have different levels of anxiety and social skill abilities than this studies current sample of HI children with ADHD and typically developing HI children. Understanding children with different areas of "giftedness" can aid in the development of interventions that are designed specifically for their needs.

A second important limitation is the reliance on self-report measures. Children, especially those with ADHD, may be unable to reflect on themselves in an unbiased fashion and

have limited personal insight (Owens et al., 2007). Although all measures were deemed reliable and valid, PIB in children with ADHD may slightly decrease the reliability of self-report measures. The use of another means of measurement and parent and/or teacher reports alongside the self-report measures may help minimize the PIB within this population.

A third limitation to note is the amount of commitment made by participating families. The time spent completing parent questionnaires and time spent on campus during the child assessments may have deterred some families from participating. Furthermore, this time commitment may have biased the sample, in that only families with transportation to and from assessment sessions and regular schedules could take part. Although this commitment was necessary in order to attain a specific clinical sample, it may be viewed as a limitation.

In addition, socioeconomic status (SES) may have biased sampling. Specifically, within resilience models, high SES has been identified as a protective factor that can promote resilience within at risk populations (Masten, 2001). In contrast, low SES can act as a significant risk factor for poor outcomes across domains (Masten, 2001). SES is associated with intellectual competence and parental education (Bradley & Corwyn, 2001). Previous research findings have consistently found that high parental education is associated with higher IQ in childhood (e.g., Alexander, Entwisle, & Dauber, 1993; Zill, Moore, Smith, Stief, & Coiro, 1995). Researchers have also suggested that SES, specifically, income, education, and occupation, is associated with better parenting which in turn can affect school achievement through school behaviour and skill-building activities (DeGarmo, Forgatch, & Martinez, 1999). For families with low SES they may have less access to stimulating resources and experiences which may negatively affect their social and emotional development (Evans, Maxwell, & Hart, 1999). Although SES was not

measured directly in this study, it is important to take it into consideration when interpreting and generalizing the current studies results.

Another limitation is the lack of a third rater. Teacher information was sought from all participating children; however, due to limited teacher response rate, there was not enough data to be included in the current study. Children spend a large amount of their time in school; therefore, obtaining information from both the participating families and teachers may also assist in findings being more informative and robust across different settings. Alternatively, obtaining teacher-reports may reduce bias within families as parents may rate their child more positively. Furthermore, teachers may have a more accurate picture of the children's social skills abilities as they have other students to compare to.

Lastly, the cross-sectional design of this study prevents determination of the directionality between anxiety and social skill abilities. Longitudinal research would be beneficial in further understanding this relationship; particularly whether anxiety can predict later social competence during adolescence when internalizing problems may become more prevalent (Mikami, 2010). This study, however, provides the initial exploration into the understanding of the relationship between anxiety and social skills in HI children with ADHD. The current results are hoped to entice further exploration into the potential influences it may have for this population.

Conclusions

In summary, this study is one of a few existing investigations into resilience factors within HI children with ADHD. Although the current findings must take into account the study's limitations, the current results provide initial support for anxiety being a predictor for social skill abilities in twice-exceptional children. Understanding the risk and protective of

factors that are influential for twice-exceptional children will add to our understanding of these children. While there were no significant relationships found between anxiety and social skills in children with ADHD, the results provide further support that not all children with ADHD experience social and emotional difficulties and that there are many protective factors that can influence a child's outcomes.

Due to the preliminary nature of the current study, further research within the field of anxiety and social skills in HI children with ADHD should be continued, specifically, longitudinal research to aid in the understanding of this relationship. Continuing strength-based research will aid in the development of intervention and prevention strategies for both twice-exceptional children and HI children and their families. It is also important to explore strength based areas in children with HI that may assist them in reaching their full potential. Lastly, it can help at-risk children become resilient and well-adjusted throughout adolescence and into adulthood (Rhee et al., 2001).

References

Achenbach, T. M. (1991). Manual for the Child Behaviour Checklist/4-18 and 1991 Profile. Burlington, VT: University of Vermont, Department of Psychiatry.

Adams-Byers, J., Whitsell, S. S., & Moon, S. M. (2004). Gifted students' perceptions of the academic and social/emotional effects of homogeneous and heterogeneous grouping. *Gifted Child Quarterly, 48,* 7–20. doi: 10.1177/001698620404800102

Alexander, K. L., Entwisle, D. R., & Dauber, S. L. (1993). First-grade behavior: its short- and long-term consequences for school performance. *Child Development, 64,*801–14. doi: 10.2307/1131219

Altman, R. (1983). Social-emotional development of gifted children and adolescents: A research model. *Roeper Review, 6,* 65-68. doi: 10.1080/02783198309552757

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: American Psychiatric Association.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th edition). Washington, DC: American Psychiatric Association.

Antshel, K., Faraone, S., Maglione, K., Doyle, A., Fried, R., Seidman, L., & Biederman, J. (2008). Temporal stability of ADHD in the high-IQ population: Results from the MGH longitudinal family studies of ADHD. *American Academy of Child & Adolescent Psychiatry, 47,* 817-825. doi: 10.1097/CHI.0b013e318172eecf

Antshel, K. M. (2008a). Attention-deficit hyperactivity disorder in the context of a high intellectual quotient/giftedness. *Developmental Disabilities, 14,* 293-299. doi: 10.1002/ddrr.34

Antshel, K. M. (2008b). Temporal Stability of ADHD in the High-IQ Population: Results from the MGH Longitudinal Family Studies of ADHD. *Journal of American Academy of Child Psychiatry, 47*(7), 817-825. doi: 10.1097/CHI.0b013e318172eecf

Bain, S. K., & Bell, S. M. (2004). Social self-concept, social attributions, and peer relationships in fourth, fifth, and sixth graders who are gifted compared to high achievers. *Gifted Child Quarterly, 48*(3), 167-178. doi: 10.1177/001698620404800302

Barber, C., & Mueller, C. T. (2011). Social and self-perceptions of adolescents identified of adolescents identified as gifted, learning disabled, and twice-exceptional. *Roeper Review, 33*(2), 109-120. doi: 10.1080/02783193.2011.554158

Barkley, R. A. (2006). *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment* (Vol. 1). Guilford Publication

Barkley, R.A. (2000). Genetics of childhood disorders: XVII. ADHD, Part 1: The executive functions and ADHD. *Journal of the American Academy of Child and Adolescent Psychiatry, 39,* 1064–1068. doi: 10.1097/00004583-200008000-00025

Barkley, R. A., Guevremont, D. C., Anastopoulos, A. D., DuPaul, G. J., & Shelton, T. L. (1993). Driving related risks and outcomes of Attention Deficit Hyperactivity Disorder in adolescents and young adults: A 3–5 year follow-up survey. *Pediatrics, 92,* 212–218.

Barkley, R. (1997). Behavioral inhibition, sustained attention, and executive function: Constructing a unified theory of ADHD. *Psychological Bulletin, 121,* 65-94. doi: 10.1037/0033-2909.121.1.65

Biederman J, Faraone, S. V., Keenan, K. (1991). Familial association between attention deficit disorder and anxiety disorder. *American Journal of Psychiatry, 148,* 251–256. doi: 10.1111/j.1469-7610.2008.02040.x

Bloemsma, J. M., Boer, F., Arnold, R., Banaschewski, T., Faraone, S. V., Buitelaar, Sergeant, J. A., Rommelse, N., & Oosterlaan, J. (2012). Comorbid anxiety and neurocognitive dysfunctions in children with ADHD. *European Child Adolescent Psychiatry, 22,* 225-234. doi: 10.1007/s00787-012-0339-9

Bowen, R. C., Chavira, D. A., Bailey, K., Stein, M. T., & Stein, M. B. (2008). Nature of anxiety comorbid with attention deficit hyperactivity disorder in children from a pediatric primary care setting. *Psychiatric Research, 157*, 201-209. doi: 10.1016/j.psychres.2004.12.015

Bradley, R. H., & Corwyn, R. F. (2001). *Age and ethnic variations in family process mediators of SES.* Retrieved from http://books.google.ca/books?hl=en&lr=&id=AJOHnVZeszwC&oi=fnd&pg=PA161&dq=age+and+ethnic+variations+in+family+process+mediator+of+SES&ots=N38Vv0oowu&sig=OjUYbr7PECTyf34At_UG9sgKkO8#v=onepage&q=age%20and%20ethnic%20variations%20in%20family%20process%20mediator%20of%20SES&f=false

Brody, L. E., & Benbow, C. P. (1986). Social and emotional adjustment of adolescents extremely talented in verbal or mathematical reasoning. *Journal of Youth and Adolescence, 15,* 1–18. doi: 10.1007/BF02140780

Bussing, R., Zima, B. T., Perwien, A.R., Belin, T. R., & Widawski, M. (1998). Children in special education programs: Attention deficit hyperactivity disorder, use of services, unmet needs. *American Journal of Public Health, 88*, 880–886. doi: 10.2105/AJPH.88.6.880

Carlson, C. L., & Mann, M. (2002). Sluggish cognitive tempo predicts a different pattern of

impairment in the attention deficit hyperactivity disorder, predominantly inattentive type. *Journal of Clinical Child and Adolescent Psychology, 31*, 123-129. doi: 10.1207/153744202753441738

Carroll, J. B. (1996). A three-stratum theory of intelligence: Spearman's contribution. Retrieved from http://books.google.ca/books?hl=en&lr=&id=JQX-PlF6EgYC&oi=fnd&pg=PA1&dq=A+three-stratum+theory+of+intelligence:+Spearman%E2%80%99s+contribution.+Human&ots=_oMK5CtL-W&sig=GI4LtAcP3CMpizukCe50ocl6SL4#v=onepage&q=A%20three-stratum%20theory%20of%20intelligence%3A%20Spearman%E2%80%99s%20contribution.%20Human&f=false

Chronis, A. M., Jones, H. A., & Raggi, V. L. (2006). Evidence-based psychosocial treatments for children and adolescents with attention-deficit/hyperactivity disorder. *Clinical Psychology Review, 26,* 486–502. doi: 10.1016/j.cpr.2006.01.002

Clark, K. E., & Ladd, G. W. (2000). Connectedness and autonomy support in parent-child relationships: Links to children's socioemotional orientation and peer relationships. *Developmental Psychology, 36*(4), 485-498. doi: 10.1037//0012-1649.36.4.485

Cohen, R., Duncan, M., & Cohen, S. L. (1994). Classroom peer relations of children participating in a pull-out enrichment program. *Gifted Child Quarterly, 38,* 33-37. doi: 10.1177/001698629403800105

Conners, C. K. (2009). Conners 3rd Edition Manual. Toronto, ON: Multi-Health Systems Inc.

Crim, C., Hawkins, J., Ruban, L., & Johnson, S. (2008). Curricular modifications for elementary students with learning disabilities in high-, average-, and low-IQ groups. *Journal of Research in Childhood Education, 22,* 233-245. doi: 10.1080/02568540809594624

Curby, T. W., Rudasill, K. M., Rimm-Kaufman, S. E., & Konold, T. R. (2008). The role of social competence in predicting gifted enrollment. *Psychology in the Schools, 45*(8), 729-744. doi: 10.1002/pits.20338

de Boo, G.M., & Prins, P.M. (2007). Social incompetence in children with ADHD: Possible moderators and mediators in social-skills training. *Clinical Psychology Review, 27,* 78-97. doi: 10.1016/j.cpr.2006.03.006

DeGarmo, D.S., Forgatch, M.S., & Martinez, C. R. (1999). Parenting of divorced mothers as a link between social status and boys' academic outcomes: unpacking the effects of socioeconomic status. *Child Development,* 70(5), 1231–1245. doi: 10.1111/1467-8624.00089

Douglas, V. I. (1988). Cognitive deficits in children with attention deficit disorder with hyperactivity. In L. M. Bloomingdale & J. Sergeant (Eds.), Attention deficit disorder: Criteria, cognition, intervention (pp. 65–81) [Book supplement to the Journal of Child Psychology and Psychiatry, 5]. New York: Pergamon Press.

Douglas, V I. (1972). Stop, look, and listen: The problem of sustained attention and impulse control in hyperactive and normal children. *Canadian Journal of Behavioural Science, 4,* 259-282. doi: 10.1037/h0082313

Evans, G. W., Maxwell, L. E., Hart, B. (1999). Parental language and verbal responsiveness to children in crowded homes. *Developmental Psychology, 35,* 1020–1023. doi: 10.1037/0012-1649.35.4.1020

Fisak, B. J., Richard, D., & Mann, A. (2011). The prevention of child and adolescent anxiety: A meta-analytic review. *Society For Prevention Research, 12,* 255-268. doi: 0.1007/s11121-011-0210-0

Foley-Nicpon, M. F., Allmon, A., Sieck, B., & Stinson, R. D. (2011). Empirical investigation of twice-exceptionality: Where have we been and where we are going? *Gifted Child Quarterly, 55*(1), 3-17. doi: 10.1177/0016986210382575

Foley-Nicpon, M., Rickels, H., Assouline, S. G., & Richards, A. (2012). Self-esteem and self-concept examination among gifted students with ADHD. *Journal for the Education of the Gifted, 35*(3), 220-240. doi: 10.1177/0162353212451735

Frentz, C., Gresham, F. M., & Elliott, S. N. (1991). Popular, controversial, neglected, and rejected adolescents: Contrasts of social competence and achievement differences. *Journal of School Psychology, 29,* 109–120. doi: 10.1016/S0022-4405(05)80003-2

Gallagher, S. A. (1985). A comparison of the concept of overexcitabilities with measures of creativity and school achievement in sixth-grade students. *Roeper Review*, *8*(2), 115–119. doi:10.1080/02783198509552950

Gardner, H. (1983). *Frames of Mind.* Retrieved from http://books.google.ca/books?hl=en&lr=&id=2IEfFSYouKUC&oi=fnd&pg=PR7&dq=gardner+frames+of+mind+1983&ots=3_aT3Q2MqX&sig=7i7m7MWCUJPmH7xsuA37s0ohuCI#v=onepage&q=gardner%20frames%20of%20mind%201983&f=false

Gottfredson, L., & Saklofske, D. H. (2009). Intelligence: Foundations and issues in assessment. *Canadian Psychology/Psychologie canadienne; Canadian Psychology/Psychologie canadienne*, *50*(3), 183-195. doi: 10.1037/a0016641

Greene, R. W., Biederman, J., Faraone, S. V., Sienna, M., & Garcia-Jetton, J. (1997). Adolescent outcome of boys with attention deficit hyperactivity disorder and social disability: Results from a 4-year longitudinal follow-up study. *Journal of Consulting and Clinical Psychology, 65,* 758−767. doi: 10.1037//0022-006X.65.5.758

Gresham, F. M., Elliott, S. N., Cook, C. R., Vance, M. J., & Kettler, R. (2010). Cross-informant agreement for ratings for social skill and problem behavior ratings: An investigation of the social skills improvement system – rating scales. *Psychological Assessment, 22,* 157-166. doi: 10.1037/a0018124

Gresham, M., & Elliott, S. N. (2008). *Rating Scales Manual. SSIS Social Skills Improvement System.* Minneapolis, MN: Pearson.

Gresham, M. & Elliott, S. N. (1990). *The Social Skills Rating System.* Circle Pines, MN: American Guidance Service.

Hartup, W. W., & Stevens, N. (1997). Friendships and adaption in the life course. *Psychological Bulletin, 121,* 355–370. doi: 10.1037//0033-2909.121.3.355

Hertzog, N. B. (2003). Impact of gifted programs from the students' perspectives. *Gifted Child Quarterly, 47,* 131–143. doi: 10.1177/001698620304700204

Hoza, B. (2007). Peer functioning in children with ADHD. *Journal of Pediatric Psychology, 32,* 655–663. doi: 10.1016/j.ambp.2006.04.011

Jackson, L. D., & Bracken, B. A. (1998). Relationship between students' social status and global-domain specific self-concepts. *Journal of School Psychology, 36,* 233–246. doi: 10.1016/S0022-4405(97)00052-6

Jensen, P. S., Martin, D., & Cantwell, D. P. (1997). Comorbidity in ADHD: Implications for research, practice, and DSMV. *Journal of the American Academy of Child and Adolescent Psychiatry, 36,* 1065-1079. doi: 10.1097/00004583-199708000-00014

Kadesjo, B., & Gillberg, C. (2001). The comorbidity of ADHD in the general population of Swedish school-age children. *Journal of Child Psychology and Psychiatry, 42(4),*487-492. doi: 10.1111/1469-7610.00742

Kao, C. (2011). The dilemmas of peer relationships confronting mathematically gifted female adolescents: Nine cases in Taiwan. *Gifted Child Quarterly, 55*(2), 83-94. doi: 10.1177/0016986210391658

Karustis, J. L., Power, T. J., Rescorla, L. A., Eiraldi, R. B., & Gallagher, P. R. (2000). Anxiety and depression in children with ADHD: Unique associations with academic and social functioning. *Journal of Attention Disorders, 4,* 133-149. doi: 10.1177/108705470000400301

Keith, T. Z., & Reynolds, M. R. (2010). Cattell–Horn–Carroll abilities and cognitive tests: What we've learned from 20 years of research. *Psychology in the Schools, 47*(7), 635–650. doi: 10.1002/pits.20496

Kendall, P. C., Compton, S. N., Walkup, J. T., Birmaher, B., Albano, A. M., Sherrill, J., … Piacentini, J. (2010). Clinical characteristics of anxiety disordered youth. *Journal of Anxiety Disorders*, *24*(3), 360–365. doi: 10.1016/j.janxdis.2010.01.009

Kennedy, J. (1990). Determinants of peer social status: Contributions of physical appearance, reputation, and behavior. *Journal of Youth and Adolescence, 19,* 233–244. doi: 10.1007/BF01537889

Klein, R. G., & Abikoff, H. (1997). Behavior therapy and methylphenidate in the treatment of children with ADHD. *Journal of Attention Disorders, 2,* 89–114. doi: 10.1177/108705479700200203

Ladd, G. W., Herald., S. L., & Kochel, K. P. (2006). School readiness: Are there social prerequisites? *Early Education and Development, 17,* 115 – 150. doi: 10.1207/s15566935eed1701_6

Ladd, G. W., Kochenderfer, B. J., & Coleman, C. C. (1996). Friendship quality as a predictor of

young children's early school adjustment. *Child Development,* 67, 1103–1118. doi: 10.2307/1131882

Lee, S. S., Lahey, B. B., Owens, E. B., & Hinshaw, S. P. (2008). Few preschool boys and girls with ADHD are well-adjusted during adolescence. *Journal of Abnormal & Child Psychology, 36,* 373-383. doi: 10.1007/s10802-007-9184-6

Leroux, J. A., & Levitt-Perlman, M. (2000). The gifted child with attention deficit disorder: An identification and intervention challenge. *Roeper Review, 22*(3), 171-176. doi: 10.1080/02783190009554028

Lezak, M. D., Howieson, D. B., Loring, D. W., et al. (2004). Neuropsychological Assessment. London: Oxford University Press.

Maedgen, J. W., & Carlson, C. L. (2000). Social functioning and emotional regulation in the attention deficit hyperactivity disorder subtypes. *Journal of clinical child psychology*, *29*(1), 30–42.

March, J. S., Swanson, J. M., Arnold, L. E., Hoza, B., Conners, C. K., Hinshaw, S. P., . . . Pelham, W. E. (2000). Anxiety as a predictor and outcome variable in the multimodal treatment study of children with ADHD (MTA). *Journal of Abnormal Child Psychology, 28,* 527-541. doi: 10.1023/A:1005179014321

Mash, E. J., & Barkley, R. A. (eds). (2003). *Child Psychopathology* (2nd edition). New York: Guilford Press.

Masten, A. S. (2001). Ordinary magic: Resilience processes in development. *American Psychologist, 56,* 227-238. doi: 10.1037//0003-066X.56.3.227

Mendaglio, S. (1995). Children who are gifted/ADHD. *Gifted Child Today, 18,* 37-40.

Mikami, A.Y., Huang-Pollock, C. L., Pfiffner, L. J., McBurnett, K., & Hangai, D. (2007). Social skills differences among attention-deficit/hyperactivity disorder types in a chat room assessment task. *Journal of Abnormal Child Psychology, 35*(4), 509-521. doi: 10.1007/s10802-007-9108-5

Mikami, A. Y., Jack, A., Emeh, C. C., & Stephens, H. F. (2010). Parental influences on children with ADHD: I. Relationships between parent behaviors and child peer status. *Journal of Abnormal Child Psychology, 38*(6), 721-736. doi: 10.1007/s10802-010-9393-2

Mikami, A. Y., & Pfiffner, L. J. (2007). Sibling relationships among children with attention-deficit/hyperactivity disorder. *Journal of Attention Disorders, 11(4),* 482-492. doi: 10.1177/1087054706295670

Mikami, A. Y., Ransone, M. L., & Calhoun, C. D. (2011). Influence of anxiety on the social functioning of children with and without ADHD. *Journal of Attention Disorders, 15*(6), 473-484. doi: 10.1177/1087054710369066

Mikami, A. Y. (2010). The importance of friendship for youth with Attention-Deficit/Hyperactivity Disorder. *Clinical Family Psychology Review, 13*, 181-198. doi: 10.1007/s10567-010-0067-y

Milich, R., & Landau, S. (1982). Socialization and peer relations in hyperactive children. *Advances in Learning & Behavioral Disabilities, 1*, 283-339.

Moon, S. M., Zentall, S. S., Grskovic, A. H., & Stormont M. (2001). Emotional and social characteristics of boys with AD/HD and giftedness: A comparative case study. *Journal for the Education of the Gifted, 24*(3), 207-247.

Morelock, M. J., & Feldman, D. H. (2003). *Extreme precocity: Prodigies, savants, and children of extraordinarily high IQ*. In N. Colangelo & G. A. Davis (Eds.), Handbook of gifted education (3rd ed., pp. 455-469). Boston, MA: Allyn & Bacon.

Oh, W., Rubin, K. H., Bowker, J. C., Booth-LaForce, C., Rose-Krasnor, L., & Laursen, B. (2008). Trajectories of social withdrawal from middle childhood to early adolescence. *Journal of Abnormal Child Psychology, 36,* 553–566. doi: 10.1007/s10802-007-9199-z

Owens, E. B., Hinshaw, S. P., Lee, S. S., & Lahey, B. B. (2009). Few girls with childhood attention-deficit/hyperactivity disorder show positive adjustment during adolescence. *Journal of Clinical Child & Adolescent Psychology, 38,* 132-143. doi: 10.1080/15374410802575313

Owens, J. S., Goldfine, M. E., Evangelista, N. M., Hoza, B., & Kaiser, N. M. (2007). A critical review of self-perceptions and the positive illusory bias in children with ADHD. *Clinical Child and Family Psychology Review, 10*(4), 335–351. doi: 10.1007/s10567-007-0027-3

Pedersen, S., Vitaro, F., Barker, E. D., & Borge, A. I. H. (2007). The timing of middle-childhood peer rejection and friendship: Linking early behavior to early-adolescent adjustment. *Child Development, 78,* 1037–1051. doi: 10.1111/j.1467-8624.2007.01051.x

Pfiffner, L. J., Calzada, E., & McBurnett, K. (2000). Interventions to enhance social competence. *Child and Adolescent Psychiatric Clinics of North America, 9,* 689-709.

Pfiffner, L. J., & McBurnett, K. (2006). Family correlates of comorbid anxiety disorders in children with attention deficit/ hyperactivity disorder. *Journal of Abnormal Child Psychology, 34,* 719-729. doi: 10.1007/s10802-006-9060-9

Pliszka, S. R. (1992). Comorbidity of attention-deficit hyperactivity disorder and overanxious

disorder. *Journal of the American Academy of Child and Adolescent Psychiatry, 31*, 197-203. doi: 10.1097/00004583-199203000-00003

Prifitera, A., Saklofske, D. H., & Weiss, L. G. (2008). *WISC-IV clinical assessment and intervention*. San Diego, CA: Academic Press.

Reis, S. M., & McCoach, D. B. (2000). The underachievement of gifted students: What do we know and where do we go? *Gifted Child Quarterly, 44*, 152-170. doi: 10.1207/S15327035EX1002_5

Reynolds, C. R., & Kamphaus, R. W. (2004). *BASC-2: Behavioral Assessment System for Children manual (2nd ed.).* Circle Pines, MN: American Guidance Service.

Rhee, S., Furlong, M.J., Turner, M.J., & Harari, I. (2001). Integrating strength-based perspectives in psychoeducational evaluations. *The California School Psychologist, 6*, 5-17.

Rimm, S. (2002). Peer pressures and social acceptance of gifted students. In M. Neihart, S. M. Reis, N. M. Robinson, & S. M. Moon (Eds.), *The social and emotional development of children with HI: What do we know?* (pp. 13–18). Waco, TX: Prufrock Press.

Rinn, A. N., & Reynolds, M. J. (2012). Overexcitabilities and ADHD in the gifted: An examination. *Roeper Review: A Journal on Gifted Education, 34*(1), 38–45. doi:10.1080/02783193.2012.627551

Saklofske, D. H., Caravan, G., & Schwartz, C. (2000). Concurrent validity of the Wechsler Abbreviated Scale of Intelligence (WASI) with a sample of Canadian children. Canadian Journal of School Psychology, 16, 87-94. doi: 10.1177/082957350001600106

Scahill, L., & Schwab-Stone, M. (2000). Epidemiology of ADHD in school-age children. In M.

Lewis (Consulting Ed.) *Child and Adolescent Psychiatric Clinics of North America*, 9(3), 541-555.

Schatz, D. B., & Rostain, A. L. (2006). ADHD with comorbid anxiety: A review of the current literature. *Journal of Attention Disorders, 10*(2), 141-149. doi: 10.1177/1087054706286698

Schultz, S. M. (2012). Twice-exceptional students enrolled in advanced placement classes. *Gifted Child Quartely, 56*(3), 119-133. doi: 10.1177/0016986212444605

Semrud-Clikeman, M. (2007). *Social Competence in Children.* Available from http://link.springer.com/content/pdf/10.1007/978-0-387-71366-3_1.pdf

Shannon, K., Beauchaine, T., Brenner, S., Neuhause, E., & Gatzke-Kopp, L. (2007). Familial and temperamental predictors of resilience in children at risk for conduct disorder and depression. *Development and Psychopathology, 19*, 701-727. doi: 10.1017/S0954579407000351

Sisk, D. (2005). Psychosocial development of the gifted: Implications for a counseling intervention for gifted students. *Gifted Education International, 19*(3), 213–225. doi:10.1177/026142940501900304

Solano, C. H. (1987). Stereotypes of social isolation and early burnout in the gifted: Do they still exist? *Journal of Youth and Adolescence, 16*, 527-539. doi: 10.1007/BF02138819

Sternberg, R. J. (2000). Patterns of giftedness: A triarchic analysis. *Roeper Review, 22(4),* 231-235. doi: 10.1080/02783190009554044

Still, G. F. (1902). Some abnormal psychical conditions in children. *Lancet,1,* 1008-1012, 1077-1082, 1163-1168.

Swiatek, M. A. (1995). An empirical investigation of social coping strategies used by gifted

adolescents. *Gifted Child Quarterly, 39,* 154–161. doi: 10.1177/001698629503900305

Tannock, R., & Schachar, R. (1995). Differential effects of methylphenidate on working memory in ADHD children with and without comorbid anxiety. *Journal of the American Academy of Child and Adolescent Psychiatry, 34,* 886-896. doi: 10.1097/00004583-199507000-00012

The Measurement and Appraisal of Adult Intelligence (4th ed.). Wechsler, David Baltimore, MD, US: Williams & Wilkins Co. (1958). ix 297 pp. doi: 10.1037/11167-000

Udvari, S. J., & Schneider, B. H. (2000). Competition and the adjustment of gifted children: A matter of motivation. *Roeper Review, 22,* 212-216. doi: 10.1080/02783190009554040

Vespi, L., & Yewchuk, C. (1992). A phenomenological study of the social/emotional characteristics of gifted learning disabled children. *Journal for the Education of the Gifted, 16,* 55-72. doi: 10.1177/01623532920160010

Vialle, W., Heaven, P. C., & Ciarrochi, J. (2007). On being gifted, but sad and misunderstood: Social, emotional, and academic outcomes of gifted students in the Wollongong Youth Study, Educational Research and Evaluation: *An International Journal on Theory and Practice, 13*(6), 569-586. doi: 10.1080/13803610701786046

Wechsler, D. (1999). *Wechsler Abbreviated Scale of Intelligence*. San Antonio, TX: Pearson Corporation.

Wechsler, D. (2008). *Wechsler Adult Intelligence Scale.* San Antonio, TX: Pearson Corporation.

Wechsler, D. (2003). *Wechsler Intelligence Scale for Children-Fourth Edition.* San Antonio, TX: The Psychological Corporation.

Wheeler, J., & Carlson, C. L. (1994). The social functioning of children with ADD with hyperactivity and ADD without hyperactivity: A comparison of their peer relations and

social deficits. *Journal of Emotional and Behavioral Disorders, 2*(1), 2-12. doi: 10.1177/106342669400200101

Wilens, T. E., Biederman, J., Brown, S., Tanguay, S., Monuteaux, M. C., Blake, C., & Spencer, T. J. (2002). Psychiatric comorbidity and functioning in clinically referred preschool children and school-age youths with ADHD. *Journal of the American Academy of Child & Adolescent Psychiatry, 41*(3), 262–268. doi: 10.1097/00004583-200203000-00005

Ziemann, S. (2009). *Merely bright—or brilliant? Finding out whether your child is gifted is the first step in getting her the challenge she craves*. Retrieved from http://articles.chicagotribune.com/1999-09-19/ features/9909190194_1_parents-of-gifted-kids-giftedness-bright-child

Zill, N., Moore, K., Smith, E., Stief, T., Coiro, M. (1995). *The life circumstances and development of children in welfare families: a profile based on national survey data.* Retrieved from http://books.google.ca/books?hl=en&lr=&id=ofSoqvPrlGAC&oi=fnd&pg=PA38&dq=the+life+circumstances+and+development+of+children+in+welfare+families&ots=5FqlQGmCI1&sig=jDcY_MWPqIZ1gQ5_btCB03kaW5Y#v=onepage&q=the%20life%20circumstances%20and%20development%20of%20children%20in%20welfare%20families&f=false