THE RELATIONSHIP BETWEEN PRAGMATIC LANGUAGE SKILLS AND DEPRESSIVE SYMPTOMS IN CHILDREN AND ADOLESCENTS WITH AUTISM SPECTRUM DISORDER

By

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To my family

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I thank the members of my committee for their guidance in completing this project. This has been an incredible learning experience and I value everyone's input. I also thank my husband, family, and friends for their support and encouragement. It has been wonderful to have you cheering me on!

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Children and adolescents with Autism Spectrum Disorder (ASD) are at increased risk for developing symptoms of depression. To date, few research studies have examined factors likely to contribute to the depressive symptomatology experienced by children with ASD. Previous investigations have suggested that language deficits, particularly deficits in pragmatic language, may be associated with socioemotional problems, such as depression, in typically developing children. However, this relationship has never been investigated among children with ASD. The current study utilized hierarchical multiple regression to investigate the relationship between pragmatic language ability and depressive symptoms among 50 children with ASD between the ages of 7 and 17. The researchers hypothesized that pragmatic language ability would account for a significant portion of the variance in depressive symptomatology exhibited by the sample of participants. The investigators predicted that children with better pragmatic language ability would exhibit fewer symptoms of depression. Results of the study provided partial support for this hypothesis. When predicting parent-reported symptoms of depression, including a parent rating scale of pragmatic language ability significantly increased the predictive value of the model. This variable uniquely accounted for a significant portion of the variance in parent-

reported depressive symptoms. In contrast, a performance-based indicator of pragmatic language skills was not a useful contributor to the model.

CHAPTER 1
LITERATURE REVIEW

Introduction

Autism Spectrum Disorder (ASD) is characterized by impairments in three broad areas of functioning: communication, social interactions, and restricted, repetitive behaviors and interests (Volkmar & Klin, 2005). These core domains interact. For example, social success is associated with communication ability (Tager-Flusberg, Paul, & Lord, 2005). Pervasive and complex impairments in these primary areas lead to disruptions in many facets of life, including establishing and maintaining social relationships, achieving educational and vocational success, and living independently (Eaves & Ho, 2008). Additionally, co-occurring psychiatric conditions are common among individuals with ASD. Empirical investigations suggest that, among comorbid disorders, depression is the most common, affecting up to 30% of individuals with ASD (Matson & Nebel-Schwalm, 2007; Vickerstaff, Heriot, Wong, Lopes, & Dossetor, 2007). Depression can lead to negative long-term outcomes and may put a person at risk for withdrawal, oppositional behaviors, aggression, and suicide. Also, depression and the resulting behaviors can lead to more strain for affected individuals and their families, causing increased stress and conflict (Matson & Nebel-Schwalm, 2007). Comorbid psychiatric conditions are often perceived by individuals with ASD and their caregivers as the most debilitating feature of ASD; however, these difficulties are rarely the primary focus of intervention efforts (Sterling, Dawson, Estes, & Greenson, 2008). Research in the field of ASD is limited by methodological issues, such as the heterogeneity of most research samples, the difficulty of assessing internalizing behaviors of subjects with communication impairments, and the overlap between symptoms of psychiatric disorders and core features of ASD (Leyfer et al., 2006; Matson & Nebel-Schwalm, 2007; Tager-Flusberg, 2004). As a result, clinicians may not receive adequate information about proper

screening, diagnosis, and treatment of co-occurring psychiatric disorders when working with individuals with ASD. Thus, more research in the area of comorbid depression among children with ASD is critical to the development of effective interventions.

Research indicates that pragmatic language ability, or social communication ability, is a primary area of deficit for children and adolescents with ASD (Tager-Flusberg, 2004; Tager-Flusberg et al., 2005; Travis & Sigman, 1998). Many children with ASD, especially those with diagnoses of Asperger syndrome (AS) or high-functioning autism, seek social interactions with peers and family members; however, limitations in pragmatic language ability are likely to result in unsuccessful interactions. Repeated failures in social interactions can lead to social isolation, withdrawal, and depression (Fujiki, Brinton, Morgan, & Hart, 1999). Thus, communication impairments, especially in the area of pragmatics, may be an important contributor to co-occurring social and emotional impairments. It is likely that acquiring a better understanding of the relationship between pragmatic language and socioemotional outcomes, specifically depressive symptoms, will enable researchers and clinicians to implement more effective treatment programs.

This review will begin with an introduction to ASD, including core characteristics, diagnostic criteria, and common comorbidities. Next, pragmatic language will be discussed, along with a description of numerous pragmatic language limitations with which individuals with ASD often contend. Finally, a discussion of the co-occurrence of depression in the ASD population will be presented, including prevalence estimates, impact on life outcomes, and proposed risk factors. In conclusion, evidence for pragmatic language impairment as a contributor to one's risk for depression will be presented.

Autism Spectrum Disorder (ASD)

Core Characteristics

Kanner (1943) described the syndrome of autism based on his observations of a group of children who demonstrated impaired or nonexistent social relationships from infancy and who had very deviant language. The primary distinguishing features noted by Kanner were impaired social and affective development. Typically developing infants are born exhibiting marked interest in social interactions; however, Kanner identified a group of children who lacked the typical motivation for social relationships. The term "autism" was selected based on its prior use in reference to peculiar, egocentric thinking to indicate that these children seemed to live in a world of their own. Kanner also identified communication impairments in his clinical sample, including mutism, echolalia, and the use of overly literal language (Kanner, 1943; Volkmar & Klin, 2005).

Decades later, Rutter (1978) reviewed extensive research on autism and identified four core characteristics of the disorder: impairment in the development of social relationships, delayed or deviant language development or both, resistance to change, and onset before the age of three years (Rutter, 1978). These criteria formed the basis for the diagnostic category of Autistic Disorder put forth by the American Psychological Association in 1980 (Tager-Flusberg, Baron-Cohen, & Cohen, 1993). These observations have proved to be robust and, although the definition has expanded in the years to follow, the basic premise has been maintained (Tager-Flusberg et al., 1993).

According to the Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (Text Revision; 2000) (*DSM-IV TR*), a widely used classification system used to diagnose individuals with mental illnesses, individuals with Pervasive Developmental Disorders (also known as ASD) exhibit impairments in three broad categories: social interaction abilities,

communication, and restricted and repetitive behavior and interests (RRBI). Impairment in social interaction abilities is reflected by difficulties in nonverbal behaviors, failure to develop peer relationships, tendency to avoid sharing enjoyment with others, and lack of social reciprocity. Lack of social reciprocity may be manifested as an avoidance of social activities in favor of solitary tasks or a lack of awareness of others. Communication impairments can be manifested by a delay or lack of spoken language, the inability to initiate or sustain conversation, the presence of repetitive or idiosyncratic language, or the lack of age appropriate imitative or imaginative play. The presence of RRBI is reflected in a preoccupation with a restricted interest abnormal in its intensity or focus, strict adherence to rituals or routines, repetitive motor mannerisms, or preoccupation with parts of objects. In order to be classified with ASD, a child must have exhibited impairments in these areas prior to the age of three years (American Psychiatric Association, 2000). Today, the World Health Organization estimates that six in every 1000 children are living with ASD (Vickerstaff et al., 2007). In 2006, the Centers for Disease Control and Prevention (CDC) concluded that, across study samples, an average of one child in every 110 was classified as having an ASD. One in every 70 males was affected, as compared to one in every 315 females (CDC, 2009). This trend indicates that the disorder is four to five times more common in males than females (CDC, 2009; Volkmar & Klin, 2005).

Although the general characteristics of autism reported by Kanner (1943) and Rutter (1978) have proven to be relatively stable over time, the definition of autism has broadened since its inception in the early 1940s. Many researchers and clinicians in the field adhere to the concept of ASD, which proposes that autism and its related disabilities fall on a spectrum (Volkmar & Klin, 2005). Disorders on the autism spectrum include: Autistic Disorder, Rett's Disorder, Childhood Disintegrative Disorder, Asperger Syndrome (AS), and Pervasive

Developmental Disorder – Not Otherwise Specified (PDD-NOS) (Volkmar & Klin, 2005). The pattern of skill deficits exhibited by an individual determines where he or she is placed on the autism spectrum. Individuals with Autistic Disorder must demonstrate six total diagnostic indicators, including two social skill impairments, one communication impairment, and one quality indicative of RRBI (APA, 2000; Volkmar & Klin, 2005). Individuals who meet diagnostic criteria for Autistic Disorder and have intellectual ability in the average range are considered to have high-functioning Autism. Individuals with AS must have average intellectual functioning, no delay in language acquisition, two social skill impairments, and one indicator of RRBI. To receive a diagnosis of PDD NOS, an individual must demonstrate two total diagnostic indicators, including one social impairment and one impairment in either communication or RRBI (APA, 2000; Volkmar & Klin, 2005).

The flexibility and change that has occurred in the diagnostic criteria for ASD have far-reaching implications for the identification and treatment of individuals with autism and related disorders. Based on broad interpretation of diagnostic criteria, individuals may be classified as having ASD for whom some clinicians feel this label is inappropriate. Such issues have led to the development of a group of individuals, all identified and treated under the same categorical label, who are perhaps more different than they are similar. Individuals with ASD represent a broad range of abilities and behaviors (Sterling et al., 2008; Tager-Flusberg et al., 1993).

Communication

Understanding language and communication is essential to the study of autism. A delay in language development or an unexplained loss of language skills is often the first sign that parents perceive indicating that their child's development is not quite right. Furthermore, identifying language deficits and facilitating language-based interventions for children with ASD is crucial, as better language skills are associated with better long-term outcomes (Tager-Flusberg et al.,

2005). Common language deficits reported in individuals with ASD include delayed language acquisition and deficient pragmatic language.

Language abilities are highly variable among individuals with ASD. Most children with ASD acquire language later than their peers and at a much slower rate. Retrospective studies report that, in infancy, children with ASD are less responsive to the vocalizations of others, including their mothers (Tager-Flusberg et al., 2005). A small portion of children with ASD, often those with AS, exhibit no marked language deficit or delay in young childhood. In contrast, Lord, Shulman, and DiLavore (2004) found that about 20% of the ASD population never acquires verbal language. However, this figure is expected to decrease with time, as early diagnoses and effective interventions become more likely (Lord, Shulman, & DiLavore, 2004). Approximately 25% of parents report their children with ASD acquiring some language by 12 to 18 months, and then experiencing a regression of language skills (Tager-Flusberg et al., 2005).

Children with ASD, and especially those with AS, are likely to demonstrate impairments in more advanced communication skills, such as pragmatics, or social communication. Pragmatic language abilities have been emphasized in autism research for decades, because impairments in this area are found across nearly all individuals with ASD (Tager-Flusberg et al., 2005). Numerous investigations have yielded consistent results: pragmatic language is deviant in children with ASD relative to their peers and relative to other domains of language (Tager-Flusberg, 2004; Travis & Sigman, 1998). Pragmatic deficits observed in individuals with ASD lead them to abruptly shift topics, select inappropriate content, and fail to tailor interactions according to their speaking partner. They are reported to engage in persistent questioning, repetitive talk about a narrow range of topics, and failure to adapt speech or behavior to their social situation (Paul, Orlovski, Marcinko, & Volkmar, 2009; Reichow, Salamak, Paul, Volkmar,

& Klin, 2008). These conversational limitations decrease the likelihood of children with ASD creating meaningful social relationships. While many children with ASD experience the pragmatic skill deficits discussed previously, those with average or above average intellectual abilities may be particularly vulnerable to pragmatic language impairments. Although these children may attempt to communicate with others, they do so incorrectly, leading to social skill impairments (Downs & Smith, 2004). Concurrently, language problems impede the ability of children with ASD to learn appropriate social skills through verbal communication, as do their typically developing peers. Thus, impairments in social and communication skills are reciprocal (Travis & Sigman, 1998).

Social interactions

Social skill impairments have been reported in individuals with autism since Kanner's original description of the disorder (Carter, Davis, Klin, & Volkmar, 2005). Vickerstaff et al. (2007) studied 30 children with ASD between the ages of 7 and 13. According to parent and teacher reports of social competence, only one child was within one standard deviation of the mean (Vickerstaff et al., 2007). They found that 97% of the sample demonstrated significant social skill impairments. Common social skill deficits in individuals with ASD included engaging in fewer social initiations, difficulty creating social relationships, and difficulty interpreting the emotions of others.

Social characteristics of individuals with ASD are extremely divergent. Many young children with autism appear to have relatively little interest in social interactions, even with caregivers and family members. This quality differentiates infants with ASD from typically developing children, who demonstrate an intense interest in their interactions and relationships with others (Carter et al., 2005). When children with ASD develop social relationships, they are often less intimate than those created by normally developing children. As compared with

typically developing children, who usually initiate social contact and cooperative play with peers, children with autism typically engage in more solitary play activities (Carter et al., 2005). Many children with autism only initiate interactions with others in order to meet a nonsocial goal, such as accessing a desired object or activity. However, higher functioning children and adolescents with ASD are often highly interested in social interactions, but their social impairments make it difficult for them to interact with others appropriately. They may not understand or interpret others' emotional states and intentions correctly (Carter et al., 2005). Deficits in core social skills, such as empathy and assertiveness, are associated with an increased likelihood of social anxiety for children with ASD. Consequently, the high prevalence of social anxiety among individuals with autism may lead to withdrawal from social interactions (Bellini, 2006).

Although many social skills emerge over time, problems establishing and maintaining social relationships continue across the lifespan, even for individuals with AS and high-functioning autism (Carter et al., 2005). High-functioning children and teens with ASD report difficulty forming friendships and increased loneliness. A study of 235 adolescents and adults with autism indicated that, according to maternal ratings on the Autism Diagnostic Interview, only 8% of the sample had a reciprocal friendship that involved shared activities and 46.4% were reported to have no peer relationships (Orsmond, Krauss, & Seltzer, 2004). Only 33% of subjects reported participating in group recreational activities and, of those, very few engaged in informal socialization. Further analysis indicated that participants who engaged in more frequent social activities were more likely to have better daily living skills, fewer internalizing behaviors, and better overall social skills. In contrast, participants with more significant language impairments demonstrated fewer social initiations (Orsmond, Krauss, & Seltzer, 2004). Researchers who have

interviewed high-functioning teens and adults with ASD noted that respondents were likely to endorse feelings of inadequacy and isolation (Carter et al., 2005).

Additionally, current research findings suggest that children and adolescents with ASD may have difficulty perceiving the emotions of others and that they are usually not responsive to others' emotions. In fact, Kanner (1943) first described autism as a deficit in processing and responding to emotions. Individuals with ASD demonstrate abnormal expressions of emotions, which is likely to affect relationships with caregivers and peers (Travis & Sigman, 1998). Children with ASD are often characterized by a limited range of emotions, uncharacteristic displays of emotion (quantity and quality), and failure to integrate multiple displays of emotion, such as eye gaze and smile. Children with ASD often struggle to correctly identify the emotional states exhibited by others (Carter et al., 2005).

These areas of social difficulty may result from an impairment in theory of mind. Theory of mind has been proposed to be a precursor to adequate social development that many children with ASD struggle to acquire. Theory of mind refers to the ability of children to recognize the mental states of themselves and others. Mental states include beliefs, desires, and intentions; the ability to identify mental states allows individuals to adequately understand and predict others' behavior (Tager-Flusberg et al., 1993). Proponents of the theory of mind hypothesis believe that a failure to develop a theory of mind underlies the social and communicative impairments observed in children with autism. According to the theory of mind, children with ASD may understand themselves as distinct beings, but may not understand others and their interactions with others. They may not have awareness or concern for others' evaluations of themselves, leading to lost learning opportunities and poor socialization (Travis & Sigman, 1998).

Restricted and repetitive behaviors and interests

Restricted and repetitive behaviors and interests (RRBI) are one of the defining features of ASD. RRBI is generally defined as a behavior that is performed with no clear goal. The class of behaviors known as RRBI vary among individuals and can include dyskinesias, stereotyped movements, tics, repetitive use of objects in non-functional ways, self-injurious behavior, object attachments, rigid reliance on particular routines, and circumscribed interests (Turner, 1999). Circumscribed interests are particularly common among individuals with high-functioning autism and AS. These can include marked preoccupations that are unusual in nature, such as a fascination with public restrooms, or interests in common activities that are unusual in their degree (e.g., an intense interest in superheroes). Szatmari et al. (1989) concluded that 86% of their sample of individuals with high-functioning autism and 37% of individuals with AS demonstrated circumscribed interests, as compared with 9% of typically developing control participants (Szatmari, Bartolucci, & Bremner, 1989, as cited in Turner, 1999).

Researchers suggest that the demonstration of RRBI is persistent and stable over time. Seltzer et al. (2004) investigated the developmental trajectory of ASD characteristics across the lifespan. The authors concluded that RRBI symptoms appeared to ameliorate only minimally over time, and did not improve as much as social and communication symptoms (Seltzer, Shattuck, Abbeduto, & Greenberg, 2004).

Life Outcomes

The majority of ASD research examines the manifestation of the disorder in childhood; thus, little is known about the transition from adolescence to adulthood or the long-term life outcomes for individuals with ASD. Due to the paucity of empirically derived information, parents of individuals with ASD are unsure of what to expect as their children age. Many parents experience anxiety regarding how their children will fare in the future (Eaves & Ho, 2008).

In the 1960s and 70s, outcome investigations suggested that most individuals with ASD had poor or very poor adult adjustment. Few experienced normal social relationships and exhibited adequate educational and vocational functioning. Although some researchers claimed that individuals with ASD who had IQ in the average range experienced better life outcomes, most high-functioning individuals had no close friends, were dependent on their families, and experienced limited employment success (Eaves & Ho, 2008). As early as 1970, Rutter noted that ASD was often accompanied by an increased risk for the development of comorbid psychiatric disorders, most commonly anxiety and depression (Rutter, 1970).

More recently, Billstedt, Gillberg, and Gillberg (2005) conducted a follow-up study of 120 individuals with ASD to assess long-term life outcomes. Results indicated that outcomes were poorer than expected: 57% of participants had very poor outcome, 21% had poor, 13% had restricted, 8% had fair, and none had good outcome. Very few participants were living independently at the time of the follow-up. Self-injury and violence were common and were considered among the most difficult problems experienced by participants (Billstedt et al., 2005).

In 2008, Eaves and Ho conducted phone interviews with 48 individuals with ASD between the ages of 19 and 31 years and their caregivers. During the interviews, the authors assessed participants' long-term outcomes in the areas of current health, physical activity, education, public supports, work, friendships, and unmet needs. Results indicated that participants' mean global outcome, derived from work, friendships, and level of independence, was fair. Of the total sample, 21% of participants reported good or very good outcome and 0% reported very poor outcome (Eaves & Ho, 2008). These findings indicate improvement in overall life outcomes for individuals with ASD, as compared with previous studies. However, many participants reported troubling health and mental health conditions. Sixty-two percent of participants reported

experiencing emotional difficulty, 50% reported experiencing obsessive-compulsive disorder, and 50% reported experiencing anxiety. In addition, participants reported elevated rates of obesity, vision problems, and epilepsy. Self-injury and aggression were also commonly experienced by individuals with ASD. Caregivers identified unmet needs in the area of social development (Eaves & Ho, 2008). In summary, although long-term life outcomes may be improving for individuals with ASD, comorbid health and psychiatric conditions continue to negatively impact quality of life and impede treatment effectiveness.

As noted previously, superior language skills are predictive of better life outcomes for individuals with ASD. Kanner (1973) followed up on his original work by investigating social outcomes of individuals with autism in adulthood. Of his original sample, those with better communication skills evidenced a greater degree of improvement over time (Kanner, 1973). More recently, Eaves and Ho (2008) identified verbal IQ as the most important predictor of overall life outcome rating among their sample of young adults with ASD. Furthermore, Seltzer et al. (2004) proposed that improved social language skills may be predictive of better life outcomes for individuals with ASD.

Intellectual Functioning

Although individuals with ASD vary widely in terms of cognitive abilities, intellectual disability frequently co-occurs with ASD and may exacerbate ASD symptoms. AS does not co-occur with intellectual disability; however, many individuals with PDD-NOS and autism also suffer from intellectual disability. According to a 2005 meta-analysis, 70.4% of individuals with autism had mild to severe intellectual disability (Fombonne, 2005). Individuals with ASD and below average intellectual functioning are more likely to exhibit profound language delays, more stereotypic behaviors, and higher levels of self-injury (Matson & Nebel-Schwalm, 2007).

Comorbid Psychiatric Conditions

Rutter (1970) noted an increased likelihood of comorbid behavioral difficulties among adolescents with autism. Current estimates indicate that between 65 and 80% of individuals with ASD experience comorbid psychiatric disorders (Sterling et al., 2008). Common comorbid conditions include depression, hyperactivity, inattention, aggression, Obsessive Compulsive Disorder (OCD), Tourette syndrome, phobias, and anxiety. These co-occurring conditions increase the burden of illness experienced by individuals with ASD and add to the heterogeneity of the group, resulting in treatment limitations (Volkmar & Klin, 2005).

Numerous methodological limitations impede research studies investigating comorbid psychiatric conditions among individuals with ASD (Volkmar & Klin, 2005). In the past, information about comorbidity was gathered from case studies, which do not indicate whether levels of comorbidity are greater than would be expected based on chance. Additionally, the nature of autism often impedes comorbidity research, as the symptoms of ASD change with age and developmental level, leading to diagnoses that change during the lifespan based on communication and social abilities. Additionally, controversy has erupted regarding whether symptoms of other disorders should be considered to be core features of autism or indicative of an additional condition (Volkmar & Klin, 2005). For example, unusual motor movements that suggest a comorbid diagnosis of tics or stereotyped movement disorder, though not necessary for a diagnosis of ASD, are linked to RRBI diagnostic criteria. Language impairments typically found in ASD individuals also complicate comorbid diagnoses by making it difficult for individuals to report cognitive and affective symptoms indicative of a co-occurring condition (Volkmar & Klin, 2005).

Numerous empirical investigations have indicated that depression is the most common comorbid condition experienced by individuals with ASD (Ghaziuddin, Ghaziuddin, & Greden,

2002; Matson & Nebel-Schwalm, 2007; Sterling et al., 2008). A review investigating the developmental trajectory of ASD in adulthood concluded that depression affects up to 28% of adolescents and adults with ASD (Seltzer et al., 2004).

In summary, ASD is a developmental disability characterized by deficits in social interaction skills, communication, and restricted and repetitive behaviors. Individuals with ASD may present with a spectrum of symptoms ranging from mild to quite severe. Although evidence indicates that long-term life outcomes for those with ASD are improving, co-occurring psychiatric conditions, such as depression, present a significant challenge for affected individuals and their families.

Pragmatic Language

Most children and adolescents with ASD experience deficits in the pragmatic aspects of communication. The current investigation hypothesizes that, for those with ASD, pragmatic language ability may be associated with one's risk for developing symptoms of depression. The following discussion will provide a definition of pragmatic language, discuss difficulties faced by individuals with pragmatic language impairment, and identify the pragmatic skills that are most commonly deficient among individuals with ASD. Last, issues related to the valid and reliable assessment of pragmatic language ability are discussed.

What is Pragmatic Language?

Among humans, language is a common code of self-expression (Benner, Nelson, & Epstein, 2002). According to Vygotsky (1986), language is a human being's most valuable psychological tool. Understanding and producing language facilitates thought and behavior. As such, it is widely considered an essential component to successful interactions with others and the achievement of positive life outcomes.

There are three general categories of language ability. *Receptive* language involves an individual's ability to receive and interpret language; receptive language deficits impede listening and comprehension. Deficits in producing language, generally through speech, are referred to as *expressive* language problems. *Pragmatic* language skills are those that allow the use of language in social contexts to serve a social function, for example, successfully navigating a conversation (Donahue & Cole, 1994). Pragmatic language skills are based on the ability to integrate contextual information with language to produce communication (Chaban, 1996). These skills rely on one's knowledge of language rules (Benner et al., 2002).

More specifically, pragmatics includes the abilities to produce connected and organized texts or units of speech, such as conversations or narratives; to use language for different purposes; to develop methods for participating in conversations; and to understand the needs of one's speaking partner (Hyter, Rogers-Adkinson, Self, Simmons, & Jantz, 2001). Unlike traditional language theories that focus on the structure and form of language, theories that emphasize pragmatics espouse Vygotsky's belief that language is a tool.

Pragmatic Language Impairment

Appropriate pragmatic skills are as important as language itself – the production of correctly structured sentences that are pragmatically inappropriate can cause communication to fail (Johnston, Weinrich, & Glaser, 1991). Typically developing children acquire pragmatic language skills early in development. For instance, unimpaired two-year-olds can consistently adapt their language use based on the background knowledge possessed by the listener (Baron-Cohen, 1988). In contrast, the majority of children and adolescents with ASD are at risk for pragmatic language impairment (Tager-Flusberg et al., 2005).

Tannock and Schachar (1996) defined pragmatic language impairment as "difficulties in using language appropriately within a social, situational, and communicative context" (p. 138).

There are three primary types of pragmatic language abilities: emotional processing skills, discourse strategies, and goal-directed language. Individuals with pragmatic language impairment demonstrate problems in one or more of these domains (Tannock & Schachar, 1996).

Emotional processing refers to the ability to understand and communicate emotions. These skills are essential to the development of positive interpersonal relationships. According to functionalist theories of emotion, emotions have both interpersonal and intrapersonal capacities. The interpersonal qualities of emotions include the abilities to interpret others' emotions, predict future behavior of others, and disguise one's own emotional expression. Intrapersonal functions of emotions include the abilities to assess the meaning of events and use that knowledge to guide subsequent behavior (Bretherton, Fritz, Zahn-Waxler, & Ridgeway, 1986).

Discourse strategies result in the production of coherent conversation and cohesive narration. These skills include adequate vocabulary, creating grammatically sound sentences, linking sentences to form coherent messages, waiting one's turn in conversation, topic maintenance, understanding appropriate body space and movement in conversation, and recognizing and repairing miscommunications (Johnston et al., 1991).

Goal-directed language is the ability to make language serve a desired purpose (Johnston et al., 1991; Larson & McKinley, 1987). Goal-directed language consists of two distinct areas: using language appropriately and making language perform various functions. In order to demonstrate appropriate language use, a child must: provide enough information, but not too much; provide information that is appropriate to the person(s), place, and situation; include enough truth value to be acceptable to other participants; and be acceptably polite. Another prerequisite to effective language use is the ability to make language perform various functions. Language is a tool and, as such, it can be used to elicit desired outcomes. Young children use

language to accomplish basic tasks, such as labeling, requesting, and protesting. As children mature, they learn to perform a variety of complex functions with language, including imagining, informing, and negotiating. Adults utilize language to accomplish even more sophisticated tasks, such as projecting, defending, and coercing (Johnston et al., 1991; Larson & McKinley, 1987).

Impairment in any of these areas may lead to pragmatic language disorder (Tannock & Schachar, 1996). Furthermore, the failure to develop pragmatic skills can lead to academic failure and social and cultural exclusion (Chaban, 1996).

Pragmatic Language Difficulties in ASD

Pragmatic language difficulties have been widely reported in individuals with ASD. Individuals with ASD typically have pragmatic language abilities that are impaired relative to their peers and relative to other language domains (Paul et al., 2009; Reichow et al., 2008; Tager-Flusberg, 1989; Tager-Flusberg et al., 2005). A synthesis of the research on the linguistic profiles of children with autism suggests that, although children with autism are likely to have deficits in all areas of language, pragmatic language is the only area in which their deficits are unique to the autism population. Although many children with ASD will acquire linguistic structure, such as phonology, semantics, and grammar, in a fashion that is similar to other children, their social use of language is unique. Typically, structural components of language are more advanced than pragmatics in individuals with ASD (Tager-Flusberg, 1989; Baron-Cohen, 1988). In fact, children with high-functioning autism, AS, and PDD-NOS often demonstrate well-developed structural language, which leads to under-identification of pragmatic deficits by parents and teachers (Tager-Flusberg, 1989).

Communicative functions can be divided into two types: nonsocial functions, which are used to achieve environmental outcomes, such as access to a desired object or activity, and social functions, which are used to attract attention to oneself or to call attention to an object or activity.

Children with ASD are much more proficient with nonsocial communication (Tager-Flusberg, 1989). Children with ASD often use language for instrumental purposes, such as requesting food or toys, rather than for purely social reasons, such as obtaining attention, commenting, acknowledging their speaking partner, initiating social interactions, or requesting information. Although children with autism can develop social communication, they do so at a later developmental period and they use it less frequently and less appropriately (Baron-Cohen, 1988; Tager-Flusberg, 1989).

Pragmatic language difficulties are associated with a wide range of communication limitations in individuals with ASD. Tager-Flusberg et al. (2005) reported that, among children and adolescents with ASD, rates of spontaneous initiation of communication are low. Additionally, evidence indicates that individuals with ASD direct most of their communication attempts to adults, rather than same-age peers (Tager-Flusberg et al., 2005). Additional pragmatic difficulties noted in individuals with ASD include talking to oneself, problems listening, difficulty following norms for politeness, making irrelevant statements, providing too much or too little information to listeners, and terminating topics inappropriately. Individuals with ASD may also demonstrate inappropriate eye gaze and vocal intonation (Tager-Flusberg et al., 2005). According to Baron-Cohen (1988), the social impairments observed in individuals with ASD may instead be a reflection of underlying pragmatic language deficit. Individuals who are described as aloof or socially avoidant may in fact desire interactions with others; however, they display inappropriate social communicative approach.

Paul et al. (2009) used a parent rating scale to evaluate the pragmatic language skills of adolescents of normal intelligence diagnosed with ASD. Their sample consisted of 29 individuals between the ages of 12 and 18 with clinical diagnoses of high-functioning autism,

AS, and PDD-NOS, and 26 typically developing peers. Results indicated that the ASD group did not perform more poorly than the TD group on all conversational behaviors; however, they did perform significantly worse on the following pragmatic domains: providing the appropriate amount of information to meet the needs of the listener, managing topics adequately, responding to the cues of one's conversation partner, repairing conversational breakdowns, and initiating appropriate conversation (Paul et al., 2009).

Pragmatic Language Assessment

Although the importance of pragmatic language in children's adjustment and socioemotional development has been well-established, many traditional language assessment instruments do not include a measure of pragmatic ability (Russell & Grizzle, 2008). Traditional assessment of pragmatic language ability has relied on subjective parent reports and observations, neither of which demonstrate the psychometric rigor of standardized, norm-referenced tests. Further, assessments that rely only on performance-based pragmatic measures may be limited in reliability, as they are based on a single sample of behavior that is occurring in a standardized, laboratory setting. This method is incongruent with the spontaneous, social nature of pragmatic language skills (Volden, Coolican, Garon, White, & Bryson, 2009). These methodological issues often lead to pragmatic language evaluations that are inconsistent and lack validity.

The ability to conduct appropriate communicative exchanges in various social contexts is crucial to the ease with which children navigate the social world. Pragmatic language deficits are particularly evident in children and youth with ASD, regardless of their level of functioning in other areas, including cognitive ability and receptive and expressive language ability. Valid and reliable assessment of pragmatic ability is a difficult but necessary task for clinicians working with individuals with ASD.

Depression

Depression in childhood and adolescence is an urgent issue for children, caregivers, clinicians, and educators. Depression is characterized by depressed or irritable mood, loss of interest in activities, weight gain or weight loss, insomnia or hypersomnia, feelings of worthlessness, difficulty concentrating, and suicidal ideation (APA, 2000). In contrast with the pervasive sadness reported by adults with depression, depression in childhood and adolescence is often manifested as irritability, boredom, and anhedonia (McCarthy, Downes, & Sherman, 2008).

According to the National Comorbidity Study, the only nationally representative study that includes adolescents, the lifetime prevalence rate of Major Depression in teenagers is 14%, with an additional 11% reporting minor depression (Hammen & Rudolph, 2003). Subsyndromal depressive symptoms, those symptoms of depression which are not sufficiently severe to meet diagnostic criteria, still portend a high level of distress. According to Cooper and Goodyer (1993), 20.7% of females between the ages of 11 and 16 years demonstrate subsyndromal depressive symptoms. Depressive symptoms increase steadily between the ages of 13 and 15 years, after which they become relatively stable (Montague et al., 2008). Williamson et al. (2008) speculated that depression becomes more common in adolescence, because social evaluation and obtaining others' approval become more important (Williamson, Craig, & Slinger, 2008). Females are at a greater risk for depression than males (Montague et al., 2008). Without proper treatment, a major depressive episode typically lasts about eight months (Hammen & Rudolph, 2003). Forty percent of individuals who have experienced a major depressive episode will experience a recurrence within two years and 72% will experience a recurrence within five years (McCarthy et al., 2008; Montague et al., 2008).

School-based mental health professionals frequently rate depression as one of the most pressing challenges they face. In fact, they report depression to be a more urgent issue than teen violence. Unfortunately, many schools do not have clear procedures established for the identification and treatment of students with these mental health issues (McCarthy et al., 2008).

ASD and Comorbid Depression

As previously discussed, depression is among the most commonly reported comorbid disorders experienced by individuals with ASD. Depressive symptoms negatively impact quality of life for those with ASD. Consequently, the treatment and prevention of co-occurring depressive symptoms in the ASD population is of critical importance. The following discussion will address the prevalence of depressive symptoms among children and youth with ASD, the impact of depression on life outcomes, and suspected risk factors for depression in the ASD population.

Prevalence

Numerous experts in the ASD research community contend that depression among children and teenagers with ASD is a critical issue requiring further investigation (Ghazuiddin, Ghazuiddin, & Greden, 2002; Sterling et al., 2008; Vickerstaff et al., 2007). Rates of depression among children with ASD are markedly higher than those reported in the general population. Vickerstaff et al. (2007) measured the depressive symptomatology of 30 children with ASD between the ages of 7 and 13 and found that 24% were classified as “mildly depressed” and an additional 29% were classified as “depressed.” These estimates reflect a much greater likelihood of experiencing depressive symptoms for youth with ASD, as compared to the general population. Leyfer et al. (2006) reported that 10% of their sample of children with ASD had at least one Major Depressive Episode meeting DSM-IV criteria. An additional 24% had

subsyndromal symptoms. These results are particularly powerful when considering that the mean age of their participants was nine years (Leyfer et al., 2006).

Rates of depression among unimpaired individuals and those with ASD increase with age; therefore, the prevalence of depression is higher among adolescents than children (Ghazuiddin et al., 2002; Sterling et al., 2008; Vickerstaff et al., 2007). The likelihood of experiencing depression for those with ASD may increase with age because of the perceived pressure to meet societal expectations, such as marriage, job success, educational attainment, and independence. Additionally, with advancing age, the developmental gap between individuals with ASD and their typically developing peers becomes more apparent (Sterling et al., 2008). The increasing rates of depressive symptoms and other co-occurring psychiatric conditions experienced by teenagers with ASD might explain the regression in behavioral development and skills that is often reported by parents of adolescents with ASD (Sterling et al., 2008).

Empirical evidence suggests that higher-functioning individuals, especially adolescents, are at the highest risk for developing depressive symptoms (Ghazuiddin et al., 2002; Vickerstaff et al., 2007). Samples of individuals with high-functioning autism and AS have consistently yielded higher estimates of depression than are found in individuals with ASD of lower cognitive ability. In particular, adolescents with AS may be particularly vulnerable to depression (Klin, Volkmar, & Sparrow, 2000; Volkmar & Klin, 2005). For example, Wing (1981) found that approximately one-third of her sample of individuals with AS were experiencing depression (Wing, 1981, as cited in Ghazuiddin et al., 2002).

Further investigation in the area of comorbid depression in ASD is warranted, as prevalence estimates indicate that a large portion of individuals with ASD experience depressive symptoms. Furthermore, emotional and behavioral problems are stable over time; children and

adolescents who exhibit depressive symptomatology are likely to also experience depression later in life (Montague et al., 2008). In particular, researchers and clinicians will benefit from further information regarding factors that increase an individual's vulnerability to developing depressive symptoms (Sterling et al., 2008).

Impact on Functioning and Life Outcomes

Experiencing depression during childhood and adolescence is associated with a host of negative long-term outcomes. Research based on depression in the general population indicates that depression negatively impacts children's and teens' overall well-being, relationships with peers and family members, and academic performance. Furthermore, child and adolescent depression is associated with suicide, the third most frequent cause of death for young adults (McCarthy et al., 2008). Unfortunately, many sufferers of childhood depression are never diagnosed or remediated. In fact, according to Evans, van Velsor, and Schumacher (2002), adolescent depression is "one of the most overlooked and undertreated psychological disorders (p. 211)" to affect young people.

Based on the impact of depression on typically developing children and teens, it is not surprising that depression may lead to poorer outcomes in those with ASD. Outcome studies of adults and children with ASD have revealed that few develop social relationships and loneliness is a common experience (Vickerstaff et al., 2007). Depression can lead to aggression and anxiety and can exacerbate the social difficulties with which children and adolescents with ASD already contend. The effects of depression on children with ASD may include reduced attempts at communication, increased social withdrawal, oppositional and aggressive behavior, and suicidal behavior. Among more severely impaired individuals with ASD, depression can lead to increased motor agitation, self-injurious behavior, stereotypic behaviors, and obsessions (Sterling et al., 2008). Comorbid depression is also likely to generate a negative impact on family and

social relationships (Ghazuiddin et al., 2002). Kim and colleagues (2000) concluded that children with high-functioning ASD who exhibited symptoms of anxiety and mood disorder were more aggressive and had poorer relationships with peers, parents, and teachers. Additionally, their parents' social activities were more limited. These findings further illustrate the importance of identifying and treating comorbid mood problems among children with ASD.

Factors Contributing to Depression in ASD

Although elevated rates of depression among children and adolescents with ASD have been consistently documented, very few empirical investigations have provided insight regarding risk factors for the development of depressive symptoms in this population (Sterling et al., 2008). This gap in the literature has hindered the development of effective prevention and intervention plans for this group of individuals (Sterling et al., 2008). In the following discussion, three risk factors for depression among children with ASD will be postulated based on previous research findings: biological and environmental risk, cognitive ability, and general language ability. Furthermore, evidence in support of each relationship will be presented. These three factors have been proposed by previous investigators as primary predictors of depressive symptomatology among individuals with ASD (Benner et al., 2002; Gallagher, 1996; Geurts & Embrechts, 2008). Finally, the possible contribution of pragmatic language deficits to depressive symptoms will be discussed. Emerging evidence implicates the role of pragmatics, or social communication skills, in the development of internalizing and externalizing behavior disorders. However, past investigations have frequently ignored the likely effects of pragmatic ability on socioemotional outcomes. Instead, they have emphasized the role of general language ability in the development of emotional and behavioral problems. The role of pragmatic language has not been examined as it pertains to depressive symptomatology in youth with ASD.

Biological and environmental factors

Family and environmental factors affect the likelihood of a child or adolescent with ASD experiencing depression. Individuals with ASD who experience depression are more likely to have family members with a history of mood disorder (Ghazuiddin et al., 2002; Vickerstaff et al., 2007). In addition, social and environmental stressors may make one more susceptible to the development of depressive symptomatology (Vickerstaff et al., 2007). Ghazuiddin and colleagues concluded that children with ASD who develop clinical depression are more likely to experience negative life events (Leyfer et al., 2006). Additionally, experiencing co-occurring medical conditions in addition to ASD, such as seizure disorders or intellectual disability, may make one more likely to experience depression (Ghazuiddin et al., 2002).

Cognitive ability

One avenue of research suggests that awareness of their social limitations may make individuals with ASD susceptible to experiencing depression (Vickerstaff et al., 2007). Social skill deficits are a core characteristic of ASD and are of particular concern among children and adolescents with high-functioning autism and AS. In these cases, individuals may have strong language and cognitive skills, but exhibit impairments in the ability to navigate social interactions successfully. In fact, researchers have noted that children with higher intellectual functioning may be at greater risk for depression than their lower-functioning peers because they are aware of their limited social skills (Vickerstaff et al., 2007; Volkmar & Klin, 2005).

Vickerstaff et al. (2007) investigated this claim by administering an assessment battery to 30 children and adolescents with high-functioning autism. Outcome measures included ratings scales designed to evaluate social skills, self-perceived social competence, and depressive symptomatology. Results indicated that older children and children with higher IQ perceived themselves as having lower social competence. Additionally, those with lower self-perceived

social competence demonstrated a higher level of depressive symptoms. The authors suggested that this trend may be explained by the fact that these individuals are more aware of their limitations in comparison with typically developing peers, whereas individuals with developmental disabilities and low IQ may not notice that they are different (Vickerstaff et al., 2007).

Sterling et al. (2008) evaluated 46 adults with ASD between the ages of 18 and 44 years. Among their sample, higher IQ was correlated with more depressive symptoms. Furthermore, participants with better social and communication skills, as measured by the Autism Diagnostic Observation Schedule (ADOS), experienced more symptoms of depression, suggesting that higher-functioning individuals may be more vulnerable to depression (Sterling et al., 2008). This finding is of great importance to teachers, parents, and clinicians working with children with ASD, because it suggests that children and teenagers with average intelligence should be assessed for low self-esteem. Additionally, interventions that focus on improving social skills may assist these children in maintaining high levels of self-confidence.

General language ability

The relationship between language and behavioral outcomes has been well-documented among children without ASD. Numerous empirical investigations have found evidence to support a link between impaired language functioning and emotional/behavioral difficulties (Benner et al., 2002; Gallagher, 1999; Prizant et al., 1990; Redmond & Rice, 1998). Upon evaluating numerous studies reporting overlaps between children with emotional/behavioral disorders (EBD) and language impairments, Gallagher (1999) found moderate to severe language deficits in 62 to 95% of children with EBD. Camarata, Hughes, and Ruhl (1998) administered a test of language development to 38 students with mild or moderate behavior disorders in a school

setting. Of these, 71% performed two standard deviations below the mean and 97% performed one standard deviation below the mean.

Baker and Cantwell (1987) and Baltaxe and Simmons (1988) were among the first groups of researchers to investigate the occurrence of comorbid psychiatric disorders among children with language impairments. Baker and Cantwell (1987) administered psychiatric assessments to 600 children between the ages of 2 and 16 years who were receiving treatment at a community speech/language clinic. The authors reported that 50% of the sample had a diagnosable psychiatric illness. They concluded that speech and language dysfunction appeared to have a significant impact on psychiatric wellness. Further scrutiny revealed that, although cognitive ability and psychosocial stressors were also associated with psychiatric illness, the biggest differentiating factor between the psychiatrically ill and well groups was speech and language status (Baker & Cantwell, 1987). Similarly, after evaluating 125 preschool children with language impairment, Baltaxe and Simmons (1988) concluded that 10% also met diagnostic criteria for attention deficit/hyperactivity disorder, 5% for conduct disorder, 5% for oppositional defiant disorder, and 6% for emotional disorders, such as anxiety and depression. Further research on the overlap between language ability and internalizing behaviors, such as depression, is limited; however, based on these findings, it is likely that depression frequently co-occurs with language impairment. This proposition is further supported by Fujiki et al. (1999), who examined teacher behavior ratings of language impaired students. They concluded that language impaired students were more likely than unimpaired children to display withdrawn behaviors. In particular, these children demonstrated reticent withdrawal, a type of withdrawal characterized by a desire to interact with others impeded by social anxiety (Fujiki et al., 1999).

Although a causal role has yet to be confirmed, research findings implicate language deficit as an etiological factor for emotional/behavioral disorders. In an investigation of the socioemotional behavior and verbal abilities of a sample of language impaired and age-matched children, Redmond and Rice (1998) found support for the *Social Adaptation Model*. According to this model, emotional and behavioral problems experienced by children with communication deficits are a direct consequence of their language impairment. This model proposes that increased social and behavioral problems are a product of the relationship between the underlying language difficulty, the social context, and the biased perceptions of others regarding individuals with language impairments. This model proposes that problematic socioemotional behaviors result from the child's attempt to compensate for his or her language impairment. For example, children with language problems typically initiate and respond to peer interactions less frequently than do typically developing peers. Based on the Social Adaptation Model, children with language impairments were rated as having more severe behavioral problems by teachers than by parents. Given these results, the authors concluded that the children's language difficulties, which caused increased stress in the school environment as compared to the home, resulted in problem behaviors (Redmond & Rice, 1998).

Effective language skills foster successful social interactions and positive academic outcomes (Donahue & Cole, 1994; Nelson, Benner, & Cheney, 2005). Prizant and colleagues (1990) proposed that expressive language disorders may make it difficult for children and adolescents to express their ideas, feelings, fears, and needs. Thus, they may appear impulsive, restless, immature, or even aggressive. Receptive language difficulties may cause individuals to misinterpret the verbalizations of others; furthermore, expressive deficits may impair their ability to request clarification, resulting in frustration. This frustration could lead to externalizing

behaviors, internalizing behaviors or both (Prizant et al., 1990). Poor communication skills may lead to rejection and isolation from peers. In addition, the academic problems faced by youth with language impairment may lead to rejection and low self-esteem (Howlin, Mawhood, & Rutter, 2000). Lastly, Gallagher (1993) reported that children with language difficulties are more likely than peers to withdraw or use aggression to solve conflicts. These factors contribute to the development of depression.

Results of the Ottawa Longitudinal Study (OLS) support the theory that speech and language problems cause emotional and behavioral difficulties. The OLS was an investigation of 142 five-year-old children with language impairment and 142 unimpaired peers. Participants were assessed at 5 years of age and re-evaluated at 12.5 years of age (Beitchman, Brownlie, & Wilson, 1996). The investigators found that language impairment was significantly associated with emotional and behavioral problems, even after controlling for socioeconomic status. In fact, speech and language function at age 5 proved to be the most important predictor of psychiatric outcome at age 12.5. Children with language impairment at 5 years of age had higher ratings of psychopathology and lower ratings of global functioning at age 12 (Beitchman, Brownlie, & Wilson, 1996). These findings support the theory that language deficit is associated with and precedes the development of emotional/behavioral problems.

Children with language deficits are more likely to develop both internalizing and externalizing behavior disorders than are their typically developing peers. Externalizing behaviors, the demonstration of overt behaviors, are more common in younger age groups (Gallagher, 1999; Prizant et al., 1990; Stevenson, 1996). Commonly comorbid externalizing problems include aggression, immaturity, Attention Deficit/Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder, and Conduct Disorder (Gallagher, 1999, Prizant et al., 1990).

Internalizing problems, such as low self-esteem, social withdrawal, depression, phobias, and anxiety, are more likely to occur among adolescents (Gallagher, 1999; Stevenson, 1996). Initially, children with co-occurring language impairments demonstrate frustration and aggression. These behaviors tend to decline rapidly, while internalizing symptoms, such as depression and low self-esteem, remain (Stevenson, 1996). As children age, their comorbid behavior problems are rated as increasingly severe, according to caregiver report. Additionally, children become more adept at masking their communication impairments at older ages (Cohen, 1996). These trends emphasize the need for continuous monitoring and intervention throughout adolescence.

Many investigators in the fields of special education and speech/language pathology have provided consistent evidence that general language ability is related to emotional and behavioral outcomes (Beitchman et al., 1996; Howlin et al., 2000; Prizant et al., 1990). Few studies, however, have systematically investigated the contribution of general language ability in predicting socioemotional outcomes in ASD. Howlin, Mawhood, and Rutter (2000) investigated factors influencing the social outcomes of adults with ASD. The authors found that expressive language, as measured by a direct assessment of expressive vocabulary, was the most significant predictor of social success. As compared with nonverbal cognitive ability, which accounted for 6%, language ability accounted for 32% of the variance in social outcome.

Pragmatic language ability

Correlations between pragmatic language ability and socioemotional functioning have been documented among children with and without developmental disabilities. In fact, past research findings have suggested that pragmatic language is more closely related to socioemotional functioning than is general language ability. Benner et al. (2002) conducted a meta-analysis in which they evaluated 26 studies of 2,358 children with emotional/behavioral

disorder and 438 without. Results indicated that, of those with EBD, 71% exhibited pragmatic language impairments, 64% exhibited expressive language impairments, and 56% exhibited receptive language impairments (Benner et al., 2002). McDonough (1989) evaluated the pragmatic language use of children with and without behavior disorders. The majority of subjects with EBD showed deficits in conversational skills, including the tendency to use shorter utterances, lack of ability to maintain conversational topic, and failure to appropriately respond to questions. Children with EBD did not display problems with general language, such as syntax or semantics (McDonough, 1989). These trends implicate pragmatic language impairment as a contributing factor to emotional and behavioral maladjustment.

Few empirical studies are available which investigate the role of pragmatic language in the development of specific psychiatric disorders, such as depression. This is likely due to the paucity of commercially available tools for adequately assessing pragmatic language skills. Furthermore, an emphasis on assessment and intervention of pragmatic language skills is a relatively recent development in the field of speech/language pathology (Kaiser, 1993). Prior to the 1980s, the majority of communication research focused on structural aspects of language, such as phonology, syntax, and semantics (Kaiser, 1993).

The current review identified only one empirical investigation examining the relationship between pragmatic language ability and symptoms of depression. Mupawose, Katijah, and Naran (2007) evaluated the association between pragmatic language and depression in a sample of adults with traumatic brain injury. The authors concluded that participants with depression demonstrated greater pragmatic language deficit (Mupawose, Katijah, & Naran, 2007). In support of this conclusion, Gravell and France (1991) reported that depressed patients often demonstrate social communication difficulties, particularly reduced nonverbal communication

and reduced initiations. Additionally, Baltaxe and Simmons (1988) conducted case studies on six children with EBD and found that all had pragmatic language deficits, including three subjects whose primary psychiatric condition was depression. The authors concluded that, for those with affective disorders such as depression, pragmatics is often the only impaired language domain. These findings support the claim that pragmatic language impairments may increase one's likelihood of experiencing symptoms of depression.

Despite the paucity of research studies investigating pragmatic ability and its impact on depression, current research has suggested that pragmatic language impairment is related to other psychiatric problems, such as inattention and hyperactivity. Geurts and Embrechts (2008) found that children with ADHD had pragmatic problems similar to those of children with ASD; however, they had no significant structural language deficits. This implies that their psychiatric condition was related to their pragmatic impairment, rather than their overall language abilities. Tannock and Schachar (1996) also reported pragmatic difficulties among children with ADHD, including problems with conversation skills, difficulty clearly expressing information, and an inability to adjust language output to meet the needs of the listener. Mack and Warr-Leeper (1992) investigated the language abilities of 20 boys with chronic behavior disorders and average cognitive functioning. They found that 16 of the 20 participants had significant impairments on at least four language measures, a prevalence of language impairment ten times greater than that found in the general population. The language skills found to be most commonly deficient were higher-order pragmatic abilities, including understanding ambiguity, making inferences, and extracting meaning from context cues (Mack & Warr-Leeper, 1992). The current study hypothesizes that a similar relationship exists between pragmatic language deficit and internalizing behaviors, such as depressive symptoms.

One avenue by which pragmatic difficulties may increase one's risk for depression is through its impact on peer relationships. Deficits in pragmatic language often lead to rejection by peers. Among children, conversational competence is associated with social status. Children who demonstrate communication deficits are less sought after as conversational partners (Rice, Sell, & Hadley, 1991; Rice, 1993). In turn, impaired children are less likely to initiate conversations with peers, likely in an attempt to avoid contexts with high language demands. According to Rice (1993), these trends contribute to a negative social spiral in which already impaired children fail to further develop their communication abilities due to limited opportunities for practice. According to Gallagher (1996), as early as preschool, children prefer playmates who talk more, communicate more successfully, express coherent messages, produce responses relevant to the topic, and engage in positive social interactions using language. The conversational skills known to best facilitate peer acceptance and the development of appropriate social skills are precisely those found to be deficient in pragmatic language impaired children, such as those with ASD.

The concept of a negative social spiral is supported by behavior patterns documented by Rice et al. (1991). The authors conducted observations of preschool children's social interactions during unstructured playtime. During the observation sessions, children were able to freely choose activities and interaction partners. Results indicated that typically developing children were the preferred playmates for all interactions, suggesting that the children were aware of the relative communication skills of their peers and adjusted their choices accordingly. Children with language deficits were more likely to be ignored by their peers. In fact, as compared to 12% of peers' initiations, 28% of language-impaired children's initiations were ignored. Also, children with language impairments were less responsive to the initiations of others. Children with impaired language did not respond to 30% of initiations directed to them; typically developing

children did not respond to 7%. Lastly, children with communication deficits were less likely to initiate interactions with typically developing peers (Rice, Sell, & Hadley, 1991). These findings suggest that pragmatic language impairment can lead to social isolation. Additionally, the tendency of language impaired children to avoid communication interactions is likely to result in further pragmatic language difficulties, as these children will have fewer opportunities to learn and practice new social communication skills. The relationship between pragmatic language skill and social development has not been investigated among individuals with ASD. The current study proposes that a similar mechanism accounts for the impact of pragmatic difficulties on the negative social interactions and peer rejection of children with ASD.

Impaired social relationships lead to the development of socioemotional difficulties, such as depression (Fujiki et al., 1999). Elder et al. (2006) stated that a lack of close friends may contribute to depression. Children who experience social isolation and peer rejection are more likely to experience emotional and behavioral problems than are their well-accepted peers (Sandstrom, Cillessen, & Eisenhower, 2003). Investigations have found that children who are rejected by their peers are at increased risk for internalizing and externalizing problems, according to parent and teacher ratings. Peer rejection is associated with greater risk for aggression, depression, learned helplessness in social situations, and anxiety (Sandstrom et al., 2003). More specifically, numerous researchers have concluded that peer rejection is predictive of later depressive symptoms (Nolan, Flynn, & Garber, 2003; Reijntjes, Stegge, & Terwogt, 2006). Based on these findings, the current investigation proposes that the underlying pragmatic language difficulties experienced by children with ASD lead to an increased likelihood of social problems and peer rejection, which result in a greater risk for depressive symptomatology.

On the contrary, Sterling et al. (2008) concluded that *better* social communication skills, as measured by the ADOS social communication index, may predict more depressive symptoms in adults with ASD. However, their group selection was very broad and may have included some individuals in the "depressed" group who were not depressed. Also, their findings may have been exaggerated due to methodological limitations in their statistical analyses. The authors conducted three t-tests, but did not divide the alpha level by three to account for multiple comparisons. Had this been done, their findings would not have been significant. Alternatively, the findings presented by Sterling and colleagues may reflect the likelihood that participants with better social communication skills were also more aware of their differences and difficulties, leading to higher rates of depression. Finally, it is possible that language factors do not play as important a role in predicting depression for adults due to the salience of other factors, such as life stressors (Sterling et al., 2008).

Readers may speculate that pragmatic language and general language skills are too closely associated to determine whether pragmatics alone have a significant impact on one's risk for depression. In fact, language research indicates that a positive relationship exists between overall language ability and pragmatics. Although the development of different aspects of language may be divergent, general language ability is associated with the development of pragmatic skills (Geurts & Embrechts, 2008). On the contrary, several investigations have documented that pragmatic language ability contributes uniquely to socioemotional outcomes, after accounting for the contribution made by general language skills. Volden et al. (2009) administered a test of general language skills and a test of pragmatic language to 37 participants with ASD. They found that pragmatic language disability was the most significant predictor of social impairment for individuals with ASD. This variable accounted for 11% of the variance in social impairment.

Pragmatic language accounted for a greater portion of the variance in social outcome than did general expressive language ability (Volden et al., 2009). Furthermore, the authors found that a large portion of the variability in pragmatic language ability was not associated with general language skills. In addition, while weaker pragmatic language skills predicted social skill impairment, *higher* expressive language scores predicted more social skill problems (Volden et al., 2009). In conclusion, it is likely that having a relatively high degree of verbal fluency that is not supported by strong pragmatic skills could put a child with ASD at increased risk for depression. Although these results have yet to be replicated, they provide support for the hypothesis that adequate pragmatic ability, rather than expressive language ability, is crucial to successful socioemotional development. Based on these findings, it is likely that adding pragmatic language ability to the existing model will significantly increase the usefulness of the model in predicting depressive symptoms.

In summary, within the language domain, impaired pragmatic abilities appear to be the most closely associated with the development of co-occurring psychiatric conditions (Hyter et al., 2001). Deficits in pragmatic language are common among individuals with ASD (Paul et al., 2009; Reichow et al., 2008; Tager-Flusberg, 1989; Tager-Flusberg et al., 2005). Pragmatic impairments reported among those with ASD include poor conversational skills, inappropriate expression of emotions, and the inability to use language to meet social functions. Pragmatic skills are critical for establishing and maintaining relationships with peers, teachers, and family members (Vickerstaff et al., 2007). Pragmatic difficulties can lead to failed social interactions and, consequently, depression. Individuals with ASD, particularly those with high-functioning autism and AS, may have interest in social interactions but lack the skills to participate successfully. A history of peer rejection paired with the inability to remediate their

communication impairment may lead to depression (Sterling et al., 2008). It is critical that the current study determines the unique contribution of pragmatic language to the model, while controlling for the effects of general language ability. It is hypothesized that pragmatic ability will be related to, but independent from, general language ability. Furthermore, it is expected that pragmatic language will be a better predictor of depressive symptomatology than will general language ability.

Limitations of Previous Research

A review of the literature indicated that studies of depression in ASD have demonstrated numerous limitations. Some investigators have failed to account for confounding factors related to one's likelihood of experiencing depression, such as family history and life stressors.

Additionally, some researchers choose to rely on strict diagnostic criteria when identifying participants with depression. Using a screening tool such as the CDI that detects subclinical levels of depression may be advantageous over more rigorous criteria, such as clinical interviews or clinical diagnoses, because reliance on stricter criteria could limit the sample and prevent researchers from identifying less severe cases. Also, investigating a broader range of depressive symptoms allows investigators to determine the degree to which certain factors contribute to depression, even when the depression may not yet be fully manifested. There is a high likelihood of subclinical symptoms resulting in Major Depressive Disorder later in life; thus, when studying young children, it may be more useful to select for preliminary symptoms.

Lastly, many investigations rely on a single source of data to capture participants' behavior and abilities. For example, depression may be measured only using a child's self-report. In order to garner an accurate and reliable estimate of a person's abilities, it is critical to collect data from multiple sources using multiple methods. The current study seeks to contribute uniquely to the field of related research by investigating a novel hypothesis, the contributing role of pragmatic

language skills in the depressive symptoms of children with ASD, while avoiding the limitations commonly noted in similar studies.

Purpose of the Current Investigation

In the area of communication, research indicates that pragmatic language ability is a primary area of deficit for children and adolescents with ASD. Many children with ASD desire to establish positive social relationships with peers and family members; however, due to limitations in social communication ability, they do not engage in successful interactions. Recurring negative social interactions are likely to result in social isolation, withdrawal, and depression (Sterling et al., 2008). Furthermore, unsuccessful and infrequent social interactions can exacerbate existing pragmatic language deficits (Gallagher, 1996; Sterling et al., 2008). Thus, communication impairments, especially in the area of pragmatics, may be an important contributor to co-occurring socioemotional impairments. Acquiring a better understanding of the relationship between pragmatic language and socioemotional outcomes, specifically depressive symptoms, will enable researchers and clinicians to implement more effective treatment programs.

The current investigation will determine the degree to which the inclusion of pragmatic language among a group of predictor variables will improve the usefulness of the model in predicting depressive symptoms. The addition of pragmatic language to the predictor set is likely to improve the predictive value of the model, as it accounts for emerging evidence that pragmatic ability is related to social and psychiatric outcomes for children with ASD. If pragmatic language limitations are found to be uniquely associated with increased susceptibility to depression in this population, then remediation of pragmatic skills could lead to improved long-term life outcomes for children and adolescents with ASD.

In addition, this investigation attempted to overcome methodological limitations inherent in the assessment of pragmatic language ability by assessing this skill through the use of two assessment tools: an observational rating scale and a standardized, performance-based assessment of pragmatic behavior. These instruments provided valuable information about participants' pragmatic language ability, including emotional processing skills, discourse strategies, and goal-directed language (Russell & Grizzle, 2008).

The current study seeks to shed more light on factors associated with co-occurring depressive symptoms in ASD. This will be accomplished through an investigation of the degree of association between pragmatic language ability and depressive symptoms among children and adolescents with high-functioning ASD.

Specifically, the study will seek to answer the following research questions:

- *Question 1:* Previous research findings indicate that genetic and environmental factors, general language ability, and nonverbal cognitive ability influence the risk for depressive symptomatology among children with ASD. To what degree does the inclusion of pragmatic language ability increase the predictive power of these factors?
- *Question 2:* For what portion of the variance in depressive symptomatology does pragmatic language ability uniquely account?

CHAPTER 2
METHODS

Participants

Subjects who had participated in research at the University of Florida involving children and adolescents with ASD were recruited for the current investigation. Participants were contacted who signed a clause stating, “I would like to be contacted to participate in future studies” on their previous Informed Consent Form (IRB# 171-2007 entitled “Genetic Dissection of Restricted Repetitive Behavior”; IRB# 297-2007, entitled “Glutamate Transporter Genes and Susceptibility to Repetitive and Stereotyped Behavior and Interests in ASDs”; IRB# 383-2008, entitled “Genetic Study of Restricted Repetitive Behavior in ASD”). If such a clause was signed, a member of the research team contacted the family by phone and described the current study. The research team also recruited patients being seen at the Child and Adolescent Psychiatry Outpatient Clinic at University of Florida and the families enrolled in the University of Florida/Gainesville Center for Autism and Related Disabilities (CARD). In these cases, families learned about the study through word of mouth and through a recruitment flyer. Families who were interested in participating in the study contacted the research team by phone. Participants were recruited without regard to their likelihood of experiencing depressive symptoms. Within this group, potential participants were identified for the current study based on the inclusion and exclusion criteria described below. Fifty children participated in the investigation.

Inclusion Criteria

Age

To achieve eligibility for the current investigation, individuals were between the ages of 7 and 17 years. The age at which comorbid psychiatric conditions are likely to arise in ASD individuals is not currently known. In the typically developing population, depressive symptoms

peak between the ages of 13 and 15. However, Vickerstaff et al. (2007) measured the depressive symptomatology of 30 children with ASD between the ages of 7 and 13 and found that 24% were classified as “mildly depressed” and an additional 29% were classified as “depressed” (Vickerstaff et al., 2007). This finding suggests that symptoms of depression may arise in children with ASD very early in development. The outcome measures selected for this investigation also restrict the age range for eligible participants, which further guided the age-related inclusion criteria.

ASD diagnosis

Individuals were also required to meet the criteria for ASD based on the diagnostic criteria set forth in the Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (DSM-IV). In order to demonstrate that this standard was met, participants were required to have a clinical diagnosis of ASD, made by a pediatrician, child psychiatrist, or licensed clinical psychologist with experience in ASD diagnosis. The following diagnoses were accepted: ASD, Autistic Disorder, AS, and PDD-NOS.

Due to the symptom heterogeneity observed among individuals with ASD, diagnosis is heavily reliant on clinical judgment. In order to confirm the appropriateness of participants’ clinical diagnoses, the Autism Diagnostic Observation Schedule (ADOS) was administered. The ADOS is a semi-structured, standardized observation instrument used to assess social and communication behaviors in children suspected of having autism or ASD. It is widely used by clinicians and researchers to determine whether an individual is likely to meet diagnostic criteria for ASD (Lord, Rutter, DiLavore, & Risi, 2008). The ADOS yields a Social Communication score and a Total Score. Higher scores indicate a greater degree of impairment. The value of the ADOS Total Score is compared with cut-off criteria to place an individual into one of three diagnostic categories: Autistic Disorder, Autism Spectrum Disorder, or Non-spectrum.

Nonverbal cognitive ability

Prior to selection, all potential participants were administered a measure of nonverbal cognitive ability: the Leiter International Performance Scale – Revised (Leiter-R; Roid & Miller, 2002). Participants whose nonverbal IQ was greater than or equal to 70, as measured by the Leiter-R Brief IQ, were recruited to participate in the current research program.

Exclusionary Criteria

Potential participants who demonstrated any of the following exclusion criteria were deemed ineligible to participate in the investigation:

- ASD that is secondary to some other genetic condition.
- Any severe sensory impairment, such as vision or hearing impairment, which could impede his or her performance on study-related tasks.
- Adopted child whose family psychiatric history was not available for review.

Measures

Outcome Variable

Depressive symptoms. Participants' levels of depressive symptoms were evaluated through the use of two complementary norm-referenced rating scales: the Children's Depression Inventory – Parent report (CDI-Parent) and the Children's Depression Inventory – Self report (CDI-Self; Kovacs, 2003).

The CDI is an instrument designed to measure the presence of depressive symptomatology in children and adolescents ranging from age 7 to 17. The CDI-Self includes 27 items which are scored with a 0, 1, or 2, indicating the degree to which a symptom is present. The CDI-Parent includes 17 items presented in a similar format. Higher scores indicate a greater level of reported depressive symptomatology. Test items for the CDI-Self are written at a first grade reading level. Items evaluate cognitive, affective, and behavioral indicators of depression. Participant responses

on the CDI-Self yield five factor scores: Negative Mood, Interpersonal Problems, Ineffectiveness, Anhedonia, and Negative Self-Esteem. The CDI-Parent yields two factor scores: Functional Problems and Emotional Problems. An overall measure of depressive symptomatology, called the Total Score, is also generated by both CDI forms.

The CDI has adequate psychometric properties, including test-retest reliabilities that range from 0.54 to 0.87 and coefficient alpha ranging from 0.71 to 0.86 (Kovacs, 2003; Vickerstaff et al., 2007). Validity for the CDI is satisfactory; evidence of construct validity is acceptable, particularly for the Total Score (Sattler & Hoge, 2006). The CDI possesses good discriminative validity; when a cut-off score of 17 is used, sensitivity was found to be 80% and specificity was found to be 84% (Kovacs, 2003). Additionally, numerous investigations have documented good concurrent validity for the CDI; the CDI is strongly correlated with other measures of depressive symptoms, as well as with measures of anxiety and self-esteem (Kovacs, 2003). Separate norms were developed for older and younger children and for males and females (Barnhill, 2001). Developers of similar instruments suggest that standard scores of 60 and greater indicate that the individual is at-risk for developing depression and standard scores of 70 and greater indicate clinically significant levels of depressive symptomatology.

Use of the CDI to evaluate adolescents' levels of depressive symptomatology is endorsed by numerous research teams. The CDI has been used in investigations of depressive symptoms exhibited by typically developing youth and those with developmental disorders (Barnhill, 2001; Rudolph, Hammen, & Burge, 1994; Vickerstaff et al., 2007; Williamson, Craig, & Slinger, 2008). Use of the CDI allows researchers and clinicians to evaluate the magnitude of depressive symptoms in a quantitative manner. The CDI can also be used as a measure of change in symptoms of depression to indicate treatment effects (Barnhill, 2001; Sattler & Hoge, 2006).

Participants' self-reported and parent-reported Total Scores, measures of overall depressive symptomatology, were used in the current analysis. Analyses were run separately for each CDI Total Score and the results were interpreted accordingly.

Predictor Variables

Biological and environmental risk factors

Two primary indicators of biological and environmental risk for depression were assessed: participants' exposure to traumatic life events and participants' family history of mood disorder. Participants' exposure to traumatic life events was evaluated through the use of the Life Events Checklist (LEC), a standardized rating scale developed by the National Center for Posttraumatic Stress Disorder (PTSD). The LEC includes 16 items intended to evaluate respondents' levels of exposure to potentially traumatic events that are suspected to put individuals at risk for PTSD. For instance, the LEC assess exposure to natural disasters, physical and sexual abuse, accidents, illness or injury, and death of a loved one. An additional item is included to assess participants' exposure to any other traumatic event omitted in the scale. Participants' caregivers completed the LEC. A composite score was generated by assigning one point to any item that the caregiver indicated the child having experienced personally. Gray, Litz, Hsu, and Lombardo (2004) evaluated the psychometric properties of the LEC and concluded that the tool has adequate test-retest reliability and good convergent reliability when compared with an established measure of trauma exposure, the Traumatic Life Events Questionnaire (TLEQ). The test-retest correlation for the LEC was 0.82. When LEC items were compared with corresponding items on the TLEQ, the average kappa coefficient was 0.55, indicating good convergent reliability. No kappa coefficient was less than 0.4 (Gray et al., 2004). The authors suggested that the LEC's adequate psychometric properties make it a useful instrument for assessing individuals' exposure to potentially traumatic events.

Family history of mood disorders was obtained through parent report. The primary caregiver was asked whether anyone who is biologically related to the participant has ever been diagnosed with a mood disorder, including Major Depressive Disorder, Dysthymic Disorder, Depressive Disorder Not Otherwise Specified, Bipolar Disorders, and Other Mood Disorders. Family History was reported as a dichotomous variable reflecting a caregiver response of "yes" or "no".

Nonverbal cognitive ability

Participants' nonverbal cognitive abilities were evaluated through the use of a standardized, norm-referenced assessment tool: the Leiter International Performance Scale - Revised (Leiter-R; Roid & Miller, 2002).

The Leiter-R is a nonverbal measure of intellectual ability. Brief administration of this instrument consists of four subtests that may be administered and responded to nonverbally, allowing for the valid assessment of children for whom traditional, verbally-loaded intelligence tests are unsuitable. This includes students who are hearing impaired, have limited English proficiency, and have moderate to severe speech or language impairments. The tasks that comprise the Leiter-R include identifying a figure embedded in a larger picture, recognizing an object based on an array of its segmented parts, putting picture cards in sequential order, and selecting a picture that completes a sequence. According to the test developers, these subtests are indicators of Fluid Reasoning and Visual/Spatial abilities (Roid & Miller, 2002). The Leiter-R yields a measure of nonverbal intellectual ability called the Brief IQ. The Brief IQ contributed to the analyses in the current investigation.

The subtests of the Leiter-R possess adequate internal consistency, as do the IQ and Composite scores. Internal consistency rating for the Brief IQ is 0.88. The Leiter-R also demonstrates satisfactory test-retest reliability. Test-retest reliability correlations for the Brief IQ

range from 0.88 to 0.96, with greater reliability found when assessing youth between the ages of 11 and 20 (Roid & Miller, 2002). Investigations have documented evidence of content validity; validity based on internal structure; and validity based on correlations with other measures of nonverbal ability, verbal ability, and achievement (Braden & Athanasiou, 2005). The correlation between the Leiter-R Brief IQ and the WISC-III Full Scale IQ is 0.85. In addition, the correlations between the Leiter-R Brief IQ and commonly used achievement tests, such as the Woodcock Johnson Tests of Achievement – Revised (WJ-R) range from 0.69 to 0.82 (Roid & Miller, 2002).

General language ability

Participants' general language ability was measured using the Clinical Evaluation of Language Fundamentals – 4th Edition (CELF-4), a widely-used standardized assessment of overall language skills (Semel, Wiig, & Secord, 2003).

The CELF-4 yields the Receptive Language Index (RLI), a measure of spoken language comprehension, and the Expressive Language Index (ELI), a measure of verbal language production. The RLI consists of two to three subtests that require individuals to follow complex directions presented orally, select two words from a group that are related, and demonstrate understanding of sentences and paragraphs. The ELI consists of three subtests that require test-takers to repeat sentences presented orally, create sentences to describe a picture, and explain why two words are related.

Pearson's product-moment correlation coefficients were calculated across two test administrations to provide evidence for test-retest reliability. The reliability estimates for the RLI are good, ranging from 0.84 to 0.93. The test-retest reliability estimates for the ELI are very good, ranging from 0.87 to 0.94 (Semel, Wiig, & Secord, 2003). Coefficient alpha for the RLI and ELI are 0.89 and 0.93, respectively, indicating good internal consistency. The developers of

the CELF-4 also documented evidence for test validity, based on content, internal structure, and response process. The validity of the CELF-4 is also supported by confirmatory factor analysis. Furthermore, the index scores yielded by the CELF-4 are strongly correlated with those of its predecessor, the CELF-3 (Semel, Wiig, & Secord, 2003).

Pragmatic language ability

Participants' pragmatic language abilities were evaluated through the use of two assessment tools: an observational rating scale and a standardized, norm-referenced assessment of pragmatic knowledge. The Pragmatics Profile (PP) is a criterion-referenced observational rating scale intended to evaluate use of pragmatic language skills based on the responses of a caregiver. The PP includes 52 items that describe pragmatics based on three domains: Rituals and Conversational Skills; Asking For, Giving, and Responding to Information; and Nonverbal Communication Skills. The PP also yields an indicator of overall pragmatic abilities, the Total Raw Score. The Total Raw Score is compared with a criterion score based on the child's age to determine whether the child's pragmatic language skills are deficient.

The test developers reported that the PP has high reliability. The overall internal consistency reliability coefficient for the PP is 0.98 (Semel, Wiig, & Secord, 2003). Based on the paucity of evidence-based pragmatic assessment instruments, Russell and Grizzle (2008) reviewed 24 measurement tools designed to assess pragmatic language, including questionnaires, checklists, and tests. The authors evaluated the tools based on their ability to assess 17 core pragmatic areas, such as requests, speech characteristics and fluency, nonverbal communication, topic maintenance, conversational turn-taking, and negotiations and instructions. No one instrument evaluated all 17 competency areas. However, the PP was found to probe 13 total domains. Further, the PP was one of only four tools that assessed all of the six competency areas that were determined to be most critical by the authors. Based on this evidence of content

validity, the authors recommend the use of the PP in the assessment of pragmatic language skills (Russell & Grizzle, 2008).

In order to garner a more comprehensive estimate of each subject's pragmatic language ability, a performance-based indicator of pragmatic knowledge was also administered. The Comprehensive Assessment of Spoken Language (CASL) is a standardized, norm-referenced evaluation tool used in the assessment of overall expressive language skills (Carrow-Woolfolk, 1999). The CASL is comprised of 15 subtests that evaluate the comprehension, expression, and retrieval skills of individuals between the ages of 3 and 21. Two subtests of the CASL, Pragmatic Judgment and Inference, were used to estimate participants' pragmatic language abilities. Tasks that comprise the Pragmatic Judgment and Inference subtests require participants to generate appropriate conversational responses and use background knowledge to answer questions about a situation.

Internal reliability estimates for the Pragmatic Judgment and Inference subtests range from 0.77 to 0.92. Test-retest reliabilities range from 0.66 to 0.84. The CASL also demonstrates evidence of adequate content validity and construct validity, based on progression of scores based on age, intercorrelations among subtests, and factor analysis. In fact, the Inference and Pragmatic Judgment subtests have intercorrelations that range from 0.59 to 0.67, indicating a relationship that is strong enough to support their combined use but weak enough to suggest that they are measuring slightly different abilities (Carrow-Woolfolk, 1999). Use of these subtests as a complement to traditional caregiver rating skills in the evaluation of pragmatics is recommended by Reichow and colleagues (2008). A comparison indicated that, when both measures are administered to children with ASD, the Pragmatic Judgment and Inference subtests were significantly correlated with the Communication and Social domains of the Vineland

Adaptive Behavior Scales, a parent report of adaptive social communication. Higher scores on the CASL subtests predicted higher Vineland scores. These results support the use of the Pragmatic Judgment and Inference subtests as a performance-based measure of pragmatic language abilities (Reichow et al., 2008).

Procedure

The primary caregiver of each potential participant was contacted via telephone by the investigator. At that time, the child was assessed to determine whether he or she met the inclusion criteria based on parent report. The investigator also determined whether the child was ineligible for the study based on exclusion criteria. A study visit was then scheduled for participants who were deemed likely to meet eligibility standards.

Participation required one study visit, which took place in a private examination room at the University of Florida Psychiatry Research Clinic. First, the investigator reviewed the informed consent form with the participant and his or her parent or caregiver. The caregiver read and signed the consent form. If possible, minor participants provided assent to participate in the study.

After their caregivers provided consent, participants were administered the Leiter-R by a trained examiner. The Leiter-R yields a Brief IQ score. Leiter-R administration took approximately 30 minutes and occurred in a private examination room.

Then, the caregiver was given three rating scales to complete: the CDI-Parent, the PP, and the LEC. The caregiver was also asked to provide information regarding family history of mood disorders. The caregiver was asked whether anyone who is biologically related to the participant had ever been diagnosed with a mood disorder, including Major Depressive Disorder, Dysthymic Disorder, Depressive Disorder Not Otherwise Specified, Bipolar Disorders, and Other Mood Disorders.

While the caregiver was completing the rating scales, the child or adolescent participant engaged in four assessment tasks: (1) completing the CDI-Self, (2) administration of two subtests of the CASL, (3) administration of the RLI and ELI of the CELF-4, and (4) administration of the ADOS.

Completion of the study tasks took approximately three hours. The direct assessment tasks with each child took approximately two hours. Upon completion of the investigation, participants were debriefed and excused.

Statistical Analyses

As stated previously, the primary goal of the current investigation is to determine what portion of the variability in depressive symptomatology experienced by children and adolescents with ASD is accounted for by variations in pragmatic language ability, when variance accounted for by biological and environmental factors, general expressive language ability, and nonverbal IQ are controlled. Thus, the outcome measures are the participant's CDI-Parent and CDI-Self Total scores. Independent variables include: (1) the participant's total score on the LEC (*LEC*), (2) a dichotomous indicator of family history of mood disorders (*Fam*), dummy coded where "no"=0 and "yes"=1, (3) the Expressive Language Index of the CELF-4 (*ELI*), an indicator of general language ability, (4) Brief IQ, as measured by the Leiter-R (*NVIQ*), (5) a measure of pragmatic language use in real-world contexts (PP Total Raw Score), and (6) and (7) the child's CASL Inference and Pragmatic Judgment subtest standard scores (mean of 100 and standard deviation of 15), denoting the child's ability to demonstrate pragmatic rules in a standardized setting.

SPSS® Version 16.0 was used for all statistical analyses.

Descriptive Statistics

In order to fully describe the sample in terms of the variables of interest, means, standard deviations, and ranges were calculated for all dependent and independent variables. Standard deviations indicate whether restriction of range occurred during the data collection phase.

Correlational Analyses

A Pearson's product-moment correlation matrix was constructed, indicating the zero-order correlations between the variables. Correlational analyses also served as an indicator of multicollinearity between the independent variables.

Hierarchical Multiple Regression

Hierarchical multiple regression analyses were used to predict depressive symptomatology based on the variables of interest: biological and environmental risk, general expressive language ability, nonverbal cognitive ability, and pragmatic language ability. Analyses were conducted at the ($p < .05$) significance level. Four regression analyses were conducted: two which included CDI-Parent Total Score as the outcome variable and two which included CDI-Self Total Score as the outcome variable.

Hierarchical multiple regression has the capacity to address the research questions because it allows researchers to enter the predictor variables in the order of their choice, allowing for an evaluation of the relative contribution of each. The relative contribution of classes of variables was tested by entering the variables in three blocks. First, participants' age in months was entered into the regression analysis. This was done to ensure that the variance in participants' scores on the assessment measures that is due to their chronological age was controlled.

The next set of variables entered into the regression model was those that have been proposed by previous investigations: biological and environmental factors (Fam and LEC), general expressive language skill (ELI), and nonverbal cognitive ability (NVIQ). Because

previous research has not unequivocally determined the relative contributions of each predictor, these variables were entered simultaneously.

Then, a second group of predictor variables was entered into the model. For each outcome variable (CDI-Parent and CDI-Self), one regression analysis was conducted in which three indicators of pragmatic language ability were included in the third block. These indicators included participants' CASL Inference and Pragmatic Judgment subtest standard scores and PP Total Raw Scores. Then, both analyses were conducted again, this time with the PP Total Raw Score entered alone in the third block to determine whether this measure alone provided any additional predictive value to the model beyond the variables included in blocks one and two. Table 2-1 illustrates the variables included for each regression analysis.

Table 2-1. Variables included in four hierarchical regression analyses

Regression model	Outcome variable	Order of entry	Predictor(s)
1	CDI-Parent Total Score	Block 1	Age in months
		Block 2	Life Events Checklist
			Family history
			CELF-4 ELI
			Leiter-R Brief IQ
		Block 3	CASL: Inference
			CASL: Pragmatic judgment
			PP Total Raw Score
2	CDI-Parent Total Score	Block 1	Age in months
		Block 2	Life Events Checklist
			Family history
			CELF-4 ELI
			Leiter-R Brief IQ
		Block 3	PP Total Raw Score
3	CDI-Self Total Score	Block 1	Age in months
		Block 2	Life Events Checklist
			Family history
			CELF-4 ELI
			Leiter-R Brief IQ
		Block 3	CASL: Inference
			CASL: Pragmatic judgment
			PP Total Raw Score
4	CDI-Self Total Score	Block 1	Age in months
		Block 2	Life Events Checklist
			Family history
			CELF-4 ELI
			Leiter-R Brief IQ
		Block 3	PP Total Raw Score

Note. CDI = Children's Depression Inventory; CELF-4 = Clinical Evaluation of Language Fundamentals – Fourth Edition; ELI = Expressive Language Index; Leiter-R = Leiter International Performance Scale – Revised; CASL = Comprehensive Assessment of Spoken Language; PP = Pragmatics Profile.

CHAPTER 3
RESULTS

The results obtained from these analyses are presented in three increments. First, descriptive statistics are presented for the demographic variables, outcome variables, and predictor variables. Then, results of the correlational analyses are presented, describing the relationships between the variables investigated in the study. Partial correlations are also presented, describing the unique relationships between the pragmatic language measures and depressive symptoms when other risk factors are ruled out. Finally, results of the hierarchical multiple regression analyses are presented, allowing for an evaluation of (1) the improvement in the model following the inclusion of the pragmatic language variables and (2) the amount of variability in depressive symptomatology that is accounted for by the predictor variables.

Descriptive Statistics

Demographic Variables

Tables 3-1 through 3-3 describe the sample in terms of three demographic variables: gender, clinical diagnosis, and ADOS classification. Table 3-1 illustrates that more males participated in the study than did females. Specifically, 80% of the participants were male (n=40) and 20% were female (n=10). This proportion is similar to the relative prevalence of ASD found in the general population. Volkmar and Klin (2005) reported that ASD is approximately five times more prevalent among males than females. Furthermore, according to the CDC (2009), males are four to five times more likely to be diagnosed with ASD than are females. Table 3-2 illustrates the relative frequency with which each clinical diagnostic category was represented in the participant sample. The majority of participants had received clinical diagnoses of Asperger Syndrome (30%; n=15), followed by Autistic Disorder (28%; n=14) and PDD-NOS (24%; n=12). The least common diagnostic category represented was ASD (14%; n=7). ASD is an

umbrella category that is not listed in the DSM-IV. This diagnostic label is occasionally used when one's clinical diagnosis is unclear; thus, it is likely that the majority of clinicians selected a more specific classification for their patients. Of note, caregivers of two participants did not report their child's clinical diagnosis. However, both participants who are missing clinical diagnostic information exceeded the ADOS criteria for Autistic Disorder. Thus, despite missing clinical labels, the representativeness of the sample is believed to be intact. Table 3-3 illustrates the ADOS classification provided for each participant based on a sample of behavior that was observed and coded during their study session. According to these results, 56% of the sample met ADOS classification criteria for Autistic Disorder (n=28), 36% met criteria for ASD (n=18), and 8% did not meet criteria for any spectrum disorder (n=4). Thus, four participants did not obtain a classification of ASD based on their behavior during the ADOS assessment. This trend can be explained by the parameters of the study. Because the study sought participants with cognitive abilities within the normal range who had sufficient language ability to respond to a standardized assessment instrument, many participants were high-functioning and did not present with classical indicators of ASD, particularly during a brief behavior sample.

Outcome Variables

Table 3-4 displays descriptive statistics for two outcome variables: CDI-Parent Total Score and CDI-Self Total Score. The scores presented are T-scores, which are normally distributed with a mean of 50 and a standard deviation of 10. Among study participants, the mean CDI-Parent score was 60.9 and the standard deviation was 11.1. These findings indicate that, according to parent report, the sample demonstrated a greater degree of depressive behaviors than were seen in the normative sample. Furthermore, the sample data was more highly concentrated in the above average range than was expected based on the normative data. Approximately 68% of the sample had CDI-Parent scores between 49 and 71.

The mean CDI-Self score for the sample was 54.1 and the standard deviation was 13.8. These scores are similar to those found in the normative sample, indicating that children who participated in the study reported similar levels of depressive symptoms to children in the normative sample. Self-report measures must be interpreted with caution, particularly when used with children with communication disabilities, such as ASD. It is likely that some children did not understand the test items. In addition, children are often inaccurate when providing self reports of behavior (Russell & Sofronoff, 2005).

In order to further describe the depressive symptoms reported for the study sample, frequency counts were calculated for three descriptive categories: Within normal limits, At-risk, and Clinically significant. According to the test developers, scores of 60 and above suggest that a child's depressive symptoms are in the at-risk range. Scores of 70 and above indicate that a child's depressive symptoms are clinically significant (Kovacs, 2003). The frequencies with which participants were rated in each of these categories are documented in Tables 3-5 and 3-6. Results indicate that parents reported clinically significant depression in 22% of the sample and at-risk levels of depression in an additional 30% of participants. According to self-reports, 10% of participants experienced depressive symptoms in the clinically significant range; an additional 16% reported that they may be at-risk for depression.

Predictor Variables

Table 3-7 includes descriptive statistics for the following predictor variables: age in months, NVIQ, ELI, LEC, Fam, PP Total Raw Score, CASL: Inference Standard Score and CASL: Pragmatic Judgment Standard Score.

The results obtained indicate that the mean age of the participants was 138.7 months, which corresponds to approximately 11 years, 6 months. The standard deviation is 36.9. Thus, the ages of study participants were widely distributed across a range from 85 to 215 months.

The mean nonverbal IQ of participants was 91.5 with a standard deviation of 16.9, indicating that the majority of participants had nonverbal intellectual abilities between 75 and 108. These scores suggest that participants' nonverbal cognitive functioning ranged from the below average to average range.

The mean ELI of the study participants was 81.3 with a standard deviation of 26.6. This suggests that expressive language skills were highly variable across participants. On average, expressive language skills of study participants were lower than what would be expected based on the performance of age-matched peers in the normative sample.

Most participants were reported to have experienced very few traumatic life events, as indicated by a mean LEC score of 1.5. In contrast, the majority of participants were reported to have a family history of mood disorder. Specifically, the mean of Family History ratings was 0.73. An examination of frequencies (Table 3-8) indicates that 72% of participants had a family history significant for mood disorders (n=36), 24% did not (n=12), and 4% opted not to respond (n=2).

The PP Total Raw Score provides an unstandardized indicator of the pragmatic language skills that an individual has been observed to use in natural settings. Results presented in Table 3-7 indicate that the mean PP Total Raw Score among study participants was 114.9. Furthermore, the CASL: Inference and CASL: Pragmatic Judgment subtest standard scores measure the pragmatic language knowledge that an individual possesses and can demonstrate in structured settings. The mean CASL: Inference and CASL: Pragmatic Judgment scores were 78.1 and 73.4, respectively. These scores indicate that, on average, participants' pragmatic knowledge was lower than what would be expected based on their chronological ages. Standard

deviations for the CASL subtest scores were 22.9 (Inference) and 23.3 (Pragmatic Judgment), suggesting that participants varied widely in their knowledge of pragmatic language rules.

Correlational Analyses

Pearson's Product Moment Correlations

Table 3-9 displays correlations between the outcome and predictor variables included in this investigation. The outcome variables were participants' CDI-Parent Total Scores and CDI-Self Total Scores. Correlational analyses indicate that participants' CDI-Self Total Scores were not significantly correlated with any predictor variable. Notably, CDI-Self Total Scores were not significantly correlated with CDI-Parent Total Scores ($r = .16$, $p > .05$), indicating that an individual's depressive symptomatology, as measured by the CDI, is likely to differ based on the respondent.

Participants' CDI-Parent Total Scores were significantly correlated with three predictor variables: Age in months ($r = .33$, $p <.05$), LEC ($r = .48$, $p < .01$) and PP Total Raw Score ($r = -.29$, $p < .05$). Older participants were reported to experience more depressive symptoms. As expected, children who reportedly experienced more traumatic life events displayed more behaviors suggestive of depression. Surprisingly, no relationship was discerned between parent-reported symptoms of depression and family history of mood disorders. Also, in contrast to previous investigations suggesting a relationship between expressive language skill and emotional/behavioral disorders (e.g. Howlin et al., 2000; Prizant et al., 1999), no relationship was found between ELI and CDI-Parent Total Score. Most noteworthy is the significant, though weak to moderate, relationship between CDI-Parent Total Scores and PP Total Raw Scores. Based on these results, participants with more well-developed pragmatic language skills were less likely to experience symptoms of depression.

Among predictor variables, several significant relationships were identified. First, all of the standardized, norm-referenced assessment measures were found to be significantly correlated. The NVIQ score was significantly and strongly related to ELI ($r = .52$, $p < .01$) and CASL: Inference ($r = .51$, $p < .01$) and was significantly and moderately related to CASL: Pragmatic Judgment ($r = .45$, $p < .05$). CASL: Inference and CASL: Pragmatic Judgment scores were significantly and very strongly correlated ($r = .84$, $p < .01$). Likewise, participants' ELI scores were significantly and strongly correlated with both CASL: Inference ($r = .79$, $p < .01$) and CASL: Pragmatic Judgment ($r = .81$, $p < .01$) subtest standard scores.

For exploratory purposes, Pearson's Product Moment Correlations were also calculated between the outcome variables and all possible indicators of pragmatic language. The findings are displayed in Table 3-10. Pragmatic language variables included the PP, CASL: Inference, CASL: Pragmatic Language and the ADOS Social-Communication score. The ADOS Social-Communication score was included based on its frequent use as a measurement of social language abilities among individuals with ASD. It was expected that the ADOS Social-Communication score would be strongly related to other measure of pragmatic language. This prediction was partially supported. The ADOS Social-Communication score was significantly associated with the CASL: Inference ($r = -.37$, $p < .01$) and CASL: Pragmatic Judgment ($r = -.48$, $p < .01$) subtest standard scores. However, it was not significantly correlated with participants' PP scores ($r = .07$, $p > .05$). Thus, it remains unclear whether the ADOS could be used as a stand-alone measure of pragmatic language ability in individuals with ASD. Of note, the ADOS Social-Communication score was not significantly correlated with parent- or self-reported symptoms of depression.

Partial Correlations

Bivariate correlational analyses indicated a significant association between symptoms of depression and pragmatic language use, as reported by parents. However, it is possible that relationships between predictors (e.g. PP Total Raw Score and ELI) could influence Pearson's Product-Moment correlations. In order to further investigate the relationship between pragmatics and depressive symptoms, partial correlations were conducted between measures of depression and measures of pragmatic language skills, while controlling for other suspected predictors (age, NVIQ, ELI, LEC, and Fam). Table 3-11 presents the partial correlations between CDI-Parent Total Score and measures of pragmatic language, controlling for age, NVIQ, ELI, LEC, and Fam. In accord with the bivariate correlational analysis, the only predictor found to be significantly associated with depressive symptoms was the PP Total Raw Score ($r = -.34$, $p < .05$). Furthermore, removing the influence of the other predictors led to an increase in the strength of the relationship. This finding indicates that the variance in CDI-Parent explained by PP Total Raw Score is stronger after controlling for other variables.

Table 3-12 displays the partial correlations between CDI-Self Total Score and measures of pragmatic language, controlling for age, NVIQ, ELI, LEC, and Fam. No significant relationships were revealed. This finding is consistent with the outcome of the bivariate correlational analysis.

Hierarchical Multiple Regression

Four hierarchical multiple regression analyses were conducted to examine whether measures of pragmatic language predict a significant portion of the variance in depressive symptoms, beyond the contributions of predictors supported by previous research (i.e., age, nonverbal IQ, expressive language skill, life stress, family history of mood disorder). For all regression analyses, age in months was entered in the first block. Predictors with established

research support were entered in the second block. Finally, measures of pragmatic language were entered in the third block. As depicted in Table 2-1, the analyses differed in regards to the outcome variables and the pragmatic language measures. The first two analyses investigate the utility of the set of independent variables in predicting parent-reported depressive symptoms. The second set of analyses investigates the prediction of self-reported depressive symptoms. Within each set, one regression analysis includes all three measures of pragmatic language in the final block and one includes only PP Total Raw Score in the final block. PP Total Raw Score was included as the sole measure of pragmatic language ability for these analyses based on results of correlational analyses indicating that this measure was the only predictor, besides LEC, which had a significant relationship with either outcome variable. Furthermore, the surprising lack of statistical association between PP Total Raw Score and the CASL subtests suggests that these measures may not be assessing the same capacity.

Of note, an analysis of multicollinearity was conducted for all regression analyses, including variance inflation factor (VIF) and tolerance. According to the criteria set forth by Field (2005), no serious concerns were noted for any predictors. Further, all Durbin-Watson statistics were between 1 and 3, indicating that the assumption of independent errors was met for all analyses. Visual inspection of scatterplots suggested no concerns with normal distribution, linearity, or homoscedasticity.

Parent Report of Depression

Regression 1

Table 3-13 displays the results of the hierarchical regression for CDI-Parent, which includes all three indicators of pragmatic language. According to these findings, it can be concluded that the full model accounted for 42.8% of the variance in parent-reported symptoms of depression. Furthermore, the analysis yielded an F-ratio of 3.65 ($p < .01$), indicating that the

full model significantly improves prediction of CDI-Parent, beyond using the mean as an indicator of "best guess". In the first block, age in months was a significant predictor of CDI-Parent Total Score ($R^2 = .12$, Adjusted $R^2 = .10$, $p < .05$), predicting 12% of the variance in the outcome measure. The inclusion of the previously investigated set of predictors in the second block predicted an additional 22% of the variance, representing a significant improvement in prediction ($R^2 = .22$, Adjusted $R^2 = .27$, $p < .05$). The pragmatic measures included in the third block did not significantly improve the predictive power of the model ($R^2 = .08$, Adjusted $R^2 = .31$, $p > .05$). Within the full model, two predictors were found to make significant contributions: LEC (ß = .46, $p < .01$) and PP Total Raw Score (ß = -.29, $p < .05$).

Unique contribution of Pragmatics Profile: Regression 2

Table 3-14 displays the results obtained from the multiple hierarchical regression for CDI-Parent including PP Total Raw Score as the sole indicator of pragmatic language ability. The full model was responsible for 42% of the variance in parent-reported depressive symptoms. An F-ratio of 4.98 ($p < .001$) indicates that the model represents a significant improvement in predictive power beyond the mean. Age in months accounted for 12% of the variance in CDI-Parent when entered in the first block ($p < .05$). The set of predictors entered in the second block predicted an additional 22% ($p < .05$); however, LEC was the only significant contributor ($p < .01$). Including PP Total Raw Score in the third block proved to add significant predictive power to the model, accounting for an additional 7.7% ($p < .05$). Within the full model, the only significant predictors were LEC (ß = .47, $p < .01$) and PP Total Raw Score (ß = -.29, $p < .05$).

Self Report of Depression

Regression 3

Table 3-15 presents the multiple hierarchical regression for CDI-Self, which includes all three indicators of pragmatic language. These findings demonstrate that the full model did not

significantly predict variance in self-reported symptoms of depression for children with ASD. This finding is further supported by an F-ratio of .27 ($p > .05$), indicating that the full model did not improve prediction of CDI-Self, beyond using the mean as an indicator of "best guess". Age in months was not a significant predictor of CDI-Self Total Score ($R^2 = .00$, Adjusted $R^2 = -.03$, $p > .05$). The inclusion of the previously-investigated set of predictors in the second block was also not a significant improvement, predicting an additional 1% of the variance ($R^2 = .01$, Adjusted $R^2 = -.14$, $p > .05$). The pragmatic measures included in the third block did not significantly improve the predictive power of the model ($R^2 = .06$, Adjusted $R^2 = -.18$, $p > .05$); however, this contribution was greater than any of the previously entered variable groups. Within the full model, no predictors were found to make significant contributions.

Unique contribution of Pragmatics Profile: Regression 4

Table 3-16 displays the results of the multiple hierarchical regression for CDI-Self including PP Total Raw Score as the sole indicator of pragmatic language ability. The full model did not significantly predict variance in self-reported depressive symptoms ($p > .05$). An F-ratio of .16 ($p > .05$) further confirms that the model was not an improvement in prediction beyond "best guess". Age in months was not a significant predictor of CDI-Self Total Score ($R^2 = .00$, Adjusted $R^2 = -.03$, $p > .05$). The set of predictors entered in the second block was also not a significant improvement ($R^2 = .01$, Adjusted $R^2 = -.14$, $p > .05$). When included in the third block, PP Total Raw Score did not significantly improve the predictive power of the model ($R^2 = .03$, Adjusted $R^2 = -.15$, $p > .05$). Within the full model, no predictors were found to make significant contributions.

Table 3-1. Frequencies for demographic variables: Gender

		Frequency	Percent
Valid	Male	40	80
	Female	10	20
	Total	50	100

Table 3-2. Frequencies for demographic variables: Clinical diagnosis

		Frequency	Percent
Valid	ASD	7	14
	Autistic Disorder	14	28
	Asperger Syndrome	15	30
	PDD-NOS	12	24
	Missing	2	4
	Total	50	100

Note. ASD = Autism Spectrum Disorder; PDD-NOS = Pervasive Developmental Disorder – Not Otherwise Specified.

Table 3-3. Frequencies for demographic variables: Autism Diagnostic Observation Schedule (ADOS) classification.

		Frequency	Percent
Valid	ASD	18	36
	Autistic Disorder	28	56
	Nonspectrum	4	8
	Total	50	100

Note. ASD = Autism Spectrum Disorder.

Table 3-4. Descriptive statistics for outcome variables

Variable	*N*	*M*	*SD*	Range
CDI -Parent total score	50	60.9	11.1	40 – 84
CDI-Self total score	42	54.1	13.8	38 – 100

Note. Maximum score = 100. CDI = Children's Depression Inventory.

Table 3-5. Frequencies for outcome variable: Children's Depression Inventory -Parent

		Frequency	Percent
Valid	Clinically significant	11	22
	At-risk	15	30
	Within normal limits	24	48
	Total	50	100

Table 3-6. Frequencies for outcome variable: Children's Depression Inventory -Self

		Frequency	Percent
Valid	Clinically significant	5	10
	At-risk	8	16
	Within normal limits	29	58
	Missing	8	16
	Total	50	100

Table 3-7. Descriptive statistics for predictor variables

Variable	*N*	*M*	*SD*	Range
Age in months	50	138.7	36.9	85 – 215
Leiter-R Brief IQ	50	91.5	17.0	70 – 126
CELF-4 ELI	50	81.3	26.6	45 – 134
Life Events Checklist	49	1.5	1.4	0 – 5
Family history of mood disorder	48	.7	.4	0 – 1
CASL: Inference	50	78.1	22.9	40 – 138
CASL: Pragmatic judgment	50	73.4	23.3	40 – 122
PP Total Raw Score	49	114.9	21.9	80 – 177

Note. Maximum score for PP Total Raw Score = 208. CELF-4 = Clinical Evaluation of Language Fundamentals – Fourth Edition; ELI = Expressive Language Index; Leiter-R = Leiter International Performance Scale – Revised; CASL = Comprehensive Assessment of Spoken Language; PP = Pragmatics Profile.

Table 3-8. Frequencies for outcome variable: Family history of mood disorders

		Frequency	Percent
Valid	Yes	36	72
	No	12	24
	Missing	2	4
	Total	50	100

Table 3-9. Pearson product-moment correlations between outcome and predictor variables

	1	2	3	4	5	6	7	8	9	10
1. CDI -P Total	1.00									
2. CDI-S Total	.16	1.00								
3. Age in months	.33*	.03	1.00							
4. Leiter-R Brief IQ	-.08	-.05	-.15	1.00						
5. CELF-4 ELI	.20	-.01	.28*	.52**	1.00					
6. Life Events Checklist	.48**	-.07	.24	.15	.11	1.00				
7. Family history	.17	.01	.40**	.06	.08	.40**	1.00			
8. CASL: Inference	.08	.06	-.02	.51**	.79**	-.01	-.11	1.00		
9. CASL: Pragmatic judgment	.19	.08	.03	.45**	.81**	.07	-.14	.84**	1.00	
10. PP Total Raw Score	-.29*	-.12	.00	.10	.14	-.13	-.24	.23	.09	1.00

Note. *$p < .05$; **$p < .01$. CDI = Children's Depression Inventory; CELF-4 = Clinical Evaluation of Language Fundamentals – Fourth Edition; ELI = Expressive Language Index; Leiter-R = Leiter International Performance Scale – Revised; CASL = Comprehensive Assessment of Spoken Language; PP = Pragmatics Profile.

Table 3-10. Pearson product-moment correlations between outcome and pragmatic language variables

	1	2	3	4	5	6
1. CDI -P Total	1.00					
2. CDI-S Total	.16	1.00				
3. CASL: Inference	.08	.06	1.00			
4. CASL: Pragmatic judgment	.19	.08	.84**	1.00		
5. PP Total Raw Score	-.29*	-.12	.23	.09	1.00	
6. ADOS Social-Communication	-.22	-.20	-.37**	-.48**	.07	1.00

Note. *$p < .05$; **$p < .01$. CDI = Children's Depression Inventory; ADOS Social-Communication = Autism Diagnostic Observation Schedule – Social-Communication Score; CASL = Comprehensive Assessment of Spoken Language; PP = Pragmatics Profile.

Table 3-11. Partial correlations between CDI -P and variables measuring pragmatic language controlling for age, Leiter-R Brief IQ, CELF-4 ELI, Life Events Checklist, and family history

	1	2	3	4
1. CDI-Parent Total	1.00			
2. CASL: Inference	.01	1.00		
3. CASL: Pragmatic judgment	.13	.49**	1.00	
4. PP Total Raw Score	-.34*	.16	-.09	1.00

Note. *$p < .05$; **$p < .01$. CDI = Children's Depression Inventory; CELF-4 = Clinical Evaluation of Language Fundamentals – Fourth Edition; ELI = Expressive Language Index; Leiter-R = Leiter International Performance Scale – Revised; CASL = Comprehensive Assessment of Spoken Language; PP = Pragmatics Profile.

Table 3-12. Partial correlations between CDI -S and variables measuring pragmatic language controlling for age, Leiter-R Brief IQ, CELF-4 ELI, Life Events Checklist, and family history

	1	2	3	4
1. CDI-Self Total	1.00			
2. CASL: Inference	.14	1.00		
3. CASL: Pragmatic judgment	.19	.51**	1.00	
4. PP Total Raw Score	-.13	.12	-.14	1.00

Note. *$p < .05$; **$p < .01$. CDI = Children's Depression Inventory; CELF-4 = Clinical Evaluation of Language Fundamentals – Fourth Edition; ELI = Expressive Language Index; Leiter-R = Leiter International Performance Scale – Revised; CASL = Comprehensive Assessment of Spoken Language; PP = Pragmatics Profile.

Table 3-13. Regression 1: Hierarchical regression predicting Children's Depression Inventory - Parent total score (N=50)

Predictor variables	B	SE	ß	Block ΔR^2
Step 1 Age				
Age in months	0.11	0.04	0.35*	0.12*
Step 2 Previously reported predictors				0.22*
Age in months	0.05	0.05	0.17	
Leiter-R Brief IQ	-0.18	0.11	-0.26	
CELF-4 ELI	0.09	0.07	0.21	
Life Events Checklist	3.84	1.08	0.49**	
Family history	-2.29	3.67	-0.09	
Step 3 Pragmatic language ability				0.08
Age in months	0.07	0.05	0.22	
Leiter-R Brief IQ	-0.16	0.10	-0.24	
CELF-4 ELI	0.04	0.12	0.10	
Life Events Checklist	3.57	1.07	0.46**	
Family history	-3.51	3.80	-0.14	
CASL: Inference	0.01	0.13	0.03	
CASL: Pragmatic judgment	0.07	0.13	0.14	
PP Total Raw Score	-0.15	0.07	-0.29*	

Note. Total Adjusted $R^2 = .31$. $F(8, 39) = 3.65$. *$p < .05$; **$p < .01$. CDI = Children's Depression Inventory; CELF-4 = Clinical Evaluation of Language Fundamentals – Fourth Edition; ELI = Expressive Language Index; Leiter-R = Leiter International Performance Scale – Revised; CASL = Comprehensive Assessment of Spoken Language; PP = Pragmatics Profile.

Table 3-14. Regression 2: Hierarchical regression predicting Children's Depression Inventory - Parent total score (N=50)

Predictor variables	B	SE	ß	Block ΔR^2
Step 1 Age				0.12*
Age in months	0.11	0.04	0.35*	
Step 2 Previously reported predictors				0.22*
Age in months	0.05	0.05	0.17	
Leiter-R Brief IQ	-0.18	0.11	-0.26	
CELF-4 ELI	0.09	0.07	0.21	
Life Events Checklist	3.84	1.08	0.49*	
Family history	-2.29	3.67	-0.09	
Step 3 Pragmatic language ability				0.08*
Age in months	0.06	0.05	0.19	
Leiter-R Brief IQ	-0.17	0.10	-0.25	
CELF-4 ELI	0.10	0.07	0.24	
Life Events Checklist	3.66	1.03	0.47*	
Family istory	-4.17	3.58	-0.17	
PP Total Raw Score	-0.15	0.06	-0.29*	

Note. Total Adjusted $R^2 = .34$. $F(6, 41) = 4.98$. *$p < .05$; **$p < .01$. CDI = Children's Depression Inventory; CELF-4 = Clinical Evaluation of Language Fundamentals – Fourth Edition; ELI = Expressive Language Index; Leiter-R = Leiter International Performance Scale – Revised; CASL = Comprehensive Assessment of Spoken Language; PP = Pragmatics Profile.

Table 3-15. Regression 3: Hierarchical regression predicting Children's Depression Inventory - Self total score (N=40)

Predictor variables	B	SE	ß	Block ΔR^2
Step 1 Age				0.00
Age in months	0.01	0.06	0.03	
Step 2 Previously reported predictors				0.01
Age in months	0.00	0.08	0.01	
Leiter-R Brief IQ	-0.03	0.18	-0.04	
CELF-4 ELI	0.00	0.11	0.00	
Life Events Checklist	-0.91	1.82	-0.10	
Family history	1.59	6.84	0.05	
Step 3 Pragmatic language ability				0.06
Age in months	0.03	0.09	0.08	
Leiter-R Brief IQ	-0.03	0.18	-0.04	
CELF-4 ELI	-0.17	0.20	-0.32	
Life Events Checklist	-1.17	1.90	-0.12	
Family history	2.57	7.42	0.08	
CASL: Inference	0.10	0.22	0.16	
CASL: Pragmatic judgment	0.14	0.22	0.24	
PP Total Raw Score	-0.08	0.12	-0.13	

Note. Total Adjusted R^2 = -.18. $F(8, 31) = 0.27$. *$p < .05$; **$p < .01$. CDI = Children's Depression Inventory; CELF-4 = Clinical Evaluation of Language Fundamentals – Fourth Edition; ELI = Expressive Language Index; Leiter-R = Leiter International Performance Scale – Revised; CASL = Comprehensive Assessment of Spoken Language; PP = Pragmatics Profile.

Table 3-16. Regression 4: Hierarchical regression predicting Children's Depression Inventory - Self total score (N=40)

Predictor variables	B	SE	ß	Block ΔR^2
Step 1 Age				0.00
Age in months	0.01	0.06	0.03	
Step 2 Previously reported predictors				0.01
Age in months	0.00	0.08	0.01	
Leiter-R Brief IQ	-0.03	0.18	-0.04	
CELF-4 ELI	0.00	0.11	0.00	
Life Events Checklist	-0.91	1.82	-0.10	
Family history	1.59	6.84	0.05	
Step 3 Pragmatic language ability				0.02
Age in months	0.00	0.08	0.01	
Leiter-R Brief IQ	-0.03	0.18	-0.04	
CELF-4 ELI	0.01	0.11	0.03	
Life Events Checklist	-1.02	1.83	-0.11	
Family history	0.78	6.96	0.03	
PP Total Raw Score	-0.09	0.11	-0.14	

Note. Total Adjusted R^2 = -.15. $F(6, 33) = .16$. *$p < .05$; **$p < .01$. CDI = Children's Depression Inventory; CELF-4 = Clinical Evaluation of Language Fundamentals – Fourth Edition; ELI = Expressive Language Index; Leiter-R = Leiter International Performance Scale – Revised; CASL = Comprehensive Assessment of Spoken Language; PP = Pragmatics Profile.

CHAPTER 4
DISCUSSION

Children with ASD are at increased risk for experiencing depression and other psychiatric comorbidities (Ghazuiddin et al., 2002; Sterling et al., 2008; Vickerstaff et al., 2007). Little is known about factors likely to contribute to the depressive symptomatology experienced by children with ASD. Previous research has postulated that expressive language skill, cognitive functioning, and environmental and biological risk factors may affect children's susceptibility to depression (Benner et al., 2002; Gallagher, 1996; Geurts & Embrechts, 2008). The current study utilized hierarchical multiple regression to assess whether pragmatic language ability, when considered alongside the previously reported factors, can be of use in predicting depressive symptoms among children and adolescents with ASD. It was hypothesized that including measures of pragmatic language ability in the regression model would increase the usefulness of the model in predicting depressive symptomatology. The investigators predicted that children with better pragmatic language ability would be found to exhibit fewer symptoms of depression.

Key Findings

Previous research has yielded inconsistent results regarding the presence of psychiatric comorbidities among children with ASD. For example, Vickerstaff et al. (2007) estimated that 29% of their sample of children with high-functioning autism exhibited a clinical level of depressive symptoms; further, an additional 24% demonstrated subclinical depressive symptoms. In contrast, Barnhill (2001) reported more modest rates of depression in a sample of adolescents with Asperger Syndrome. Research findings vary widely in terms of estimated prevalence rates of psychiatric disorders and risk factors for comorbid disorders. In addition, researchers utilize various assessment techniques to measure comorbidities. Thus, further study in this field is

needed to both confirm previous findings and provide preliminary evidence for new areas of inquiry.

Two novel research questions were proposed by the investigators. In addition to addressing these questions, the current findings illuminated important information regarding risk for depression among individuals with ASD. The following findings address both primary research inquiries and general information that will be valuable in further understanding psychiatric comorbidities among children with ASD. General findings are presented first, followed by findings that address primary research questions.

Do Parent- and Self-Reports Agree Regarding the Presence of Depressive Symptoms in Youth with ASD?

Methods of assessing comorbidities in ASD have varied widely, including case studies, clinical interviews, and behavior rating scales completed by parents, teachers, and children (Sterling et al., 2008; Volkmar & Klin, 2005). Behavior rating scales are commonly used due to the availability of normative information and their efficiency in terms of time and cost. However, many researchers have questioned the reliability of behavior ratings across informants (Lopata et al., 2010; Russell and Sofronoff, 2005).

In this study, bivariate correlational analysis indicates that there is no significant association between parent- and self-reported symptoms of depression in the sample. This disparity can be partially explained by validity concerns, including the possibility that children with communication impairments may have difficulty responding to self-report items and that some children may not have been candid with their responses. Numerous investigations have documented inconsistency between child and parent ratings of psychological adjustment. For instance, Russell and Sofronoff (2005) assessed parent- and self-reported symptoms of anxiety among children with ASD. Parents reported significantly more impairment than did children.

The authors concluded that children with ASD were likely to lack self-awareness regarding their difficulties and, thus, parent reports were likely to be more accurate (Russell & Sofronoff, 2005). Research comparing parent- and child-reported behavior ratings in the general population has indicated generally low correlations across respondents (Lopata et al., 2010). Future research may benefit from including a third source of behavioral information, such as teachers or secondary caregivers, to ensure that responses accurately represent children's behavior.

Is Depression More Prevalent among Children with ASD than among Typically Developing Children?

Vickerstaff et al. (2007) found that 24% of their sample of children with ASD were classified as "mildly depressed" and an additional 29% were classified as "depressed." This prevalence estimate is similar to findings reported by Leyfer and colleagues (2006) and Wing (1981, as cited in Ghazuiddin et al., 2002). However, rates of depression reported by other research teams have varied widely. For instance, a review by Lainhart (1999) reported that prevalence estimates ranged from 4.4% to 57.6% between 1967 and 1999. Furthermore, Solomon et al. (2004) collected pretest self-reports of depression among a sample of children with ASD prior to implementing a social skills intervention program. No participant reported depressive symptoms above the average range at pretest (Solomon, Goodlin-Jones, & Anders, 2004).

Among the sample of children with ASD included in the current investigation, parents reported higher ratings of depression symptomatology, relative to the symptoms reported by parents of children in the normative sample. The mean total score on the CDI-Parent for study participants was higher than expected based on the normative information. Results from the National Comorbidity Study estimated the lifetime prevalence rate of Major Depression in adolescents to be 14%, with an additional 11% reporting subclinical symptoms of depression

(Hammen & Rudolph, 2003). Results of the current study indicate that 22% of study participants were rated as displaying depressive symptoms in the clinically significant range by caregivers; an additional 30% were reported to display symptoms in the at-risk range. In agreement with previous research, these findings suggest that children with ASD are at increased risk for depressive symptoms, as compared to typically developing children (Ghazuiddin et al., 2002; Leyfer et al., 2006; Vickerstaff et al., 2007).

Are the Three Measures Believed to Represent Pragmatic Language Ability Significantly Associated?

The assessment of pragmatic language skills is difficult to accomplish due to the lack of valid and reliable instrumentation that can be used across a wide range of age groups (Russell & Grizzle, 2008; Volden et al., 2009). Based on previous research findings, three instruments were chosen to measure pragmatic language ability among research participants: PP, CASL Inference, and CASL Pragmatic Judgment (Reichow et al., 2008; Russell & Grizzle, 2008). Significant intercorrelations among these tools would provide evidence that they indeed measured the same capacity. Surprisingly, an analysis of the bivariate correlations among predictor variables revealed no significant association between the CASL subtests and the PP. Although the CASL subtests are highly correlated with each other, neither is significantly associated with the PP. Thus, it is possible that these tools in fact measured two different constructs. Furthermore, the strength of the relationships between the CASL subtests and the measure of expressive language (ELI) makes it unclear whether these tools are in fact measuring distinct domains. The highly significant correlations between these measures suggest that the CASL subtests may simply provide additional indicators of participants' general structural language skills.

Alternatively, these three pragmatic language tools may be measuring two different aspects of the same construct. While the CASL subtests are likely to measure knowledge of pragmatic

language rules, as demonstrated in a structured assessment setting, the PP Total Raw Score provides an indicator of a child's use of pragmatic language skills in naturalistic environments. It is likely that children with ASD, especially those with nonverbal cognitive skills within the average range, are aware of appropriate social communication behaviors but fail to use them consistently in real-world interactions, thus resulting in socioemotional difficulties.

Interestingly, the ADOS Social-Communication score, an index often used in clinical and research settings to determine whether a child meets social and language criteria for ASD, was found to be significantly correlated with CASL subtest scaled scores. This strong inverse relationship indicates that participants with a greater degree of social communicative impairment as estimated by the ADOS were more likely to obtain lower scores on a standardized assessment of pragmatic language. Although exploratory in nature, this result is consistent with research findings stating that pragmatic language impairment is common among individuals with ASD (Tager-Flusberg, 2004; Travis & Sigman, 1998). Alternatively, these findings could suggest that the CASL subtests may not be valuable measures of assessing relative pragmatic skills among individuals with ASD, as they may in fact be measuring an intrinsic feature of the disorder. In contrast, participants' ADOS Social-Communication scores were not significantly correlated with their PP scores. Thus, the PP may be a more sensitive measure of pragmatic language use among our ASD sample.

What Predictor Cariables are Significantly Correlated with Depressive Symptomatology?

Past research has provided preliminary evidence that general language ability, cognitive ability, life stress, and family history of mood disorders influence one's likelihood of experiencing depression (Benner et al., 2002; Gallagher, 1996; Geurts & Embrechts, 2008). However, inconsistencies were noted in the existing literature. For instance, although most research teams concluded that impaired language skills were related to more depressive

symptoms, Sterling et al. (2008) noted that better social communication abilities were predictive of increased depression among adults with ASD. In addition, although numerous research teams have speculated that better cognitive abilities may be related to greater risk for depression (Vickerstaff et al., 2007; Volkmar & Klin, 2005), Kim et al. (2000) found no relationship between Leiter-R nonverbal IQ and mood disorder. Furthermore, support for risk factors is often theoretical, without consistent empirical support (Sterling et al., 2008). The investigators of the current study diverged from previous researchers by postulating that measures of pragmatic language may be associated with indicators of depression among children with ASD. No previous research was found which investigated the relationship between pragmatic language ability and depression in children with ASD. Support for an empirical relationship between pragmatic language and depression could have far-reaching implications for assessment and intervention for individuals with ASD.

Surprisingly, the results of the bivariate correlational analysis indicate that only two variables were significantly correlated with parent-reported depressive symptoms: life stress and PP Total Raw Score. Although many investigators have postulated that language abilities may play a role in the etiology of depression among individuals with ASD (Beitchman, Brownlie, & Wilson, 1996; Howlin, Mawhood, and Rutter, 2000), the measure of general expressive language ability (ELI) was not significantly correlated with depressive symptomatology in the current study. This finding is consistent with Kim et al. (2000), who concluded that better early language ability is not related to mood problems in later childhood. The relationship between depression and PP Total Raw Score is particularly noteworthy as it supports the hypothesis that pragmatic language is associated with depression in children with ASD. In order to further investigate this relationship, partial correlations were conducted between measures of depression and measures

of pragmatic language skills, while controlling for other suspected predictors (age, NVIQ, ELI, LEC, and family history). A significant relationship between PP Total Raw Score and depression was found, despite removing the potential influence of other variables. This finding provides further evidence that a significant relationship exists between parent-reported pragmatic language use and parent-reported depressive symptoms. Of note, no variables were significantly associated with self-reported depressive symptoms.

Research Question 1: To What Degree does the Inclusion of Pragmatic Language Ability Increase the Predictive Power of the Previously Investigated Factors?

Four hierarchical multiple regression analyses were utilized to answer Research Question 1. Two series of hierarchical multiple regression analyses were conducted: one predicting parent-reported depressive symptoms and another predicting self-reported depressive symptoms. Within each series, one regression analysis included all three measures of pragmatic language skill and another included only PP Total Raw Score as the sole indicator of pragmatic language ability.

In conducting each hierarchical multiple regression analysis, SPSS® performed three separate regression analyses: one including Block one; another including Blocks one and two; and a final analysis including Blocks one, two and three. Block one included participants' age in months. Block two included the predictor variables supported by previous research findings: family history of mood disorders, traumatic life events, general expressive language skill, and nonverbal IQ. Block three included the novel predictor: pragmatic language ability. Entering the variables in this manner allowed the researchers to evaluate the change in the overall predictive power of the model that occurred when pragmatic language was added to the existing set of variables. SPSS® reported the squared multiple regression coefficient (R^2) for each block of predictors entered into each regression analysis. In addition, the program determined whether the R^2 for each model reached significance, thereby indicating how well the variables that had been

entered predicted depressive symptomatology. An evaluation of the change in R^2 that resulted from the inclusion of the pragmatic language variable(s) determined the degree to which the inclusion of pragmatic language improved the predictive power of the model.

Of note, neither Regression 3 nor Regression 4 successfully predicted self-reported symptoms of depression beyond "best guess." When considered jointly, the proposed risk factors did not predict symptoms of depression. Furthermore, the addition of pragmatic language measures in Block three did not improve the predictive power of either model. Therefore, further discussion focuses solely on Regressions 1 and 2, which predicted parent-reported depressive symptomatology.

Regression 1 indicated that, when all proposed risk factors were included, the model was useful in the prediction of parent-reported depressive symptoms. However, including the three measures of pragmatic language ability did not significantly improve the model. Although this finding does not support the hypothesis that pragmatic language skill uniquely contributes to the prediction of depression among individuals with ASD, it suggests that this set of risk factors could be useful to consider when determining whether an individual is at risk for developing depression.

The full model for Regression 2 was also useful in predicting depressive symptoms among the study sample. Furthermore, including the PP Total Raw Score in Block three improved the predictive power of the model by 7.7%. In addition, the change in F after adding Block three was significant, indicating that the addition of pragmatic language made a meaningful contribution to the model. This finding suggests that children's pragmatic language ability is significantly associated with symptoms of depression, even after accounting for related abilities, such as general expressive language and cognitive ability.

Across the models, LEC and PP were the only significant predictors of parent-reported depression symptomatology. This finding conflicts with previous research indicating that family history of mood disorders, general expressive language, and cognitive ability are risk factors for depression among youth with ASD. However, the full model for Regression 2 is significant, indicating that, when considered together, these factors improve prediction of depressive symptomatology.

Research Question 2: For What Portion of the Variance in Depressive Symptomatology does Pragmatic Language Ability Uniquely Account?

In addition to the findings reported previously, the investigation determined the amount of variance in depressive symptoms uniquely associated with indicators of pragmatic language ability, while controlling for the variance accounted for by nonverbal cognitive ability, general expressive language ability, and biological and environmental risk factors. Research Question 2 was addressed by an examination of the standardized regression coefficient and semi-partial correlation for PP, CASL Inference, and CASL Pragmatic Judgment in Block three of Regressions 1 and 2. The standardized regression coefficients denote the change in depressive symptomatology expected based on a one-unit change in each measure of pragmatic language. The squared semi-partial correlation signifies the portion of variance in depressive symptomatology uniquely associated with each pragmatic language ability indicator.

In Regression 1, the standardized regression coefficient for the PP Total Raw Score was statistically significant. Furthermore, the unique contribution of PP to the prediction of the parent-reported depressive symptoms was moderate (r = -.26). This value indicates that PP scores uniquely accounted for 6.3% of the variance in parent-reported depressive symptoms. Neither CASL subtest significantly predicted depressive symptomatology. This provides partial support for the study hypothesis.

Results of Regression 2 provide further evidence for the unique contribution of the PP Total Raw Score in predicting parent-reported symptoms of depression. In this analysis, the unique contribution of PP to the prediction of depression was also moderate (r = -.27); PP scores uniquely accounted for 7.7% of the variance in parent-reported depression.

Implications

The findings yielded by the current investigation have important implications for the assessment and treatment of children with ASD. First, the results of the current study provide evidence that youth with ASD have elevated levels of depressive symptomatology relative to typically developing children. Thus, clinicians conducting diagnostic evaluations for individuals suspected of having ASD ought to include an assessment of socioemotional functioning in their test battery.

Additionally, the study results may improve screening practices for comorbid psychiatric conditions among individuals with ASD, leading to earlier identification and intervention. Because of the communication and social difficulties inherent in ASD, most individuals are not referred for psychiatric evaluation due to perceived changes in mood. Rather, caregivers notice behavioral manifestations of depression, such as increased aggression, changes in sleep or appetite, increased self-injury, or more pronounced repetitive behaviors. Consequently, referrals often do not occur until symptoms of depression are quite severe (Lainhart, 1999). Earlier intervention for depression is likely to lead to improved treatment outcomes. Overall, it appears that evaluating caregivers' reports of observed pragmatic language use among children with ASD may assist in determining the child's likelihood of experiencing depression. This information is useful for clinicians, as it could assist in identifying children who are at greater risk for depression so that targeted prevention measures can be implemented. Increased

prevention efforts could reduce the prevalence of comorbid depression among individuals with ASD, leading to improved quality of life.

Furthermore, the findings provide preliminary evidence that participation in pragmatic language therapy programs may reduce depressive symptoms among children with ASD. Experimental treatment research utilizing single-subject design will be necessary to confirm this hypothesis in the future. In her dissertation study, Deal (2009) implemented a pragmatic language therapy program with a group of children in a South Georgia public school. By comparing pretest and posttest reports of problematic behavior, Deal concluded that students who had participated in the pragmatic language therapy program exhibited a significant decrease in problematic behavior; the control group did not demonstrate similar behavioral improvements (Deal, 2009). It is likely that similar outcomes would be noted among children with developmental disabilities, such as ASD. Continuing to document the positive effects of pragmatic language therapy on socioemotional development for children is likely to improve academic, social, and behavioral outcomes for children and families.

The implications of the current investigation extend beyond the ASD population. In concordance with previous research findings (Benner et al., 2002; Gallagher, 1999; Prizant et al., 1990; Redmond & Rice, 1998), the results of the current study provide evidence for an interaction between language ability and socioemotional functioning. Consequently, speech/language pathologists and psychologists should work together to address emotional and behavior problems that co-occur with language impairment. Currently, most speech/language pathologists do not receive training regarding the identification and treatment of socioemotional difficulties, such as aggression and withdrawal (Brinton & Fujiki, 1993). In the future, speech/language therapists may benefit from increased awareness of signs of an underlying

emotional/behavioral issue. Additionally, psychologists and behavior specialists should be aware of red flags for communication difficulties when working with children with emotional and behavioral disturbances. Such interdisciplinary training is likely to allow professionals to identify and treat comorbid disorders earlier, leading to more positive treatment effects.

Limitations

Results of the current study should be interpreted with caution due to the limited sample size. Wilson Van Voorhis and Morgan (2007) concluded that the general rule-of-thumb is to include at least 50 participants for a regression analysis. Harris (1985) recommended that, to conduct multiple regression analysis with optimal statistical power, a minimum of 10 participants should be included for every predictor variable. The current investigation included up to eight predictors, depending on the regression model. Thus, it would have been optimal to include 80 participants. Participants were recruited for 14 months; however, due to the low incidence of ASD in the population and the time demands required for participation, only 50 participants were included in the final data set. In addition, some potential subjects were excluded from the final data analysis due to nonverbal IQ below the criterion level. Researchers conducting comparable investigations have experienced similar recruitment difficulties. For instance, Volden et al. (2009) conducted a multiple regression analysis predicting social outcomes for individuals with ASD, including 37 participants. Overall, research in the field of ASD would benefit from increased recruitment efforts and collaboration among research teams to share data, allowing for larger sample sizes.

The research findings presented here should also be considered in terms of possible threats to validity. When a strong association is found between two variables, it is possible that an underlying confounding variable has inflated the relationship between the two. Because two of the primary measures used in the regression analysis were parent reports of behavior (i.e., PP and

CDI-Parent), it is possible that both are influenced by parent response style. Parents who tend to emphasize problematic behaviors are more likely to under-report pragmatic language skills and over-report depressive symptoms. In contrast, parents emphasizing positive aspects of development are likely to provide inverse ratings. Future studies can account for this influence by collecting data from multiple sources, such as teacher ratings, and from utilizing objective, observational instruments to assess pragmatic language skills.

Additionally, although measurement tools were selected on the basis of psychometric value, their reliability and validity have not been established for individuals with developmental disabilities. In particular, the CDI includes items assessing social withdrawal, a core feature of ASD. Overlapping features of depression and ASD make it difficult to distinguish clinical depression from inherent features of autism. Clinical interviews may yield a more valid indicator of depression among individuals with ASD.

The study results provide preliminary evidence for a significant and unique relationship between pragmatic language ability and depression in children with ASD. However, because this investigation was not experimental, causation cannot be determined. Thus, although it is possible that limitations in pragmatic language cause children with ASD to experience depression, it is possible that the pragmatic communication deficits noted in the sample are consequences of depression. In fact, depression is often manifested by limited social communication. Gravell and France (1991) noted that depressed patients often demonstrate reduced nonverbal communication and reduced initiations. In the future, longitudinal studies may be valuable in examining whether early pragmatic language impairment is related to depressive symptoms experienced later in life.

In summary, although no research study is free from limitations, the current investigation provides compelling evidence that pragmatic language ability is uniquely related to risk for

depression among children with ASD. This finding builds on previous research conclusions by more precisely identifying which aspects of communication are associated with depression. Armed with this knowledge, future researchers and clinicians may develop pragmatic language treatment strategies that prevent and remediate socioemotional difficulties in children with ASD.

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BIOGRAPHICAL SKETCH

Emily Ann Wray was born in Flint, Michigan. She and her twin sister, Elizabeth Buckley, were raised in North Carolina and graduated from Piedmont High School in Monroe, North Carolina. Emily attended the University of Florida and obtained her Bachelor of Science degree in April of 2005. She entered the school psychology program at the University of Florida in August of 2005 and obtained her Master of Arts in Education degree in December of 2008. She will earn her Doctor of Philosophy in School Psychology in August of 2011.

Emily completed a clinical internship at the Carolina Institute for Developmental Disabilities (CIDD) at the University of North Carolina. She will continue her training at the CIDD for her postdoctoral fellowship year. Emily and her husband, Jason, have settled in Chapel Hill, North Carolina.