The Use of Peer-Mediated Interventions for Enhancing Social Communication Behaviors among Secondary Students with Autism Spectrum Disorders and Their Peers

By

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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

Table Page

LIST OF FIGURES

Abstract

Research has suggested that youth with severe developmental disabilities (with and without ASD) benefit both academically and socially from inclusive school environments. The primary service delivery approach used for supporting the social, academic, and extracurricular experiences of adolescent students with significant developmental disabilities is individually assigned, one-to-one paraprofessionals and special educators. While this approach can serve an important auxiliary role in supporting these students' experiences, there is a stark absence of empirical evidence for this approach. Peer-mediated interventions have emerged as a promising alternative to one-to-one adult-delivered support models for improving academic and social outcomes for students with severe developmental disabilities. Research is needed that explores and describes the occurrences of social communication behaviors (SCB) that adolescents with severe disabilities exhibit and how their outcomes are influenced by peer-mediated interventions. The present study used data from a randomized control trial (RCT) to systematically: (1) explore and identify SCB occurrences among high school students with significant developmental disabilities with and without ASD; (2) explore and identify the SCB occurrences among high school typically developing students; (3) compare and contrast the SCB occurrences of both groups in relation to different student variables; and (4) investigate the quality of social interactions between typically developing high school students and high school students with DD before and after the implementation of peer-mediated interventions. Study data used direct observation event recording software and narrative recording. Results indicated statistical and clinical support for the peer support condition as compared to other treatment conditions in promoting various types of SCB among students with severe developmental disabilities, specifically those with ASD. A student's disability severity was found to modulate the occurrences general initiations exhibited by them. Little change was detected in social interaction quality attributes among disability groups between treatment conditions. Findings have positive implications for increasing SCB among students with DD who present with ASD. Findings have implications for assessing SCB and increasing social interactions and engagement among adolescents with severe developmental disabilities, specifically ASD, in general education settings.

CHAPTER 1

Introduction

The purpose of this chapter is to provide a brief overview of Autism Spectrum Disorders and to introduce the purpose of this study. According to the *Diagnostic Statistical Manual of Mental Disorders Fifth Edition (DSM-5),* a reference published by the American Psychiatric Association (APA, 2013), Autism Spectrum Disorders (ASD) consists of global impairments in reciprocal social communication and social interaction; and restricted, repetitive patterns of behavior, interests, or activities; and these impairments are present from early childhood and limit or impair everyday functioning. Children can receive clinical diagnoses based on the criteria outlined in the DSM-5 or an educational diagnosis through criteria outlined by the *Individuals with Disabilities Education Improvement Act* (IDEA, 2004). In recent years, there have been extensive changes to the diagnostic criteria of autism, which has impacted the prevalence and understanding of pervasive developmental disorders (PDDs). The changes to the DSM-IV-TR criteria (version prior to DSM-5) for autism spectrum disorders (ASDs) were proposed to increase diagnostic sensitivity and specificity. The significant changes that led to the DSM-5 diagnostic criteria included: (a) shifting from a multi-categorical model to a single diagnostic category of autism spectrum disorder (ASD); (b) replacing the three-domain model with a two-domain model; (c) relaxing the criteria for age at onset; and (d) adding symptoms not previously included in DSM-IV-TR, such as sensory interests and aversions (Heurta, Bishop, Duncan, et al., 2012). Autism Spectrum Disorders are diagnosed based upon characteristic impairments in reciprocal social skills, communication skills, or the presence of restricted behaviors, interests, and activities (APA; Klinger, Dawson, & Runner, 2003). These three impairment areas are used as a starting point for assessment and for the purposes of diagnosis.

Professionals can utilize this information to develop a treatment to address these areas of need individually (APA, 2013).

The prevalence of children diagnosed with ASD has greatly expanded over the years (Wing & Potter, 2009; APA, 2013). In fact, census data shows that autism affects 1 in 59 children (Centers of Disease Control and Prevention [CDC], 2014; Christensen, Baio, Braun, et al. 2018). More specifically, Christensen, Baio, Braun, et al., used data collected from the Autism and Developmental Disabilities Monitoring (ADDM) Network to provide estimates of the prevalence and characteristics of ASD among children aged 8 years who reside in 11 ADDM Network sites in the United States (Arkansas, Arizona, Colorado, Georgia, Maryland, Missouri, New Jersey, North Carolina, South Carolina, Utah, and Wisconsin). A total population of 325,483 children aged 8 years was covered by the 11 ADDM sites, which represented 8% of the total U.S. population of children aged 8 years in 2014. In analyzing these data, they found the combined estimated prevalence of ASD among the 11 ADDM Network sites was 16.8 per 1,000 (one in 59) children aged 8 years (Baio, Wiggins, Christensen, et al., 2018). In fact, significant variations in the prevalence rates were found among the 11 ADDM Network sites, ranging from 13.1 per 1,000 children aged 8 years to 29.3 per 1,000 children aged 8 years. The higher estimated prevalence among states that reviewed both education and health records suggests that special education systems are crucial entities in providing comprehensive services that include identification and intervention for children with developmental disabilities (DD).

Early diagnosis and intervention have been a focus of research in recent decades, as several studies have indicated that many features of ASD respond better when dealt with early in the developmental trajectory (Christensen, Bilder, Zahorodny, et al., 2016; Stone & Yoder, 2001; Wing & Potter, 2009; Rogers, 1998; Rogers, 1999). Symptoms are typically recognized during the second year of life, but may be seen earlier if developmental delays are present and severe enough. Other studies have demonstrated that interventions provided to children five years and younger contributed to improvements in social, language, and intellectual functioning (Christensen, Bilder, Zahorodny, et al., 2016; Rogers, 1998; Rogers, 1999). A recent study found that about half of four-year-old children born in 2006 had an evaluation by the time they were about two years and three months old while about half of the eight-year-old children born in 2002 had an evaluation by the time they were about two years and eight months old (Christensen, Bilder, Zahorodny, et al., 2016). These findings suggest that professionals are increasingly seeking ways to identify and reliably diagnose ASD at an earlier age; and thus, increase the chances of early intervention services being systematically employed with younger children with ASD.

While early identification is important for children with Autism Spectrum Disorders, the *severity* of deficits is also important to consider for intervention purposes. The DSM-5, compared with the predecessor DSM-IV-TR, has attached “severity specifiers” to help further characterize the individual with ASD and his/her specific needs. For example, an individual with a severity level 3 rating “requiring very substantial support” identifies that the individual has severe deficits in social communication and restricted, repetitive behaviors. Compared to less severe specifiers (e.g., Level 1 and Level 2), Level 3 appears to have the most far-reaching effects with respect to one’s livelihood. It is diagnosed when an individual has severe deficits in verbal and nonverbal communication skills that cause severe impairments in functioning, very limited social interactions, and minimal responses to social overtures from others (APA, 2013). Likewise, the individual also displays an inflexibility of behavior, extreme difficulty coping with change, or other restricted/repetitive behaviors that markedly interfere with functioning in all life sphere (APA). A specifier can be used to assist in intervention planning, such as helping professionals to identify individual targets and execute optimal supports for those targets. Children with ASD with a Level 3 severity specification require much assistance, and thus intervention selection is critical, which suggests that there is a significant need for research examining intervention efficacy for individuals with severe developmental disabilities that include ASD.

Although, there is much specificity surrounding the diagnosis of autism for younger children, there is still limited knowledge and understanding regarding specific deficit areas (e.g., social communication behaviors [SCB]) and how best to characterize, assess and treat these deficits in older school-aged children and adolescents. For example, studies have shown that a toddler's use of SCB is important for an accurate diagnosis and plan for intervention (Lord & Luyster, 2006). However, there are limited empirical studies examining the SCB among older school-aged children and adolescents with autism spectrum disorders (see review by: Bellini, Peters, Brianner, & Hopf, 2007). Moreover, few researchers (i.e., Boyd, Conroy, Asmus, McKenney, & Mancil, 2008; Horner, 2012; Hughes & Carter, 2002; Chandler, Fowler & Lubeck, 1992; Carter, Hughes, et al., 2005) have systematically explored, described, and compared the SCB occurrences in these age groups and how their SCB may differ from their typically developing peers. In particular, relatively little attention been paid to identifying the most critical social and behavioral needs of adolescents with ASD during high school (Carter et al., 2014). More specifically, there have been little to no studies that address the social lives of adolescents with ASD in high school, which suggests little is known about their peer interactions and durable friendships (e.g., Petrina, Carter, & Stephenson, 2014). Although the paucity of such interactions can be impacted by limited opportunities, social-related deficits are considered a defining feature of ASD and are important for characterizing and planning appropriate interventions (American Psychiatric Association, 2013; Ventola, Kleinman, Pandey, et al., 2007). This is a significant limitation given the implications of a diagnosis of ASD on school functioning, educational, social, and functional outcomes. Increasing the focus on improving social communication behaviors (vs. challenging behaviors) through direct assessment and intervention can lead to improved functioning for older children and adolescents with ASDs and other developmental disabilities (DD). Additionally, increasing the knowledge of social-behavior presentation and effective intervention approaches for children and adolescents with co-occurring moderate to severe DD and ASD has become of interest, however, little information is known. Previous research has identified behavioral markers of ASD that distinguish it from DD that emerge over the childhood (Barbaro & Dissanayake, 2012; Soto, Giserman Kiss, & Carter, 2016). However, research has also identified that there are characteristics of ASD that overlap with various developmental disabilities (DD), which may complicate intervention selection and outcomes (Mitchell, Cardy & Zwaigenbaum, 2011). It would thus be of meaning to learn how different intervention approaches impact social communication behaviors for these co-occurring diagnostic populations.

Recent research has focused on characterizing and comparing social communication skills for young children who are typically developing vs. those with ASD. Two lines of research that have emerged focus on: (1) the capacity for joint attention and (2) the ability to use symbols (Wetherby & Woods, 2006). While this research is informative, it is primarily focused on very young children and lacks a specific focus on appropriate social communication behaviors in older children. We also don’t understand how such research translates to adolescents with ASD or those with a severe developmental disability with ASD.

Other lines of research have investigated the use of Applied Behavior Analysis procedures for the assessment and intervention of ASD social communication skills and behavioral difficulties. In particular, Boyd, Conroy, Asmus, McKenney, and Mancil (2008) found that preschool children with ASD engaged in infrequent, but highly variable rates of peer interaction. This study found that preschoolers with ASD engaged in prosocial behaviors in the presence of specific antecedent factors related to peer group size, level of adult engagement, and how activities were selected. While this study investigated SCB and the potential use of antecedent factors for intervention purposes, it did not focus on explicitly describing the SCB of older children, much less adolescents with ASD and/or DD, or comparing and describing the SCB differences of these age groups and typically developing children in inclusive settings (e.g., general education classrooms). Past research has also not attempted to characterize SCB differences in these groups in relation to an intervention (e.g., peer-directed). Although intervention planning should always be individualized for a specific adolescent, understanding the areas in which this group of adolescents (with ASD and/or severe DD) typically exhibit social strengths and deficits could provide valuable insights into potential avenues for intervention.

The current research project aims to expand the literature base with regards to SCB by systematically identifying the occurrence of SCB among high school adolescents with severe developmental disabilities with and without ASD in general education settings. As a comparison, typically developing peer's SCB will also be identified as they occur in interaction with adolescents with ASD (with severe DD) and with other typical adolescent peers and those differences will be statistically compared in relation to peer-mediated interventions. The project's goals are to systematically: (1) explore and identify SCB occurrences among high school students with ASDs (with severe DD), (2) explore and identify the SCB occurrences among high school typically developing students, (3) compare and contrast the SCB occurrences of both groups in relation to different peer-mediated intervention approaches, (4) investigate the quality of social interactions between typically developing high school students and high school students with ASDs before and after the implementation of peer-mediated interventions, and (5) determine and describe specific characteristics (i.e. relevant variables) of high school students with ASD and/or severe DD that may be involved in social communication behavior gains (changes from pre to post observations) within the context of peer-mediated interventions.

CHAPTER 2

Review of Literature

The objective of this chapter is to present a more thorough review of the characteristics, key features, and prevalence of children with ASD as well as provide an overview of literature relevant to the purposed project. First, the chapter begins with a review of ASD characteristics and prevalence. The DSM-IV-TR criteria is referenced as the participants included in the completed Peer Partner Project (P3) were identified as students with ASD using the DSM-IV-TR criteria. Information on the DSM-5 ASD diagnostic criteria is also briefly reviewed. Second, the chapter reviews common assessment approaches for diagnosing ASD in children. Third, the chapter highlights benefits of educational inclusion for children with ASD and developmental disabilities. Fourth, the chapter reviews social communication behaviors and assessment approaches for assessing these behaviors. Fifth, literature is reviewed that is relevant to the purposes and goals of the current project. The chapter concludes with research questions.

Characteristics and Prevalence of Children with ASD

Diagnostic criteria. Children with ASD have marked observable impairments in social interactions, communication skills, and behavior activities and interests. The term autism has been broadened to include autism spectrum disorders (ASD). The reason for this terminology is that autism has been widely recognized and used by parents and professionals as opposed to the use of pervasive developmental disorder that was used in earlier issues of the *Diagnostic Statistical Manual of Mental Disorders* (Baird, Cass, & Slonims, 2003).

The DSM-5 characterizes Autistic Disorder by impairments in communication, social interactions, and a presence of stereotyped or challenging behaviors, which result in clinically significant impairments in one’s functioning (see Table 2-1 for overview). The manifestations of these impairments vary greatly depending on the developmental level and chronological age of the individual. Children diagnosed with Autistic Disorder have qualitative impairment in social interaction as shown through a marked impairment in the use of multiple nonverbal behaviors and social and emotional reciprocity. Specific difficulties seen include trouble making and sustaining friendships, repetitive use of language, lack of spontaneous seeking to share interests, achievements or enjoyments with others. Correspondingly, qualitative impairments are also seen in the realm of communication as evidenced by a delay in, or lack of, spoken language and the specific use of language to initiate and sustain conversations with others. In addition, children with autism may use language in a stereotypical and repetitive manner. There is also a lack of spontaneous make-believe play as would be expected for a child of his or her age. Aside from the marked impairments in social interaction and communication, children with autism also exhibit stereotyped and challenging behaviors as evidenced by stereotyped and repetitive motor movements (e.g., hand or finger twisting), persistent preoccupation with parts of objects, and often inflexible adherence to specific, nonfunctional routines or rituals. According to the DSM IV-TR delays or abnormal functioning in any one these areas usually have their onset prior to age three and cannot be better accounted for by another PDD (see APA [2000]).

Asperger's Disorder is characterized by similar features as Autistic Disorder. The features evident in individuals with Asperger's Disorder include a severe and sustained impairment in social interaction and in behaviors, activities, and interests (see Table 2-1 for overview). Like Autistic Disorder, children with Asperger's Disorder have difficulties with peer relationships and using nonverbal behaviors to regulate social interactions. In addition, these children also lack social and/ or emotional reciprocity, which may ultimately affect their abilities to develop and sustain age-appropriate peer relationships. Also evident in children with this disorder is a lack of spontaneous seeking to share interests and enjoyment with other people. Aside from social interaction impairments, children with Asperger’s may also exhibit preoccupations with stereotyped and restricted behaviors, interests, and parts of objects, which are also seen in children with Autistic Disorder (APA, 2000). However, in contrast to Autistic Disorder, children with Asperger’s do not have early delays in cognitive and language skills, or have motor mannerisms that accompany their restricted, repetitive, and stereotyped interests and activities (Brock, Jimerson, & Hansen, 2006). Rather these children have circumscribed interests that involve them spending a disproportionate amount of time attending to and gathering information about these interests. Furthermore, children with Asperger’s Disorder do not appear to have clinically significant delays in adaptive behavior, cognitive development, or self-care (Brock, Jimerson, & Hansen, 2006; APA, 2000). However, they may show some cognitive impairment, but have intelligence within normal limits. They also do not appear to have a lack of motivation for social interactions as seen in other children with ASD.

With a prevalence rate of 1 per 20,000, Rett’s Disorder is a progressive developmental disorder that occurs primarily among females (Brock, Jimerson, & Hansen, 2006). An individual diagnosed with Rett’s Disorder has normal prenatal and perinatal development with normal psychomotor development through the first 5 months of life, and normal head circumference at birth. Following this normal period of development an individual will experience a series of deficits between the age of 5 and 48 months. This onset of deficits includes a decrease in head growth, the loss of acquired and functional hand motor skills and the development of stereotyped hand movements, the loss of social engagement, and impairments in body movements’ coordination, and expressive and receptive language development accompanied with severe psychomotor retardation (APA, 2000; Brock, Jimerson, & Hansen, 2006). Severe to profound cognitive deficits are associated with Rett's Disorder. Social difficulties similar to Autistic Disorder and Asperger's Disorder are present as well, but not as pervasive and tend to be more fleeting (Brock, Jimerson, & Hansen, 2006). Adolescents with Rett's Disorder are found to have severe muscle atrophy, scoliosis, spasticity, and decreased mobility (APA, 2000; Tidmarsh & Volkmar, 2003; see Table 2-2 for overview). The duration and course of this disorder is lifelong, persistent and progressive.

A clinical diagnosis of Childhood Disintegrative Disorder, also known as Heller's syndrome, is a very rare condition with a prevalence rate of 1.7 per 100,000. It is more likely to affect males (Brock, Jimerson, & Hansen, 2006). An individual diagnosed with Childhood Disintegrative Disorder displays a marked regression in various areas of functioning following a period of at least 2 years of normal development (APA, 2000). Normal development is characterized by the development of appropriate verbal and nonverbal behaviors, social and emotional reciprocity, and play and adaptive behaviors. Subsequently after age two (but before age 10), an individual may show autistic-like symptoms that involve impaired development of social interaction, communication; and restricted, repetitive behaviors, and stereotyped behaviors, mannerisms, and interests (APA, 2000). The disorder pattern is further characterized by the loss of expressive or receptive language skills, social skills or adaptive behaviors, bladder/bowel control and motor skills (APA, 2000; Malhotra & Gupta, 2002). Usually, previously acquired skills are lost in almost all developmental areas. Childhood Disintegrative Disorder follows a continuous course and is lifelong in duration.

The diagnosis of PDD-NOS is used when an individual presents with difficulties in at least two of the three Autistic Disorder symptom clusters, but does not otherwise meet the diagnostic criteria for Pervasive Developmental Disorder (APA, 2000). More specifically, individuals may have impairments in verbal or nonverbal social communication skills, and present with stereotyped behaviors, interests, and activities. However, individuals with this diagnosis typically have milder symptoms (see Table 2-3 for overview). In summary, the diagnoses prescribed by the DSM IV-TR criteria are clinical diagnoses which are typically given in clinical settings by appropriate licensed professionals.

While DSM IV-TR is fundamental to understanding features of autism and related disorders, it is important to acknowledge that the American Psychiatric Association released a fifth edition (DSM-5) in May 2013, which changed how a diagnosis of autism is conceptualized (see Table 2-4 for overview). These changes included the following: shifting from a multi-categorical model to a single diagnostic category of autism spectrum disorder (ASD); elimination of PDD and the 5 subtypes found in DSM-IV; creation clinical specifiers and associated features of ASD; changing from DSM-IV PDD 3-domain criteria that comprised of social reciprocity, communication, and restricted and repetitive behaviors (RRB) to DSM-5 ASD domain criteria composed on social communication/interaction and RRB; for DSM-5, inclusion of sensory symptoms in the RRB component of the diagnostic criteria; and, for DSM-5 changing the onset from “age 3” to “early childhood.” Instead of the 5 subtypes of PDD, DSM-5 adds a new diagnostic category, “Social Communication Disorder (SCD).” SCD includes social pragmatic difficulties, but does not include RRB criteria found in ASD. Early studies have found that compared with the DSM-IV criteria for Asperger’s disorder and PDD-NOS, the DSM-5 ASD criteria have greater sensitivity and specificity (Heurta, Bishop, Duncan, Hus, & Lord, 2012). Moreover, Mattila et al. (2011) examined an early draft of the DSM-5 criteria (2010) and found that approximately 96% of the children with PDD diagnoses were classified correctly under the ASD category.

In an epidemiological study conducted in 2014, investigators were interested in how the DSM-5 ASD criteria corresponded to the DSM-IV-TR PDD criteria in relation to prevalence estimates, diagnostic processes, and eligibility for clinical services (Shin Kim, Fombonne, Koh, Kim, Cheon, & Leventhal, 2015). They recruited children ages 7-to 12-years-old in a South Korean community, those in regular and special education schools, and those from a disability registry. They used the Autism Spectrum Questionnaire, Autism Diagnostic Observation Schedule, and the Autism Diagnostic Interview-Revised to assess children and to make clinical diagnoses using the DSM-IV PDD and DSM-5 ASD and SCD criteria. Study results demonstrated that the DSM-5 ASD and SCD combined had virtually the same prevalence as DSM-IV PDD prevalence. Their results indicated that more than 90% of individuals with a DSM-IV PDD diagnosis will have a DSM-5 ASD or SCD diagnosis. Furthermore, those meeting the PDD-NOS diagnosis were still identified as having significant developmental psychopathology. Overall, the findings suggested that there was inter-reliability between both diagnostic classification systems, and that patients and their families can expect a smooth transition between both systems.

Van Steensel, Bogels and Bruin (2014) were interested in how many and which children with a DSM-IV classification of autism spectrum disorder (ASD) fulfill the DSM-5 symptom-criteria. They also wanted to determine whether children who did and did not meet DSM-5 symptom-criteria and children with social anxiety disorder (SAD) can be differentiated from each other based on ASD symptomatology. They recruited 90 children with DSM-IV classification of high functioning ASD and 21 children with SAD. Study results showed that 30% of the ASD sample did not meet DSM-5 ASD diagnostic criteria. These children only met the two-out-of-four criteria for the repetitive domain. Those who were identified according to

DSM-IV and DSM-5 symptom criteria had higher scores on the social-communication domain than children with SAD. Study findings suggests a range of related symptoms in the DSM-5 for children with ASD, SCD, and SAD. Research is needed to examine whether ASD and SCD, as well as SCD and SAD, can be differentiated reliably and with sufficient validity.

In a systematic review Smith, Reichow and Volkmar (2015) elucidated that 50 to 75% of individuals will maintain the ASD diagnosis, but the greatest decreases will be among high-functioning populations with IQs over 70 and/or previous diagnoses of PDD-NOS or Asperger’s disorder. Based on recent research of the different classification systems, those individuals with less severe autism symptoms (DSM-IV PDD-NOS) or who are more high functioning (DSM-IV Asperger’s Disorder) may encounter more difficulty with maintaining the DSM-5 ASD diagnosis. In some instances, those who present for the first time with less severe ASD symptoms will not get the ASD diagnosis as they would have under DSM-IV, but may be served under DSM-5 SCD or another developmental disorder. In summary, it is important to understand the evolution of PDD to ASD diagnosis (see Appendix A) and how individuals will be impacted. It might appear that those with less severe autism spectrum symptoms (DSM-IV PDD) are not in need of services like those with more severe (DSM-5 ASD), but with adequate support, these individuals might achieve greater independent and integrated community participation and inclusion. The DSM-5 criteria will make it more difficult for high-functioning individuals to be diagnosed at an early age and receive the intensity of services that is most likely to result in an optimal outcome (Smith, Reichow, and Volkmar, 2015). Future research is recommended to understand how the ASD profiles (continuum of severe to mild) will best be served under an intervention approach. The present study focused on individuals with significant disabilities and more severe forms of ASD.

Serving Individuals with Disabilities

Over the last several decades, the U.S. government has played a prominent role in shaping the education of students with disabilities as well as the delineating accommodations in the outside world. For example, the Education for All Handicapped Children Act of 1975 (Public Law 94-142) was a significant piece of legislation that redefined educational programming for students with disabilities (Hughes & Carter, 2008). Public Law 94-142 (now the IDEA) required public schools to provide students with disabilities a free and appropriate education in the least restrictive environment (LRE) to every child with a disability (Merrell, Ervin & Gimpel, 2006). Subsequent amendments, as reflected in the IDEA, have increased the significance of: (a) access to the general education curriculum, (b) the provision of services for young children from birth through five, (c) transition planning, and (d) accountability for the achievement of students with disabilities. The IDEA upholds and protects the rights of infants, toddlers, children, and youth with disabilities and their families. Four purposes of Public Law 94-142, included: “to assure that all children with disabilities have available to them … a free appropriate public education which emphasizes special education and related services designed to meet their unique needs; to assure that the rights of children with disabilities and their parents … are protected; to assist States and localities to provide for the education of all children with disabilities; and to assess and assure the effectiveness of efforts to educate all children with disabilities” (Education for All Handicapped Children Act, 1975; see U.S. Department of Education, Office of Special Education and Rehabilitative Services, 2010). Prior to the authorization of Public Law 94-142, many school children with severe disabilities did not have access to opportunities for learning, and were therefore, denied an appropriate education.

The IDEA was re-authorized in 2004 and most recently amended through Public Law 114-95, the Every Student Succeeds Act, in December 2015. The stated purpose remains the same, which is to: (a) “to ensure that all children with disabilities have available to them a free appropriate public education that emphasizes special education and related services designed to meet their unique needs and prepare them for further education, employment, and independent living;” (b) “ensure that the rights of children with disabilities and parents of such children are protected;” (c) “assist States, localities, educational service agencies, and Federal agencies to provide for the education of all children with disabilities;” (d) “assist States in the implementation of a statewide, comprehensive, coordinated, multidisciplinary, interagency system of early intervention services for infants and toddlers with disabilities and their families;” (e) “ensure that educators and parents have the necessary tools to improve educational results for children with disabilities by supporting system improvement activities; coordinated research and personnel preparation; coordinated technical assistance, dissemination, and support; and technology development and media services;” and (f) “assess, and ensure the effectiveness of, efforts to educate children with disabilities.” To facilitate this purpose, IDEA has identified educational criteria to identify students with disabilities. Due the nature of this research, the IDEA autism education criteria is described next.

The IDEA autism educational criteria. The *Individuals with Disabilities Education Act* identifies autism as a developmental disability and offers special education services as an intervention option. It is critical to recognize that DSM IV-TR/DSM-5 diagnoses are not synonymous with special education eligibility (US Department of Education, 2005, US Department, 2006). According to *IDEA* 2004 regulations [US Department of Education, 2005 (c)

(1) (i)], in order for a student to qualify as having autism and for special education services, the following criteria need to be met:

> I. Autism means a developmental disability significantly affecting verbal and nonverbal communication and social interaction, generally evident before age three that adversely affects a child's educational performance. Other characteristics often associated with autism are engagement in repetitive activities and stereotypical movements, resistance to environmental change or change in daily routines, and unusual responses to sensory experiences.
>
> > i. Autism does not apply if a child's education performance is adversely affected primarily because the child has an emotional disturbance, as defined in paragraph (c) (4) of this section.
> >
> > ii. A child who manifests the characteristics of autism after age three could be identified as having autism if the criteria in (c) (1) (i) or this section is satisfied.

In summary, *IDEA* states that in order for an individual to qualify for an autism disability category, his/ her impairments must be negatively affecting his/ her educational performance. The classification of a disability category, as outlined by *IDEA*, is used for the purposes of delivering appropriate educational services to individuals with disabilities who may require special education and related intervention services. Researchers have argued that this eligibility classification statement specifies autism as broadly meaning ASD. In this regard, it is unclear whether *IDEA* would be able to recognize students with milder forms of autism as needing special education services. Hence, students with milder forms of autistic symptoms require careful examination by individualized education program (IEP) teams to determine the necessity for special education services.

Demographics, prevalence, and impact. The number of children diagnosed with ASD has become an increasing concern. As stated, the Centers for Disease Control and Prevention (2014) estimated that 1 out of 59 children will be diagnosed with ASD and need lifelong care. Moreover, combining data from all 11 of the Autism and Developmental Disabilities Monitoring (ADDM) Network sites, ASD prevalence was 16.8 per 1,000 (one in 59) children aged 8 years (Baio, Wiggins, Christensen, et al., 2018). Overall, when all data was combined across the 11 ADDM sites, the prevalence rates included 26.6 per 1,000 boys and 6.6 per 1,000 girls (prevalence ratio: 4.0 for all sites combined). The prevalence of ASD was significantly ($p<0.01$) higher among boys than among girls in all 11 ADDM sites, with male-to-female prevalence ratios ranging from 3.2 to 4.9 (depending on ADDM site). During the surveillance period of 2000 to 2014, the overall ADDM ASD prevalence estimates increased from 6.7 to 16.8 per 1,000 children aged 8 years, which represents an increase of approximately 150%.

The DSM-5 reports that ASD is diagnosed four times more often in boys than in girls. In clinic samples, the DSM-5 reports that females tend to be more likely to show accompanying intellectual disability, suggesting that girls without accompanying intellectual impairments or language delays may go unrecognized, which is consistent with research in this area (APA). ASD prevalence estimates based on the new DSM-5 case definition were very similar in magnitude but slightly lower than those based on the historical DSM-IV-TR case definition (Baio, Wiggins, Christensen, et al., 2018).

In 2000, the U.S. Department of Education funded the National Longitudinal Transition Study 2 (NLTS2), an investigation to document the secondary school experiences and postsecondary outcomes of students with disabilities (Newman, Wagner, Cameto, Knokey, &

Shaver, 2010; Newman, Wagner, Knokey, Marder, et al., 2011). Participants included 11,280 students between the ages of 13 and 16 who were receiving special education services under the 12 disability categories mandated by IDEA (students with primary designations of autism comprised 6% of the study sample). All participants were followed for eight years and were between the ages of 21 and 25 at the final data collection (Newman, et al., 2010; Newman, et al., 2011). After data collection was finished, which included gathering surveys, questionnaires, and telephone interviews from parents, adolescents and school staff, NLTS2 researchers found that impairments associated with autism were more complex compared to other disability groups. Study results highlighted the need to develop school-based, evidence based interventions for youth on the autism spectrum.

In consideration of school settings, 6% to 8% of school-aged children are diagnosed with an ASD. Specifically, in 2004, there were more than 165,552 school-age students (6 to 21 years of age) with autism served under *IDEA*, most of whom were between the ages of 6-to 11-years-old (e.g., n=96,799) (US Department of Education, 2006). Moreover, in 2004, students classified with autism represented 2.7 percent of all school-aged children with disabilities serviced under *IDEA*; this percentage has increased .001 percent since 1991 (U.S. Department of Education, 2005). Furthermore, the Autism and Developmental Disabilities Monitoring (ADDM) sites collected information on the most recent eligibility categories under which children received special education services. Results revealed that among children with ASD who were receiving special education services in public schools during 2014, the proportion of children with a primary eligibility category of autism ranged from approximately 37% in Wisconsin to 80% in Tennessee. Most other sites noted approximately 60% to 75% of children with ASD having autism listed as their most recent primary special education eligibility category.

Aside from these findings, Kohrt (2004) conducted an electronic survey with school psychologists and found that 95% of the respondents reported an increase in the number of students referred for autism. In general, respondents also reported seeing eight students with autism per year. Given this new reality, it is essential that professionals understand autism and become better prepared to identify and deliver interventions to students with ASD (Brock, Jimerson, & Hansen, 2006).

School Service Delivery for Student with Disabilities

While federal legislation (P.L. 94-142) afforded children with disabilities ages 3 through 21 free and appropriate education (FAPE), how children with disabilities were serviced in order to guarantee FAPE by their local educational agencies differed. In order for students to benefit from FAPE, students with disabilities required special education services. It was an immense task to get the well over a million children with disabilities actually into school with the passing of P.L. 94-142. Once students with disabilities were in school, child find quickly gave way to a service delivery model where students with disabilities were often educated away from their typically developing peers. In the late 1970s and 1980s, special education was generally seen as a separate place where students with disabilities would go to be educated by special educators away from the general education classroom, non-disabled peers, and general education teachers (United States Department of Education, 2010). Schools and their special education services became challenged as they sought to support the needs of the steadily growing number of students (Yeargin-Allsopp et al., 2003). In particular, schools were challenged by costs, as it can cost two to three times more to educate students with disabilities (Fuchs & Fuchs, 2006).

As Public Law 94-142 went through its first major revision in 1997, becoming known as the Individuals with Disabilities Education Act (IDEA), the topic of school service delivery became a major concern. Following the *A Nation At Risk* report (1983), many educators began to challenge the containment approach of students to special education (see: US National Commission on Excellence in Education, 1983). IDEA (1997) indicated students with disabilities were general education students first, then a student who receives additional benefit from a set of special education services (Bastche et al., 2006; United States Department of Education, 2010; Prasse, 2014). This new viewpoint on students with disabilities shifted the exclusionary service delivery model (i.e. separate classrooms) to one of inclusion (i.e. participation in general education).

Between the 1990’s and 2000’s inclusion of students with disabilities became a focus. Inclusion was modeled in different ways, but overall the focus was on providing students with disabilities support in the general education classroom environment giving them the same opportunity to learn the general education curriculum alongside their non-disabled peers from the general education teacher. In an inclusive model, the general education teacher became responsible for the learning of the student with a disability. It also provided the students with a disability the ability to learn through peer models. As research has shown, children learn through direct instruction from a teacher but also through peer modeling (Spaulding, 2009; Hughes & Carter, 2008).

There are varying models of special education that are inclusive. First, there is a full inclusion service delivery model, where the students with disabilities spend their entire school day in the general education classroom and the general education teacher provides the majority of their instruction. Second, there is a co-teaching service delivery model, which is based on placing both a general education teacher and a special education teacher together in the same physical classroom space so that the needs of all learners can be addressed in that learning environment. The general education teacher and the special education teacher collaboratively teach all students, often teaching curriculum that is a strength area for each teacher while the other supports the teaching efforts. Studies have found that students without disabilities made significantly greater progress in reading and math, as well in motor skills, social-communication, personal-living, and community-living when served in inclusive settings (Cole, Waldron, & Majd, 2004; Spaulding, 2009). Third, there is a push-in service delivery model, where the special education teacher would support students with disabilities in the general education classroom during a particular subject area or time of day. The special educator would provide specialized support or pull students with disabilities together to work on a specific learning area. Push-in services can include the special education teacher working with a small group of students with disabilities using a structured intervention. The special education teacher is more able to control the pacing of the lesson, provide additional examples, and solicit more responses from students with disabilities in a push-in model (Spaulding, 2009). Finally, a pull-out service delivery model is very similar to the push-in model, as the special education teacher pulls students with a disability into a separate instructional environment to teach concepts. In the pull-out service delivery model, the special education teacher has more control over the instructional environment and teacher decision making than in other service delivery models.

Within special education service delivery, students with disabilities (most often developmental disabilities like Intellectual Disability and ASD) are often assigned paraprofessionals to assist them throughout the school day. Paraprofessional are sometimes referred to as classroom assistants, instructional aides, teacher assistants and para-educators. They are considered to be in a support role, and so they must be directed and supervised by a certified teacher or other school professionals. In many states, schools employ more special education paraprofessionals than certified special educators (Giangreco, Hurley, & Suter, 2011). Moreover. More than 400,000 full-time equivalent paraprofessionals currently work with school-aged children who receive special education services in the United States (U.S. Department of Education, 2010). Paraprofessionals can work with students with disabilities in multiple capacities, including academic, social-emotional, and behavior support. They provide support to students with disabilities in general education classrooms; in inclusion classrooms that include general education students and special education students taught together; and in self-contained classrooms. Moreover, these school staff spend considerable time working closely with students with severe disabilities. For example, 97% of special education paraprofessionals report providing one-to-one instruction to students with disabilities either daily or weekly (Carter, O'Rourke, Sisco, & Pelsue, 2009) and 87% report regularly providing behavioral and social support (Fisher & Pleasants, 2012). Schools, parents and researchers have recognized the increasingly integral role that paraprofessionals are playing in special education services. However, it has been recognized that most professionals lack training in evidence-based instructional strategies, especially when working with students with intellectual disability and/or autism spectrum disorders (Carter et al., 2009; Giangreco, 2009).

As special educators and paraprofessionals provide important services to students with disabilities, several concerns have emerged. Specifically, the rapid growth of paraprofessionals has not been driven by research findings; the use of individually assigned paraprofessionals lacks empirical support as a service delivery model (Giangreco, Edelman, et al., 2001; Giangreco, Suter, Doyle, 2010). Several studies have raised concerns about the over-reliance on adult-delivered one-to-one support in inclusive classrooms, which are stated as such: students have fewer interactions with their classmates when always accompanied by an adult, particularly during adolescence (Carter, Sisco, Brown, Brickham, & Al-Khabbaz, 2008); students feel stigmatized by the constant presence of adult by their side or isolated by their classmates when paraprofessionals implement separate instruction programming from the general education curriculum (Giangreco et al., 2005); students have fewer interactions with certified, highly qualified adults outside of their paraprofessionals (Giangreco, Broer, & Edelman, 2001); students may become overly dependent on their professionals, considering them their primary friends (Giangreco & Broer, 2005); student may receive fewer opportunities to develop their social-emotional skills (e.g., self-determination, resiliency) when everything is done for them or on their behalf (Giangreco et al., 2005); and the assignment of a paraprofessional may inhibit students from actively determining their own need for support and the avenues by which that support will be provided (Giangreco et al., 2005; Giangreco, 2010). Based on this summarized research as well the increasing calls for schools to reduce their growing reliance on individually assigned support for students with disabilities, and to promote access to and inclusion in general education, alternative service delivery models are being explored, implemented and evaluated. Schools and their educators continue to explore how to best support students with disabilities to participate fully and meaningfully in general education and in their larger school community (Carter, Kushing, & Kennedy, 2009).

Special education services for students with autism spectrum disorders. Many prominent symptoms of ASD, such as difficulties with communication and social interaction and fixed and repetitive thinking and behavior, can limit functioning at school. In addressing the pervasive nature of ASD symptoms, schools often provide a combination of communication, social, and behavioral services and life skills training to help students succeed at school (Spann, Kohler, & Soenksen, 2003). Special education services received by students with ASD can differ by age, disability severity, and demographic characteristics. Bitterman et al. (2008) found that children with ASDs received more services and more intensive services than children with other kinds of disabilities. There are limited studies that have examined the specific special education services students with ASDs receive throughout their school career. Most current studies have focused on a wide range of therapies rather than the special education services provided to children with ASDs in schools (McConachie & Robinson, 2006). Importantly, the research has tended to focus on students with ASD exclusively rather than on students who also have severe developmental disabilities with and without ASD.

Wei, Wagner, Christiano, Shattuck, and Yu (2014) analyzed national data sets to examine types of special education services and supports for students with ASDs from preschool through high school. Three national data sets, the Pre-Elementary Education Longitudinal Study, the Special Education Elementary Longitudinal Study, and the National Longitudinal Transition Study–2 were examined. These national studies included multiple sources of data from parent/youth telephone interviews or mail surveys; school, teacher, and school program surveys; and in-person student assessments and interviews. Study findings revealed that the most common special education service received by students with ASDs in all three study cohorts was speech/ language therapy; 85.2%, 84.6%, and 66.8% of students across the studies received this service. The average number of special education services received by students with ASDs was 4.67, 3.65, and 3.88 for preschool, elementary, and secondary school students, respectively. Overall, the authors found that some service receipt rates declined with age, including a declining trend of speech and language services, occupational therapy services, and the provision of academic supports/learning strategies for students with ASDs from elementary school to secondary school levels. Nonetheless, the authors found increasing service receipt rates for several special education services, including secondary school students with ASDs having higher odds of receiving mental health and social work services through their schools then their elementary school peers. Overall, secondary school students with ASDs received less speech/language and occupational therapies and were less likely to have a behavior management program. Given this reality, it seems adolescents with ASDs are likely to experience a decrease in needed service delivery that would aid with their social communication and interaction skills. Thus, with this decrease, they lose access and opportunities to receive instruction, modeling, and practice on these critical skills. A new approach, like peer-mediated interventions, can help bridge that gap in service delivery and shift special educator and paraprofessional roles of direct support to students with disabilities to that of indirect support, collaboration, and monitoring of all students within the inclusive classroom. In addition, research might benefit from the understanding of peer-mediated interventions on students with *severe* developmental disabilities with and without ASD, as less attention has been paid to how these groups of students benefit from specific intervention approaches, and/or are served in general education settings.

Educational Inclusion for Children with Disabilities and ASD

Inclusion may be defined as 100% placement in age-appropriate general education classes (Idol, 1997) or as a range of learning opportunities both within and outside the general education classroom (Baker & Zigmond, 1995). A number of educators and researchers have investigated the impact of inclusive arrangements on students' educational experiences as well as the effectiveness of these arrangements. Specifically, two lines of research have emerged investigating these outcomes: (a) academic outcomes and (b) social outcomes.

Doré, Dion, Wagner, and Brunet (2002) examined adolescents with mental retardation (MR) who were transferred from a self-contained special education classroom to a full-inclusion classroom. The sample consisted of two 15-year old girls with developmental disabilities that consisted of mild to moderate deficits in IQ and adaptive functioning. Students attended a full-inclusive classroom for the second-half of the semester. Both girls were evaluated on variables such as activity level in lectures, group work, and independent work as well as their degree of *active* engagement during activities. In addition, their social interactions with peers were examined. Findings revealed that the transfer to full-inclusion classrooms was associated with more frequent *active* engagement in activities, which was directly linked to their increased learning outcomes. In addition, a slight increase in their social interactions with nondisabled peers was found. While this study illustrated the unique benefits of inclusion on students with mild to moderate developmental disabilities, it would be of additional interest to see how inclusion outcomes differ for students with more *severe* developmental disabilities with and without ASD.

Similarly, Salend and Duhaney (1999) conducted a literature review examining the impact of inclusion on academic and social outcomes of children with disabilities. The overarching findings were that children with disabilities gained both academically and socially from participation in inclusive education programs. For example, academics gains included mastery of their IEP goals, improved performance on standardized tests, better grades, and increased on-task behavior and motivation to learn. The most gains were seen in reading and writing for children with specific learning disabilities (SLD). In addition, children with disabilities also made gains in their social interactions. For instance, children with *mild* disabilities made more social contacts, had richer friendship networks, and received more social support than their peers who were educated in self-contained classrooms. Nonetheless, in their review, they found that some students with *mild* disabilities performed better academically when given traditional special education pull-out services, and be less accepted by their typical peers as well as report lower self-perceptions than their typical peers. Similarly, their review also pointed out that although students with *severe* disabilities demonstrated more social interactions with their typical peers in inclusive programs, there interactions were often assistive in nature and tended to decline as the school year progressed. This study was a broad review of the literature on inclusion and suggested that inclusion can have mixed outcomes for students with disabilities that depends on disability type and severity. However, it remains unclear how inclusion with specific interventions may impact students with severe developmental disabilities with and without ASD. Moreover, most studies included in the review were of elementary students, which emphasizes a need for investigating inclusion outcomes for middle and high school students with severe disabilities.

Glovak (2007) investigated the play and social interactions of pre-school children with ASD in integrated play groups (IPG). In particular, the study compared ASD children in an isolated play group and in an IPG (i.e., inclusive). Findings revealed that children with ASD who were placed in the IPG had more frequent and sustained social interactions as well as decreased isolated play. Individuals in the IPG also improved their language skills, social communication skills, and made more friends. In general, this study suggested that peers may be a source of intervention for improving the social outcomes of children with ASD. The findings suggest that an inclusive approach, such as integrated social or play groups, could be effective for children with severe developmental disabilities that include ASD; although more research is needed to investigate how specific outcomes (e.g., increases in language use, social skills, etc.) are impacted by disability severity within the context of an intervention approach.

Belini, Peters, Brenner & Hope (2007) conducted a meta-analysis on the effectiveness of social skill interventions for children with ASD in school settings. The purpose of the meta-analysis was to identify social skills interventions and their participant, setting, and procedural features that lead to effective intervention outcomes for children with ASD. Findings revealed that 55 peer-reviewed studies were published between 1986 and 2005; all which employed various single subject methodologies (e.g., changing conditions design, alternating treatment design, multiple-baseline design, reversal designs, and a combination of designs). Hours of intervention ranged widely from 2.5 to 28 hours across 8 to 73 sessions. Intervention length ranged from 10 to 210 days.

Findings revealed that school-based interventions were minimally effective for remediating social skill deficits in children with ASD. However, the results indicated that interventions that were implemented in typical classroom settings (vs. pull-out, resource room) produced higher treatment effects and generalization and maintenance of social skills for children with ASD. The article underscores Gresham, Sugai, and Horner (2001)'s finding that social skill interventions have weak outcomes due to the fact they are often implemented in "contrived, restricted, and decontextualized" settings, such as resource rooms or other pull-out settings. In addition, Bellini pointed to another explanation for these limited effects, that interventions generally were implemented as static interventions—neither tailored to "fit" the individualized needs of students, nor aligned with the students' specific skill deficits, nor informed by the identification of contextual variables that may influence students' social outcomes. In order to do this, more focus on individualized assessment will be required. Their review also didn't examine how individual differences (disability type and severity) may moderate the intervention outcomes.

While much of the research in the area of inclusion has naturally focused on instructional strategies and academic achievement outcomes, investigations have also been directed toward specifying the beneficial components of inclusive contexts. In particular, many researchers have widened their lenses to include examinations of classroom culture or social climate represented by teacher beliefs, classroom management, social relations, rules for speaking and participating, and classroom dynamics (Turner & Meyer, 2000). A study by Berry (2006) examined the social context of inclusion with more of a focus on exploring classroom practices and constructing a social-cultural participatory community among students with and without disabilities. The study included 17 general education students and 12 special education students and staff in an urban school district. The student sample comprised of second, third, and fourth graders with low to high socioeconomic status. Classroom observations were video-taped that combined focused and selective open-ended social and academic observations in the classroom. Dialogue and classroom activity were logged. Selected videotapes were transcribed and examined for themes, such as "community," that characterized classroom climate and social interactions. Teacher utterances were also analyzed for evidence of interactional styles, pedagogical beliefs and practices, and how the teacher encouraged and supported participation among students. Finally, patterns of interaction between a specific student with disabilities and his/her nondisabled peers were examined. Aside from observational data collection, teacher interviews were conducted and transcribed prior the beginning of the data collection and again at the end of the school year. The results of this study found that while it appeared that students with and without disabilities were at all times included, engaged, and interactive; with a closer look at these interactions some exclusionary practices were observed. The author suggests that inclusion and the creation of a classroom community must be viewed as a continuous processes. Furthermore, the author suggests that teachers establishing rich learning contexts can provide crucial opportunities for participation for students with disabilities. These rich learning conditions can provide legitimate peripheral participation among students with disabilities in ways that are likely to move them increasingly toward the center of the classroom practice. In particular, students with disabilities did not benefit from placement as a proxy for inclusion. This research indicates that it is not enough to include students with disabilities, but rather conditions for inclusion need to be direct and explicit in preparing non-disabled peers and in creating an inclusive classroom community of unity and care for all. Based on this research, students with disabilities and their non-disabled peers may benefit from explicit peer-mediated instruction and intervention that can distinctively impact their social relationships and academic participation in and out of the classroom context. This research also points to the need for investigating how classrooms can provide effective inclusive environments and practices for students with a wide-range of disabilities that present as mild to severe in nature.

Copeland and colleagues (2004) investigated the perspectives of general education high school students who provided social, academic, and friendship support to their peers with moderate or severe disabilities in order to increase access to general education. Participants included 32 high school students who had participated in a peer buddy program with 152 students with severe disabilities across six high schools. The peer buddies interacted with their peers with disabilities for a minimum of one class period per day throughout the semester across both instructional (e.g., functional academics, functional life skills, employment training skills) and non-instructional (e.g., participating in sports, volunteering, “hanging-out” between classes). The study utilized focus groups to elicit multiple perspectives from high school students. Focus group were recorded and transcribed and analyzed for content patterns.

The study analyses revealed four broad categories of responses from peer buddies, which were (a) perceived challenges to general education participation of student with disabilities, (b) action taken by peers to increase access to general education among students with disabilities, (c) recommendation for improving the peer support program to increase general education access, and (d) perceived benefits of the peer support program. Peer buddies perceived that their participation in the Peer Buddy Program reduced or circumvented many challenges associated with their interactions with students with disabilities. Their responses provided social validation of a peer support model and suggest that students with disabilities benefit from broad access to general education classrooms (vs. pull out, proximity, or resource). Future research may want to employ peer supports to facilitate and increase access to general education as well as increase social and academic opportunities within the general education curriculum.

Several studies have investigated the impact of TD children on the frequency and quality of peer interactions among students with disabilities. Gunn, Trembath, and Hudry (2014) completed a series of non-experiential case studies to investigate whether pre-school children with ASD benefit from social interactions with their typically developing (TD) peers in reverse inclusion conditions. In this study, participants involved 13 children with ASD and two TD peers. Recordings were made in an unobtrusive manner, using a handheld video camera within a 5m radius of the target child/children. Study findings demonstrated that children with ASD interacted with both peer types (TD and ASD) more frequently during the semi-structured and structured activities, than during free play. No clear bias was observed for a peer type. The results highlighted the significant individual variability present among ASD children, and the need to tailor learning supports to the needs of individuals (structured vs. free-play). This research also suggests that children with ASD may not show the same benefits in social interaction in a reverse inclusive setting as they do in fully inclusive settings. However, it is not clear how this study's findings would translate to high school students and the implications of structuring opportunities to socially interact with TD peers.

In an earlier study, Tsao et al. (2008) reported that children with disabilities made more positive interactions towards TD peers, received more positive responses from TD peers, and interacted less with their peers with disabilities in inclusive settings. Additionally, Hauser-Cram et al. (1993) reported similar findings, based on naturalistic observations of preschoolers with disabilities across inclusive and segregated classrooms. These lines of research found that children with disabilities were observed to initiate and respond more frequently to their peers in inclusive classrooms than in segregated classrooms. The implication from this line of research is that further examination of the extent to which adolescents rates of interaction can be increased through peer-mediated intervention, and the type of support and structure required to affect their outcomes is not known but in need of investigation.

In summary, findings suggest that children with disabilities benefit both academically and socially from inclusive placements. Salend and Garrick (1999) concluded that benefits of inclusion for many students with disabilities include gains in academic achievement, increased peer acceptance and richer friendship networks, higher self-esteem, avoidance of stigma attached to pull-out programs, and possible lifetime benefits (e.g., higher salaries, independent living) after leaving school. They also found that the practice of inclusion could benefit students without disabilities. Although, given that a majority of these studies were not specifically focused on children or adolescents with ASD but rather on children with MR and SLD, there is a need to conduct research to determine if these findings will be applicable to adolescents with DD (with and without ASD) in inclusive school settings. A considerable amount of research indicates that children and adolescents with severe DD and/or ASD often have limited opportunities for interactions in inclusive settings; and thus, infrequent social interactions with typical peers (Bauminger, Shulman, & Agam, 2003). It has also been suggested that the social benefits associated with inclusion for children and adolescents with DD and/or ASD are difficult to assess independently due to nature of the disorder and severity that may be involved. As a result of limited social interactions with typical peers (i.e., in inclusive settings), the social skills of children with ASD are not well developed and less likely to be remediated, particularly as they get older. It has also been noted that children with developmental disabilities have similar impairments to children with ASD, which can include physical, learning, language, or behavior deficits that impact day-to-day functioning, and usually last throughout their lifetime. It would seem, therefore, that further investigations are needed in order to understand the overlap of these populations and how they respond to inclusive intervention approaches.

Assessment Approaches for ASD

Early identification. The identification of children with ASD early on has been promoted as ideal because of the greater likelihood of positive impact on children's livelihood. In fact, there is mounting evidence that early identification and intervention before age 3 are major determinants of the ASD course than if children were identified by age 5 (Wetherby, Woods, Allen, Cleary, Dickinson, & Lord, 2004). Specifically, research has shown that 75% to 88% of children with ASD show signs of the condition in the first two years of life, with 31% to 55% of those children exhibiting signs in the first year of life (Young & Brewer, 2002). Moreover, Stone and colleagues (1999) have shown that children with autism can be reliably diagnosed under the age of three (see also Mann Layne, 2007). Indeed, children diagnosed with ASD at age 2 were likely to have the same diagnosis at age 3 (Stone et al., 1999; Lord et al., 2004). These studies indicate that impairments in SCB (e.g., failure of gaze monitoring, pretend play, protodeclarative pointing, joint attention, lack of response to their name, odd facial expressions, poor motor imitation) were evident at age 2, but restrictive and repetitive behavior patterns were not evident until age 3; which consequently delays the process of appropriate early identification of ASD. In spite of this, studies have demonstrated that early screening of SCB parameters can be a reliable avenue for identifying ASD at age 2 (Baird et al., 2000; Robins et al., 2001; Wetherby et al., 2004). Screening is viewed as a universal method that is designed with the intent of prevention and early identification of problems in a group or population in order to facilitate early intervention. Siegel (1996) delineated screening as having two different levels each answering different questions. Level 1 is often referred to as routine developmental screening, whereas Level 2 is referred to as the diagnostic and evaluation stage for ASD. During these two sequential stages of screening, a professional is likely to rely on a child's parental concerns and the constellation of child behaviors present.

Level 1 ASD assessment: Screening approaches. Screening involves all children being screened for risk factors and warning signs of ASD or other developmental disorders. Risk factors may include the individual having a sibling with ASD (Newschaffer, Fallin, & Lee, 2002) or a previous diagnosis of epilepsy, fragile X syndrome, and/ or a family history of ASD or ASD-like behaviors (Filipek et al., 1999, 2000). The presence of risk factors may suggest that more careful attention needs to be paid to a child's concrete behaviors. Therefore, researchers have identified behavioral warning signs of ASD, which have been termed *absolute indicators* of the need for screening (Filipek et al., 1999). Warning signs identified in infancy include: (a) no big smiles or other joyful expressions by 6 months; (b) no reciprocal sharing of sounds, smiles, facial expressions by 9 months; (c) no reciprocal gestures such as pointing, showing, reaching or waving bye-bye by 12 months; (d) no babbling at 12 months; (e) no single words at 16 months; (f) failure to attend to human voice by 12 months; (g) failure to demonstrate interest in other children by 24 months; (h) failure to imitate by 24 months; and (i) any loss of any language or social skills at any age (Filipek et al., 1999; Filipek et al., 2000; Wetherby et al., 2004; Ozonoff, 2003). As children develop through childhood, warning signs may include a preference to be alone, lack of emotion towards others, becoming very upset with changes in routine, and a failure to make friends and engage is social/emotional reciprocity (Filipek et al., 2000; Brock, Jimerson, & Hansen, 2006; see Appendix B). In order to gather this information from parents at primary care visits, a number of screening instruments have been developed. Common instruments used to routinely screen for ASD are *The Parents' Evaluation of Developmental Status (PEDS;* Glascoe, 1997), *The Ages and Stages Questionnaire* (ASQ; Bricker & Squires, 1994), *The Child Development Inventories* (CDI; Ireton & Glascoe, 1995), *The Brigance Screens* (Brigance, 1986), and specific developmental probes regarding a child's communication, socialization, behavior, and the development of a younger sibling or an older child with known or suspected ASD. Also during Level 1, formal audiological evaluations, lead screening, and specific screening instruments for autism may be performed.

There are several screening tools available for assessing infants and toddlers for ASD. *The Checklist for Autism in Toddlers* (CHAT) was one of the first tools developed to identify risk of autism among 18-month-old children (Baird et al., 2000; Baron-Cohen et al., 1992). The *CHAT* consists of both direct and indirect assessment procedures, which require a parent to complete a rating scale about their at-risk child and a practitioner to directly observe the child. Rating scale questions assess key areas of child functioning, such as joint attention and pretend play; which have been viewed as profound predictors of ASD. The *CHAT* has been regarded as one of the most widely used researched screening instruments (Goin & Meyers, 2004); and demonstrates adequate predictive value (the percentage of children who have a screening test result indicative of autism who actually do have ASD; 59%), and specificity (the proportion of children without autism who have a screening test result suggesting that they are free of ASD; 99.9%). In fact, support for this instrument comes from research suggesting that 83 percent of 18-month-old children within one sample of 16,000, who failed the *CHAT* key items, were subsequently diagnosed with ASD at 42 months of age (Kabot, Masi, & Segal, 2003). However, the *CHAT* has been shown to be less sensitive (the proportion of children with autism who have a screening test result indicative of autism; 21%) to identifying children who show less severe symptoms of ASD (e.g., Asperger's Disorder [Kabot, Masi, & Segal, 2003]); thus, allowing these children to "fall through the cracks" and likely be identified at a later time. To help develop a more sensitive instrument to the broader ASD symptoms, Robins, Fein, Barton, & Green (2001) developed the *Modified Checklist of Autism in Toddlers* (M-CHAT). Unlike the *CHAT*, the *M-CHAT* does not require direct observation and is designed to identify children for ASD at 24 months of age. The *M-CHAT* consists of 24 yes/no items, in which 6 are regarded as critical items. Psychometric data suggests that the *M-CHAT* has a sensitivity of 95%, specificity of 99%, positive predictive power of 79%, and negative predictive power (the percentage of children who have a screening test result indicative that they are free from ASD) of 99% (Robins et al., 2001).

Another screening tool designed for very young children (ages 12 to 48 months) is the *Pervasive Developmental Disorders Screening Test-II* (PDDST-II; Siegel, 2004). *PDDST* was developed for use within both general and clinical populations. This measure includes three different stages of identification. Stage 1 is specifically focused on identifying children with ASD in the general population. Stage 2 is intended for use within a clinic setting and designed to differentiate children with have an ASD vs. another developmental disorder. Stage 3 is intended for use with an autism specialist and is designed to discriminate autism from other ASD. At each of these stages, parents are required to complete rating scales about their children's early behaviors in areas such verbal and nonverbal communication (e.g., joint attention, responsiveness), language use (e.g., sounds, single words usage, and understanding of language), temperament, and play and social interaction. Psychometric data gathered from a study delineating 681 children referred for autism assessment from 256 children who were part of a study of very low birth rate revealed 0.92 and 0.91 for sensitivity and specificity, respectively (Siegel, 2004).

Several screeners have been developed for identifying school-age children with ASD. One of the most widely used is *The High Functioning Autism Spectrum Screening Questionnaire* (ASSQ; Ehlers & Gillberg; 1993), which is a checklist designed to be completed by parents and/or teachers. The scale consists of 27 items that are rated on a 3-point scale (with 0 indicating normality, 1 some abnormality, and 2 definite abnormality) and has a total score range of 0 to 54. The rating scale items are designed to gather information about a child's social interactions (e.g., social mindedness), communication patterns, presence of restricted/repetitive behaviors and motor clumsiness, and other ASD associated symptoms. As demonstrated through epidemiological and validation studies, the scale is suggested to be a "reliable and valid screening instrument for high functioning ASD in clinical settings" (Ehlers, Gillberg, & Wing, 1999, p. 139-140). Data revealed that the use of a lower *ASSQ* cut-off score (e.g., teachers = 11 and parents = 13) correctly identifies 90% to 91% of children with ASD, however, also identifies 23% to 42% of social impaired children (e.g., attention deficit hyperactivity disorder and other behavior disorders) that may not necessarily have an ASD, which therefore suggests low discriminant validity (Ehlers, Gillberg, & Wing, 1999).

A common screening tool used with clinical populations of children age 4 years and older is the *Social Communication Questionnaire* (SCQ; Rutter, Baily, & Lord, 2003), previously known as the *Autism Screening Questionnaire*. *SCQ* comprises two forms: a *Lifetime* and *Current* form. The Current form asks about the child's behavior in the past 3 months, whereas the Lifetime form asks questions about the child's entire developmental history. Both forms can be informative for determining whether a formal diagnostic assessment is needed and for determining treatment and educational plans. The *SCQ* consists of 40 yes/no items for parents to answer. Items came from the Autism Diagnostic Interview-Revised (ADI-R), which is considered the "gold standard" measure for gathering developmental history related to ASD (Rutter et al., 2003). The *SCQ* is not suitable for individual diagnosis; items must be compared to clinical observations. Since the *SCQ* is a fairly new instrument the authors have acknowledged that psychometric properties need further investigation, but the instrument does show promise in carefully discriminating between children who have autism vs. other developmental disorders (Brock, Jimerson, & Hansen, 2006; Christensen, Bilder et. al., 2016).

Level 2 ASD assessment: Indirect and direct diagnostic approaches. Level 2 involves a more in-depth investigation of children already identified to be at-risk developmentally. Children identified at this Level are usually showing atypical developmental patterns. The central purposes of Level 2 screening are: (a) to differentiate children who have ASD from children who have other developmental disorders, and (b) to determine interventions that are linked to the evaluation of children's strengths and weaknesses (Brock, Jimerson, & Hansen, 2006). In order to meet those central purposes both indirect and direct assessment procedures are utilized by professionals. Indirect assessment procedures include gathering data from caregivers (e.g., parents and teachers) about the child being evaluated. Common indirect assessment procedures include the parents and teachers completing ratings scales, checklists and interviews about the child suspected of ASD. Whereas, direct assessment procedures involve obtaining data by observing the child suspected of ASD. Both direct and indirect assessment methods are important for determining an appropriate diagnosis.

ASD Indirect Diagnostic Assessment Approaches

Rating scales. The *Gilliam Autism Rating Scale—Third Edition* (GARS—3; Gilliam, 2013) is a behavioral checklist designed to assist in the diagnostic assessment of individuals 3 through 22 years of age who are suspected of autism. *GARS* consists of 56 items that are grouped into six subscales: Restrictive/Repetitive Behaviors, Social Interaction, Social Communication, Emotional Responses, Cognitive Style, and Maladaptive Speech. Questions are designed to correspond to the definitions of the American Psychiatric Association and the Autism Society of America. The scale is designed to be completed by a parent, caregiver, or teacher and takes about 5 to 10 minutes to complete. Rater scores are converted into standard scores, which are then converted into an Autism Index (e.g., which indicates the probability of the individual having autism). Authors have contended that the measure demonstrates adequate validity in discriminating persons who have autism from those with severe behavioral disorders or mental retardation. However, a study conducted by South et al. (2002) concluded that the measure had a high false negative rate (52%), which suggests that that tool may underestimate autism symptomology; and should therefore, be used in conjunction with other assessment tools when making a diagnosis.

Myles, Bock, & Simpson (2001) developed the *Asperger's Syndrome Diagnostic Scale* (ASDS), which is a behavioral checklist designed to be completed by a parent, caregiver or teacher. The scale consists of 50 items that are divided into five subtests: Language, Social, Maladaptive, Cognitive, and Sensorimotor; and is scored on a 2-point scale (with 0 indicating not observed and 1 indicating observed). The checklist generally takes about 10-15 minutes for raters to complete. The raters' subtest raw score is converted to standard scores, which are then summed and converted to an Asperger's Syndrome Quotient (ASQ). The ASQ (vs. single subtest composites) is used as a score to help make the diagnosis of Asperger's Syndrome. An ASQ score of 90 and above is associated with "Likely" to "Very Likely" probability that the child has Asperger's Syndrome. Overall, the *ASDS* has been demonstrated to be psychometrically sound and have moderate to good reliability (Mirenda, 2003).

Another indirect assessment measure, as discussed earlier, is the *PDDST-II: Stage 3*, where the measure is intended to be used for making an individual Autistic Disorder diagnosis (vs. screening for general ASD). In this stage, if eight or more of the items are checked as being "YES, Usually True," then the result is suggestive of an Autistic Disorder diagnosis vs. another ASD. Psychometric data reveals that Stage 3's ability to differentiate 355 children with Autistic Disorder from 99 children with another ASD was positive. In particular, results revealed that *PDDST-II: Stage 3* has a sensitivity of 0.58 and specificity of 0.60 (Siegel, 2004); which suggests moderate reliability and validity in diagnosing and discriminating autism from other ASD.

Interview. Interviewing parents, caregivers and teaches about the suspected child is an additional indirect assessment procedure that a professional can choose to perform. Rutter, Le Couteur, and Lord (2003) developed the *Autism Diagnostic Interview—Revised* (ADI-R), which is considered to be the “gold standard” for diagnosing Autistic Disorder (Filipek et al., 1999, p. 459). *ADI-R* requires a trained clinical interviewer, which may limit its use in community settings; however, the materials provide sufficient training for most professionals. *ADI-R* is a parent interview that gathers information about three specific core areas: (1) social relatedness, (2) communication, and (3) ritualistic or preservative behaviors; each of which corresponds to DSM IV-TR (APA, 2000) and ICD-10 (WHO, 1993) diagnoses of ASD. The measure consists of 93 items that take approximately 90 to 150 minutes to administer. Overall, the *ADI-R* manual suggests that is has sound psychometric properties; specifically, rare false positives and high discriminative validity (Rutter et al., 2003; Mildenberger, Sitter, Noterdaeme, & Amorosa, 2001; Risi et al., 2006).

ASD Direct Diagnostic Assessment Approaches

Autism Diagnostic Observation Schedule (ADOS; DiLavore, Lord, & Rutter, 1995*).* Like the *ADI-R* mentioned earlier, the *ADOS* is considered to be “gold standard” in the diagnosis of autism (Filipek et al., 1999, p. 460). The *ADOS* is a comprehensive social behavior assessment for children, adolescents, and adults. It is a standardized, semistructured interactive play assessment that is investigator-facilitated, and consists of 4 modules designed to gather information about an individual’s reciprocal social interaction skills, communication skills, behaviors and interests, and play or imaginative use of materials. Assessment of those areas of functioning permits a professional to make an ASD diagnosis. Module 1 is designed for individuals who are preverbal or who speak in single words, Module 2 is designed for children who speak in phrases, Module 3 is for children and adolescents with fluent speech, and Module 4 is for adolescents and adults with fluent speech. *ADOS* require 30 to 45 minutes to administer and as with the *ADI-R*, requires specific training and procedural fidelity. The ADOS exhibits good to excellent predictive validity, especially when used in combination with the ADI-R (see Risi et al., 2006). The manual suggests adequate internal consistency, interrater reliability, and discriminative validity (Lord et al., 2000). Conversely, the *ADOS* was found to be less sensitive to differentiating among autism spectrum disorders (Klinger & Renner, 2000; Brock, Jimerson, & Hansen, 2006).

The ADOS was revised in 2012 (Lord, Luyster, Gotham & Guthrie, 2012; Lord, Rutter, et al., 2012; ADOS-2) to include an expansion of the diagnostic algorithms used in Modules 1 to 3 and the addition of the Toddler Module. Minor modifications to administration instructions and protocols were updated to include enhanced description of administration and behaviors being observed. The ADOS-2 has five modules, only one of which is administered at a given time based on the individual's verbal level (from no words to fluent speech) and/or age (from 12 months through adulthood). Each ADOS-2 module consists of semi-structured talking- and/or play-based activities using standardized materials; total administration time is 30-60 minutes. Item scores on a 0-3 scale, with higher scores indicating greater symptom severity, are assigned immediately after completing the administration. Raw scores of items from a "Social Affect" and a "Restricted Repetitive Behavior" algorithm domain are summed and applied to cut-offs to yield the classification Both the original and revised algorithms (see Gotham, Risi, Pickles, & Lord, 2007) show strong predictive validity, with the revised set of algorithms showing better specificity in lower-functioning populations. Diagnostic algorithms have strong predictive validity and discriminant validity against best estimate clinical diagnoses. Inter-rater reliability, internal consistency, and test-retest reliability of the measure were found to be good to excellent in the original ADOS reliability sample of 98 individuals and 12 reliable examiners, as well as in updated data on the revised algorithms (see the ADOS-2 manual, Lord et al., 2012). The ADOS-

2 is the most widely used and well-established observational assessment for the classification of ASD.

Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Renner, 1988). The *CARS* is an objective 15-item structured observation scale that asks an evaluator to compare the child being assessed to others of the same developmental level on a 4-point scale (with 1 indicating normal behavior, 2 indicating mildly abnormal behavior, 3 indicating moderately abnormal, and 4 indicating severely abnormal behavior). The 15 items target areas of verbal and nonverbal communication, social behaviors, activity level, affect appearance, intellectual functioning, and verbal and motor imitation. The evaluator's scores across the items are summed and used to determine the severity of autistic behaviors. Score totals ranging from: 15 to 29 indicate non-autistic, 30 to 37 indicate mildly-moderately autistic, 37 to 60 indicate severely autistic. The *CARS* is a tool that can be supplemented with interviews and record reviews, whereas the professional gathers information about *CARS* items from parents and teachers and from reviewing school and medical records, in addition to direct observations of *CARS* items. In terms of psychometric properties, the *CARS* has been deemed as adequate (Prizant, 1992). According to the Schopler, Reichler, DeVellis, & Daly (1980) the *CARS* showed a reliability and validity coefficient of 0.94 and 0.84, respectively; indicating a high degree of internal consistency and ability to measure the correct phenomenon (e.g., autism).

In 2010, the CARS underwent additional development study to standardize a new version- Childhood Autism Rating Scale, Second Edition—Standard Version (CARS2-ST; Schopler, Van Bourgondien, Wellman, & Love, 2010. In the study, a verification sample of 1,034 individuals on the spectrum was used to determine the psychometric properties of the revised measure. Over two-thirds of the individuals in the verification sample were male, which is consistent with current diagnostic trends (CDC, 2012). Approximately 20% of individuals in the sample were between the ages of 11 and 15, while 7% were over the age of 15. Everyone in the sample had Full Scale IQ (FSIQ) estimates of 85 or lower (Schopler et al., 2010). Like its predecessor, the CARS2-ST has strong technical properties. The internal consistency estimate is .93 and interrater reliability correlations for individual items range from .55 to .93 (Mdn = .71). Ratings obtained from the verification sample are consistent with the CARS.

In reviewing both the indirect and direct assessment measures (see Appendix C), there main purpose appears to be diagnosing children within clinical settings as opposed to natural contexts. Most of the measures examine the broad domains relating to ASD; however, few of the measures examine specific SCB, which are a central concern for children with ASD. In addition, most of the assessment information gained from these measures may have little utility for designing interventions that meet children’s individual needs. Overall, they are designed for one main purpose, which is to diagnose ASD and not to necessarily remediate or facilitate interventions. Therefore, assessments that are linked to interventions are needed, specifically with regards to SCB of children with ASD.

A Key Assessment and Intervention Approach: Applied Behavior Analysis to Address ASD Challenging Behaviors

Overview of applied behavior analysis procedures. Applied Behavior Analysis (ABA) is “the science in which tactics derived from the principles of behavior are applied systematically to improve socially significant behavior” (Cooper et al., 2007, p. 20). ABA techniques have been used to improve a wide range of socially meaningful behaviors, such as aggression, social withdrawal, self-injury, functional living skills, and academic performance; and across a wide range of populations (e.g., children and adults with developmental disabilities, learning disorders, and pervasive developmental disorders) and settings (e.g., schools, homes, institutions) [Steege & Mace, 2007; Cooper, Heron, & Heward, 1987]. With regard to children with ASD, ABA techniques, such as Functional Behavior Assessment (FBA), have been successfully utilized to address and ameliorate challenging behaviors through prompting and fading procedures and various reinforcers (Lovass, 1977). Specifically, these techniques have been used with individuals with ASD in several different ways: (a) to teach new skills, (b) to maintain previously learned adaptive skills, (c) to generalize adaptive learning from one situation to another, (d) to narrow conditions under which problematic behaviors occur, and (e) to reduce the problematic behaviors by discontinuing their reinforcement (Steege & Mace, 2007).

ABA focuses on observable behaviors and the functional relationship between the observable behaviors and environmental conditions surrounding those behaviors. Professionals use ABA procedures to identify behaviors and contexts that increase or decrease the likelihood of a target behavior. FBA is the most common ABA procedure used by professionals to identify antecedent and consequent factors that increase or decrease the likelihood of a target problematic behavior (e.g., aggression). Professionals use this information to develop hypotheses about why a particular target problem behavior is occurring, then to design and implement interventions to ameliorate the target problem behavior (Wacker, Northup, & Cooper, 1992; Steege & Mace, 2007). ABA procedures are also effective for demonstrating that an intervention is, indeed, responsible for the behavior change (e.g., reduced aggression).

ABA has been regarded as the science for studying human behavior (Whaler & Fox, 1981). Conceptually, Baer, Wolf and Risley (1987) identified seven dimensions that characterize ABA: *applied, behavioral, analytic, technological, conceptual, effective, and capable of appropriately generalized outcomes*. Recently, the *effective* dimension and *appropriately* *generalized outcomes* dimensions have taken on a larger role in ABA science. Specifically, ABA assessment techniques have been broadened in the area of technology and to a systems level application. There has also been a shift in orientation among ABA researchers that is more attuned to contextual factors of behavior which helps to increase the emphasis that has been placed on the link between assessment and intervention. Moreover, legislative mandates have recently required children with disabilities to be assessed using a type of ABA procedure (e.g., FBA). However, the understanding and the comprehensive implementation of ABA procedures is often misunderstood and misapplied in school settings (Repp, 1994).

Methodologically, Bijou, Peterson, and Ault (1968)'s first description of ABA procedures and the analysis of child behavior in naturalistic setting using Antecedent-Behavior-Consequence (A-B-C) recordings have influenced the formulization of ABA procedures. Furthermore, Carr's (1977) research laid the foundation for understanding how behaviors are *functionally* linked to environmental conditions. Subsequently, Iwata, Dorsey, Slifter, Baumann, and Richmann (1982/1994) created a direct test of those findings via the development of functional analysis methodology. These findings contributed to the understanding that behavior can be systematically studied and functionally linked to environmental factors, and that the direct understanding and manipulation of the functional relationship can change the behavior outcome.

Historically, ABA procedures have been demonstrated to be integral to understanding human behavior and for the objective assessment of significant behavior before, during, and after the delivery of an intervention. The use of single-case experimental designs is the ABA methodology for examining the effectiveness of an intervention on a behavior. Formal techniques that have unfolded through ABA research include: (a) the use of descriptive assessments (DA) in natural settings, (b) the use of structural analysis (SA) procedures to identify antecedent events and contextual factors (CF) that surround aberrant behavior, and (c) the use of functional analysis (FA) procedures to determine maintaining reinforcers (consequences) of aberrant behavior. These techniques have been most useful for altering challenging behaviors for individuals with ASD and other developmental and behavior disabilities.

Descriptive assessment. Descriptive Assessment refers to a set of procedures that describe interactions between the individual's behavior and naturally occurring events (Bijou, Peterson, & Ault, 1968). Information is gathered about the individual's behavior and the environmental context in which the individual performs the behavior. Gathering this information assists in developing presumed hypotheses about the functional relationship between the individual's behavior and environmental context surrounding the behavior; this process is referred to as the beginning step of a functional behavior assessment. Descriptive Assessment allows for the identification of antecedent, consequent, and contextual variables surrounding an individual's behavior in the natural environment without the manipulation of environmental conditions. Miller, Tansey, & Hughes (1998) suggested that the goal of DA in FBA is to record: (a) the description of the setting in which the behavior occurs, (b) the frequency in which the behavior occurs, (c) the intensity of the behavior (e.g., consequences of behaviors for individual, peers, and surrounding environment), (c) the duration of the behavior, (d) previous interventions attempted with the behavior, and (e) deemed impact of the behavior.

Descriptive Assessment uses a continuum of information-gathering procedures that range from indirect, informant-based procedures to direct observation-based (i.e., not requiring informants) procedures. Indirect descriptive procedures include behavior interviews, rating scales, checklists, questionnaires, and a review of records. Parents, teachers, and caregivers usually serve as informants that complete these various procedures that are aimed at gathering information about antecedent, consequent, and contextual factors surrounding the target behavior. According to Gresham and Davis (1988) behavioral interviews allow for: (1) the specification of the behavior of interest; (2) a more objective description of target behavior; (3) the identification of environmental conditions surrounding the target behavior; (4) an estimation of the frequency, intensity, and duration of the target behavior; (5) an agreement on the type of data to be collected and used; and (6) a discussion of next steps in terms of the target behavior. Overall, interviews gather a broad range of information about the topography of the behavior, the antecedent events, consequent events, and other information to determine factors that may be influencing the behavior (Miltenberger & Veltum, 1988). An example of a descriptive assessment interview identified in the literature is the *Functional Assessment Interview* (*FAI*; O'Neill, Horner, Albin, Sprague, & Storey, 1997). The *FAI* is an example of a structured interview used to assess the function of behavior. It is a comprehensive interview that includes questions regarding the antecedents, consequences, and setting events surrounding problematic behavior. Setting events are events which may change the nature of the stimulus-response relationship (Carr et al., 1999).

Interviews may be used alone or in combination with other assessment techniques. Interviews are useful for gathering initial information but have limitations. They have many of the same problems as other indirect data collection methods, such as observer bias, observer expectations, and false recollection of events (Lennox & Miltenberger, 1989; Repp & Horner, 1999). Therefore, it is recommended that the interview serve as a starting point in the functional assessment process (Lennox & Miltenberger, 1989).

Behavior rating scales provide a standardized format for gathering *summary judgments* regarding an individual's behavioral characteristics from informants (Merrell, 2008). Common rating scales used to gather descriptive assessment information include: the *Motivation Assessment Scale* (MAS; Durand & Crimmins, 1988), the *Motivation Analysis Rating Scale* (MARS; Wiesler, Hanzel, Chamberlain, & Thompson, 1985), *Questions about Behavioral Function* (QABF; Matson, & Vollmer, 1995), the *Student-Assisted functional Assessment Scale* (Kern, Dunlap, Clarke, & Childs, 1994), and the *Problem Behavior Questionnaire* (Lewis, Scott, Sugai, 1994). Rating scales collect information about possible target behavior reinforcements, communicative functions of target behaviors, and other information needed to formulate functionally-based interventions (Lennox & Miltenberger, 1989). For example, the *MAS* is a behavioral rating scale administered to parents and teachers that assesses four possible functions (escape, attention, tangibles, and sensory stimulation) of problematic behavior. Questionnaires, such as the *MAS*, provide specific information related to the behavior and are convenient to administer (Mace, 1994). However, similar to the behavioral interview, information may be biased by the informant's memory, expectations, or interpretation of events (Lennox & Miltenberger, 1989).

Different than rating scales are checklists, which are used by endorsing from a list of behavior problems or competencies. The *Teacher Functional Behavioral Assessment Checklist* (Stage, Cheney, Walker, & LaRocque, 2002) is an example of an indirect assessment checklist. In contrast, rating scales provide a means for estimating the *degree* to which a behavior is present, while checklists merely identify the presence or absence of a behavior. Professionals should examine informant reports and interview information for consistency in themes.

Indirect descriptive assessment procedures are regarded as less expensive in terms of professional time involved and the amount of training required to use them. Most importantly, they allow for a professional to collect information on low-rate behaviors that might be missed by several direct observation sessions and are often more reliable than unstructured interviews (Merrell, 2008). In summary, indirect descriptive assessment procedures are convenient and time efficient and often capitalize on direct observation findings. While there are several benefits to indirect descriptive assessment procedures, there are also several problems associated with their use. For example, different raters may have different ways of responding, may lack the situational specificity of the behavior, may not recall the behavior and events surrounding the behavior correctly, or may be judging the individual's behavior according to another unrelated behavior (Arndorfer & Miltenberger, 1993; Merrell, 2008). Research has cautioned the use of indirect descriptive assessment procedures as stand-alone assessment procedures (Alter, Conroy, Mancil, & Haydon, 2008) and most typically are used in conjunction with other assessment methods.

Often used in tandem with indirect descriptive assessment procedures are direct descriptive assessment procedures. Direct descriptive assessment procedures encompass the use of antecedent-behavior-consequence (ABC) recordings, scatter plots, and systematic observations. ABC recordings are commonly used to record events in a narrative fashion. The recording consists of transcribing the events that preceded (antecedents) the individual's targeted behavior, the targeted behavior as it's being performed, and the events that followed (consequences) the individual's targeted behavior (Cooper, Heron, & Heward, 2007). The professional must be trained to describe events clearly and accurately without inferring motivation or intentions (Lennox & Miltenberger, 1989). Research has suggested a more rigorous ABC procedure that incorporates further direct observation of information collected in descriptive ABC reports that not only describes behaviors and events, but also quantifies their occurrences (Mace & Lalli, 1989). Overall, ABC recordings allow for a professional to develop testable hypotheses regarding the presumed functions that the target behavior is serving, which is informative for developing effective interventions that are derived from assessment data (Bijou, Peterson, & Ault, 1968; Repp, 1994).

Another direct descriptive assessment is systematic observations. Direct systematic observations are a cornerstone for the assessment of behavioral, social, and emotional problems exhibited by individuals (Merrell, 2008). Direct observation is a procedure in which “observers develop operational definitions of the targeted behaviors of interest, observe the subjects, and systematically record their behaviors” (Merrell, 2008, p.64). Direct observations have been found to be attuned with applied behavior analysis (Baer, 1982). This method allows for the professional to gather functional information regarding the individual’s behavior and “ecology” in which the behavior occurred. In converse to an anecdotal observation that merely defines when, where and how the targeted behavior occurred, a systematic observation takes into consideration the surrounding ecology of the behavior and is more likely to provide information on the conditions that elicit and reinforce the behavior (Merrell, 2008). A professional can not only use this information to describe and classify the target behavior and context, but also to develop interventions that are based on both indirect and direct DA data collected (Alter, Conroy, Mancil, & Haydon, 2008).

Direct descriptive assessment procedures, commonly referred to as descriptive analysis procedures, require professional knowledge about coding procedures (e.g., event, interval, time-sampling, and duration or latency recording), the *situational specificity* of behavior, observer training and reliability, and the use of social comparison data (Merrell, 2008). Professions must also be aware of *observer reactivity*, where an observer's presence may influence the behavior of those being observed, which could threaten the reliability of the observation data collected. The use of systematic observations requires: (a) carefully defined and selected behaviors to be observed; (b) training, reliability checks and retraining; (c) typical subjects in the same setting for behavior comparison; and (d) selection of a carefully matched recording procedure to purpose (Merrell, 2008). Overall, direct descriptive assessments are complementary to indirect directive assessments and have the potential to play an extremely important role in improving the reliability of appropriate intervention selection and design. Direct observation of behavior reduces the biases associated with indirect data collection methods. However, these methods are difficult to standardize and provide only correlational data that must be interpreted carefully (Mace, 1994; Taylor, 1994). DA sets the stage for hypotheses developed in the DA to be directly tested experimentally. Experimental analysis methods are based on Carr's (1977) theoretical model in which operant mechanisms are hypothesized to maintain aberrant behavior. Carr hypothesized that different individuals engage in similar topographies of aberrant behavior for different environmental reasons. Carr proposed three potential operant mechanisms underlying the motivation for aberrant behavior: positive reinforcement, negative reinforcement, and sensory reinforcement. Carr's proposal that aberrant behavior can have an operant basis has led to substantial research and the subsequent development of assessment techniques to identify the operant mechanisms underlying aberrant behaviors.

Structural analysis. Structural Analysis is a direct assessment of antecedent events that occasion behaviors (Stichter, Sasso, & Jolivette, 2004). In other words, the environment is manipulated to compare and contrast different antecedent events to confirm their effect on the target behavior. Structural Analysis procedures have mostly been used for examining inappropriate behaviors (e.g., self-injurious behaviors, stereotypical behavior, aggression, and temper tantrums). The resulting antecedent interventions have been seen as an alternative to the use of punishment and restrictive procedures for problematic behavior of individuals. The use of structural analysis of behavior involves the identification of factors that contribute to, or set the stage for, the occurrence of both inappropriate and appropriate behaviors (Stichter, Sasso, & Jolivette, 2004). Antecedents may include aspects of the physical environment or biological environment (Axelrod, 1987). Furthermore, Conroy and Stichter (2003) divided antecedents into physiological states, social events, and environmental and instructional factors that occur in temporal distance (e.g., setting events), concurrently, and/ or in combination with challenging behaviors. Typically, information is collected on antecedents, and then hypotheses are developed and empirically verified through the manipulation of target variables (antecedents) suspected of contributing to the occurrence of the target behavior (O’Neill et al., 1997). Results of the SA can then be used to structure the environment and/or presentation of academic tasks in a manner that extinguishes the individual’s target behavior (Dunlap, Kern, dePerczel, Clarke, Wilson, Childs, et al., 1993). Only recently, has research begin to use SA procedures to investigate the effects of antecedent events related to the occurrence of prosocial or adaptive behaviors in natural settings (e.g., Peck et al., 1997).

Carr and Durand (1985) developed the first SA, which was conducted with four children with autism and focused on their aberrant behaviors. The study examined antecedents such as task demand and adult attention. The results indicated that child behaviors were shown to correlate with changes in antecedent conditions (high vs. low demands and high vs. low attention) rather than with contingent access to consequences (i.e., escape and social attention).

This study paved the way for the use of SA procedures to isolate specific conditions that may be associated with aberrant behaviors.

Numerous subsequent studies have reported successful intervention for challenging behavior when intervention was based on a SA (Cooper et al., 1992; for a review, see Luiselli & Cameron, 1998). Cooper et al. (1992) conducted two studies with children who displayed behavior problems in an outpatient and in a classroom setting. The purpose of this research was to investigate the effects of antecedents on child behavior in these two settings. The antecedents examined included task preference, task demands, and adult attention. Study 1 included 10 children from an outpatient Behavior Management Clinic who displayed problems with noncompliance, aggression, and opposition at home and school. A trained observer recorded child inappropriate, appropriate, and off-task behaviors through analogue parent-child dyads. An analogue condition is an environmental simulation that is similar to occurrences in the natural environment. Using a multi-element design, a type of single-case experimental design, specific analogue condition manipulations (i.e., free play, high demand-low preference, high demand-high preference, low demand-high preference, parent attention, therapist attention) were implemented and child behaviors were recorded.

According to Cooper et al. (1992) results from study 1 indicated distinct individual patterns of improved behavior across antecedent conditions with three children showing improved behavior with changes in the level of task demand, one child responding better to a preferred task, two children showing improved behavior to parental attention, and two children responding better to therapist attention. Study 2 used similar methodology as study 1, but was conducted in a classroom setting with two children that resulted in a brief functional analysis. Results from study 2 indicated that one child showed improved behavior on high demand-high preference math and reading tasks and the other child showed improved behavior on high-demand-high preference language and reading tasks. Both studies demonstrated that the application of SA procedures resulted in improved behavior, and were informative for intervention design and implementation and were used in tandem with functional analysis (i.e., examination of behavior consequences) procedures.

Reilly and colleagues (2005) investigated the effects of classroom activity on the frequency of a child with ASD and self-injurious behaviors using a SA procedure. This procedure was used to identify antecedents that surrounded the student's engagement in self-injurious behaviors. Findings revealed that self-injurious behaviors occurred more frequently in the context of increasing academic demands and less frequently on scheduled tasks. This study further supports the effectiveness of SA procedures in recognizing events that contribute to target behaviors, particularly those of children with ASD.

In general, the primary focus of SA is on antecedent and contextual factors that precede the occurrence of a behavior and not on consequent factors (see functional analysis section) happening after the behavior has occurred. Structural analysis is often employed to examine the effect of instructional and behavioral strategies on an individual's performance. Overall, research has indicated that a more thorough understanding of environmental conditions that may be causing a behavior would include not only an assessment of antecedent factors, but also consequent factors that follow the behavior; which can be accomplished through the use of functional analysis procedures (Iwata, Pace, et al., 1994).

Functional analysis. Functional Analysis is a specific empirical methodology within ABA, which focuses on the investigation of reinforcing events that serve to maintain challenging behaviors. A solid foundation of research has utilized FA procedures to ameliorate aberrant behaviors for children with ASD and other developmental disabilities (Asmus, Wacker, Harding, Berg, Derby, & Kocis, 1999). Research has revealed that challenging behaviors serve a communicative purpose (Carr, 1977), are strategies for getting needs met (Ferguson & Horner, 1994), and have specific intentions (Neel & Cessna, 1993; Axelrod, 1987). In order to successfully identify the correct function of a behavior, it is recommended that a professional conduct a FA, which consists of experimentally manipulating variables to validate hypotheses regarding possible variables that may be maintaining or reinforcing challenging behaviors. As opposed to DA that identifies correlational relationships between variables, FA identifies causal relationships between behaviors and environmental variables (Lennox & Miltenberger, 1989). The identification of functional relationships leads to interventions that are likely to succeed in ameliorating a challenging behavior.

Iwata and colleagues (1982/1994) created the methodology described in landmark research that examined the efficacy of functional analysis procedures. The study used an operant methodology to assess the functional relationships between self-injurious behaviors (e.g., head banging, ear pulling and gouging, eye gouging, head hitting, neck choking, self-biting, hair pulling, hand mouthing) and specific environmental events. They observed nine developmentally disabled participants, between the ages of 18 months and 17 years, during various analogue conditions (e.g., play materials present, experimental demand, social attentiveness). Participants were observed prior to and upon study omission and were seen to engage in at least two self-injurious behaviors, with head banging being the most prevalent. Participants were exposed to four different conditions during 15 minute sessions that used a multi-element manipulation design. The specific conditions comprised of social disapproval, academic demand, unstructured play, and alone.

Results revealed that levels of self-injury were associated with different sources of reinforcement during the various conditions. More specifically, self-injury patterns differed both between and within individuals. Five general patterns of responding emerged. The first pattern revealed that participants showed low levels of self-injury during the unstructured play condition (indicating that their rates were consistently at or below their overall mean level), which was described as a room with various toys where participants could freely engage and move around. A second pattern that emerged was that four of the participants had the greatest self-injury rate during the alone condition, which was characterized by minimal external sources of reinforcement (sensory reinforcement). A third pattern of results showed that two participants displayed little to no self-injury during all conditions except the high demand condition (negative reinforcement). The fourth pattern showed that one participant had the most self-injury during the social disapproval condition (positive reinforcement). The final pattern revealed that two participants showed an undifferentiated pattern (i.e., very high and consistent rates) of self-injury across two or more conditions (sensory reinforcement).

These findings are consistent with Carr’s (1977) finding that self-injury may be a function of different sources of reinforcement. As Iwata et al. (1982/1994) suggests self-injury may be a function of self-stimulation, escape of high demands and/or social attention, and to gain attention. Therefore, these findings indicate that discovering the function of a behavior through FA procedures may assist in identifying specific factors (vs. random factors) that reinforce and maintain behaviors, which can in turn contribute to treatment utility in reducing challenging behaviors at home, school, and clinic settings (Repp, 1994).

The utility of FA procedures has been empirically demonstrated with several behaviors, in several populations, and in several settings (Iwata, Vollmer, & Zarcone, 1990, Mace, Lalli, &

Lalli, 1991; Iwata, Pace, et al., 1994; Asmus, Ringdahl, Sellers, et. al, 2004; Carr & Durrand, 1985). However, a majority of these studies have focused on only consequent factors and usually in the context of challenging behaviors. Limited studies have been done on FA procedures and the occurrence of prosocial behaviors. Furthermore, studies have not extended their analyses to the effects of antecedent factors, in addition to, consequent factors. As pointed out by Carr (1994), research in applied behavior analysis is moving toward a focus on more functional properties of problem behaviors (e.g., social avoidance vs. task avoidance), the influence of context (nondyadic vs. dyadic), and the multidimensional complexity associated with naturalistic observation and assessment (subcategory analysis vs. category analysis). However, these ABA assessments have not typically been utilized to examine and study prosocial behaviors with the intent to identify and increase their occurrence. These points may take on a significant role as the need to increase social communication behaviors (SCB) of children and adolescents with ASD become a larger focus of research.

Social Communication Behaviors in Children with Typical Development and with ASD

The development of SCB skills is a fundamental skill of childhood because it allows children to learn about the world around them, interact with others, and develop a sense of personal competence (McDevitt & Ormrod, 2007). Without appropriate SCB skills development, children fail to acquire: (a) positive relationships with others, (b) appropriate ways of relating to others, and (c) an understanding of their self. For children with ASD, the risk of having SCB difficulties is high. More specifically, children with ASD appear to have vastly atypical SCB patterns early and persistently, particularly in social interaction competencies (Seibert, Hogan, & Mundy, 1982; Sigman, Mundy, Sherman, & Ungerer, 1986). As children with ASD continue to mature, their SCB skills difficulties appear to have greater social implications. Research has shown that SCB skills are essential for an individual to lead an independent and productive life (Koenig, Rubin, Klin, & Volkmar, 2000). Moreover, parents of children with ASD have identified that one of the greatest challenges in having a child with ASD is the lack of SCB that their children express when they reach preschool and school-age years (Prizant, Wetherby, Rubin, Laurent, & Rydell, 2006). In order to understand the role of SCB in children's development and how SCB impairments are an immense challenge to the development of children with ASD, a review of typical SCB developmental trends is needed. Typical SCB development consists of growth in several key developmental domains, such as (a) communication, (b) emotionality, (c) understanding of self and others, (f) social cognition, and (f) interpersonal behaviors. Research has offered numerous theoretical explanations of how children learn SCB. Early explanations have focused on theories of modeling and reinforcement. More specifically, these theories have described children's learning of SCB as largely the result of imitation. For example, infants imitate sounds and behaviors that parents and other caregivers make (Tronick, Cohn, & Shea, 1986). In addition, older children learn by imitating people's words, facial expressions, and phrases (Owens, 1996; Bandura, 1989). Behavior theory (Skinner, 1957) has suggested that direct reinforcement may also play a role in how children learn SCB. For example, when infants make a variety of sounds and smile, adults respond favorably; this positive response in turn reinforces the child to repeat those same behaviors.

An additional theoretical explanation has turned to biology to elucidate how children develop SCB. For instance, Chomsky (1976) proposed that children have a pre-wired biological mechanism that enables them to learn many features of language (i.e., one aspect of SCB) in a short time. Information processing, an alternative theory, concentrates on children's cognitive processes, such as attention, reasoning and working memory abilities (Harris, 1992; Karmiloff-

Smith, 1993; Merzenich, 2001) and the ways these processes facilitate children's learning of SCB. Furthermore, sociocultural theory takes an opposite viewpoint from information processing explanations, and proposes that children's engagement in social interactions fosters SCB development (Nelson, 1996a; Vygotsky, 1997). It unclear as to which theoretical explanation best explains children's development of SCB, but it may be possible that children learn through various methods.

Typical development: Communication behaviors. The development of communication skills varies across individuals and age groups. One of the first forms of language communication that children learn is crying. Infants are immediately attuned to their caregiver voice and engage in various sound vocalizations. Children first learn to repeat vowel sounds at age one and consonant-vowel syllables at about six months (McDevitt & Ormrod, 2007). Between one and six months of age, infants learn to communicate by smiling, cooing, babbling, and pointing. By eight months children have learned to recognize single words and phrases (Fensen et al., 1994). On their first birthday, infants are using single words, which leads to them using two-word combinations at about 18 months (Fensen et al., 1994; O'Grady, 1997). Between the first year and second year of life children experience a rapid increase in vocabulary (Harris, 1992).

Continuing as developing toddlers, children advance in the areas of vocabulary and syntax. For example, toddlers learn 30 to 50 words a month and, and later as many as 20 new words each day. By preschool, children are able to organize their knowledge of various words into broad categories and cross-word relationships (Gelman & Kalish, 2006). By the time children are of kindergarten-age, their linguistic knowledge has increased from 8,000 to 14,000 words, of which they use 2,600 in their own speech (Gelman & Kalish, 2006). From elementary to high school, children are using approximately 50,000 words to 80,000 words in receptive vocabulary (Owens, 1996). Thus, children are learning several new words each year, and even each day (Nagy, Herman, & Anderson, 1985). Children also readily grasp general "rules" of how to learn a word, which is referred to as *fast mapping (*Heibeck & Markman, 1987). Important rules children come to learn are: "(1) If I see several objects and know labels for all of them except one, a new word is probably the name of the unlabeled object; (2) If someone uses a word while pointing to a particular object, the word probably refers to the whole object rather than to just a part; (3) Words for particular things are more likely to refer to animate objects (McDevitt & Ormrod, 2007, p.326)."

Another important language developmental trend that children acquire is the use of syntax. Syntax appears in children's earliest use of word combinations. For example, children at 18 months, first use one-word sentences to express themselves, and then advance to using *telegraphic speech* (e.g., sentences with only lexical words and no grammatical words). Research has demonstrated that children use simple syntactic rules even when their sentences are only two words long (O'Grady, 1997; Cairns, 1996). Between the ages of two and six children heavily rely on word order and context instead of syntax when interpreting others' messages. Children's knowledge of complex syntactic rules (e.g., word order, understanding of passive phrases, the use of multiple clauses, subject-verb agreement, noun-pronoun agreement, function of punctuation marks, etc.) continues to grow well into secondary school (Owens, 1996). Researchers have debated on how children acquire syntactic knowledge. One common explanation is that children engage is *semantic bootstrapping*, which consists of using word meanings to derive knowledge about syntactic categories and structures (Gelman & Kalish, 2006).

Another important aspect of communication that children come to acquire is the use of verbal and nonverbal strategies to communicate with others. As children mature they learn strategies for initiating conversations, changing the conversation topic, telling stories, and engaging in persuasive conversations (McDevitt & Ormrod, 2007). Additionally, children learn important sociolinguistic behaviors, often referred to as *pragmatics*. Pragmatics includes one's knowledge of social and cultural conventions that govern appropriate social interactions. Throughout childhood, children learn to refine their pragmatic behaviors. Common pragmatic behaviors that children come to acquire are: (a) looking at others in the eye when speaking and listening to them, (b) standing close to social partners with appropriate distance, (c) answering questions readily when asked by a social partner, and (d) waiting several seconds before answering questions and not interrupting a social partner (McDevitt & Ormrod, 2007). While the development of these pragmatic behaviors is favorable in most cultures, some cultural variation exists. The abovementioned communication/language behaviors are one aspect of SCB that typically developing children progressively develop and refine throughout childhood but are lacking and difficult to produce for children and adolescents with ASD.

Typical development: Emotionality. Another developmental aspect of SCB is emotional development. The core elements of emotional development consist of: (a) a child's ability to display and regulate emotions, and (b) a child's ability to form attachments with other individuals, particularly caregivers. McDevitt and Ormrod (2007) have outlined several specific developmental trends that occur in children in the area of emotional development: (1) "infants begin life with a few basic emotions and gradually add new feelings;" (2) "infants respond to other people's emotions;" (3) "children learn to guide their actions on the basis of other's people's emotional expressions;" (4) "children learn to reflect on emotions;" (5) "children expand their repertoire of basic emotions to include self-conscious emotions;" (6) "children and adolescents gradually learn to regulate their emotions;" (7) children gradually learn "others' feelings are an important emotional response"; (8) "adolescents brings new [emotional] anxieties and pressures" (pp.418-422).

More precisely, in regards to these developmental trends, infants at 6 months show contentment, interest and distress emotions; and as they mature (i.e., by two years old) they add emotions, such as anger and fear (Lewis, 2000). Infants also show the ability to detect emotions in others (Caron, Caron, & Mac Lean, 1988). By three months infants imitate the faces people make, such as happy, sad, and angry faces (Haviland & Lelwica, 1987). A research study by Montague and Walker-Andrews (2001) showed that 4-month-old infants reacted to the emotions of other's in meaningful ways. Using a peakaboo-type game, the researchers showed that infants were able to detect a specific emotional reaction and react according to the emotion. For example, if the infant was exposed to a fearful expression, the infant would progressively look away, and if the infant was exposed to an angry expression, he/she would increase their looking behavior and interest, as if they were planning a self-defense behavior.

Children in the first year of life also show an inclination to engage in social referencing, whereas they will monitor others' faces for cues that a novel or puzzling event is happening (Boccia & Campos, 1989). As children develop in early childhood, they become more thoughtful and realize how to use emotions to express and connect to words in order to tell about likes, dislikes, and events (Wellman, Harris, Bannerjee, & Sinclair, 1995). In upper elementary grades and middle and high school grades, children progressively learn how emotional expressions may differ from how people literally feel (Selman, 1980), and that people can have ambivalent feelings (Harter & Whitesell, 1989). Increasingly as children grow through middle school, they develop self-conscious emotions (Campos, Frankel, & Camras, 2004), and later learn to engage in emotional management strategies to cope with stressful situations (Brenner & Salovey, 1997). Important emotional responses, such as empathy (i.e., the ability to experience the same emotion as another person, who may be in pain) and specific comforting behaviors (e.g., hugs) improve in sophistication as children reach higher ages. Though, the development of these responses depends on how their developmental context fosters them (Zhou et al., 2002).

Another important SCB within the domain of emotional development is the ability of children to develop attachments with other individuals. The developmental course of children's attachments begins in infancy, where newborns use gestures to form primitive attachments with caregivers. Soon, thereafter, infants begin to learn that only some people provide affection, attention and care for them on a regular basis. Once they recognize this, at three months they will smile only at selective individuals whom they know best (Camras, Malatesta, & Izard, 1991). Infants begin to learn the routines of social exchanges with caregivers (e.g., counting toes, singing songs during a diaper changing) by 6 months of age. From seven months-to 2-years-old infants show attachments to people, as evidenced by reaching out to be picked up, protesting when separated from a caregiver, and making "attention-grabber" noises when a caregiver is the same room (McDevitt & Ormrod, 2007). In the latter half of the first year of life, infants experience stranger anxiety (Mangelsdorf, Shapiro, & Marzolf, 1995). At two years old, children begin to engage in turn-taking interactions and become more active social partners (McDevitt & Ormrod, 2007) as shown by their ongoing social (and emotional) reciprocity and simple vocalizations. These previously discussed attachment behaviors lay the foundation for multiple attachments to occur in later childhood. Overall, appropriate emotional development is an important aspect of SCB and why it is of such importance to understand and assist those with diagnoses of ASD to obtain and expand their SCB.

Typical development: Understanding of self and others. Another crucial aspect to appropriate SCB development is the development of a sense of self and others. Sense of self is defined as “children’s knowledge, beliefs, judgments, and feelings about themselves” (McDevitt & Ormrod, 2006, p.442), when extends to knowledge about other’s beliefs, judgments, and feelings. Research has observed the following developmental trends in children’s development of a sense of self: (1) “children construct increasingly multifaceted understandings of who they are;” (2) “as children group older, their feelings of self-worth increasingly depend on peers’ behaviors and opinions;” (3) “most youngsters gradually internalize criteria by which to evaluate themselves;” (4) “youngsters gradually integrate their many self-perceptions into general observations of who they are;” and (5) children’s “sense of self becomes more stable over time.” (McDevitt & Ormrod, 2007, pp. 444-447). Unique aspects of these trends can also be observed in children across various developmental ages. In the first year of life, infants develop the ability to imitate other people’s facial expressions, which in turn develops their sense of self (Collie & Hyne, 1999). Later in early childhood, toddlers begin to refer to themselves as “I” and “me,” and to learn about sharing behaviors (McDevitt & Ormrod, 2007). Between the ages of 2 and 6, children usually develop a positive sense of self, which enables them to easily overcome failures (Lockhart, Chang, & Story, 2002). This age range is largely characterized by overconfidence and optimism. As children’s development progresses, they begin to see themselves as more complex individuals, with general strengths and weaknesses. (Harter et al., 1998). Elementary children begin to make social comparisons with peers, which in turn influences their sense of self. Early adolescence is characterized by an increasing tendency to internalize others’ standards for performance and heightened sensitivity of what others think of oneself (Harter, 1999). In later adolescence, children show a decrease in self-conscious behaviors and ongoing reflection on identify issues (e.g., who am I? what course should my life take?; McDevitt & Ormrod, 2007). The development of a sense of self and others is crucial to SCB skills development and within a high school setting, without a sense of self and others, social interactions and friendship becomes elusive for many adolescents with ASD.

Typical development: Social cognition. Social cognition is another essential aspect of children's SCB. Social cognition is defined as the process of thinking about how other people are likely to think, act, react, and choosing one's own interpersonal behaviors accordingly (McDevitt & Ormrod, 2007, p.458). Research has divided social cognition into two interrelated categories: theory of mind and social information processing (Harris, 2006; Dodge, 1986). Theory of mind (TOM) is described as a child's awareness that other people have inner psychological states (e.g., thoughts, emotions, beliefs, motives, intentions), which may or may not be different from oneself. TOM allows individuals to interpret and predict the behaviors of others and to more effectively interact with others (Harris, 2006; Flavell, 2000).

Over the course of development, children develop TOM milestones, such as (a) intentionality (in infancy), (b) words to describe other's mental states (e.g., "want," "think," "know," "feel" [in preschool]), (c) precursor meta-cognitive skills (e.g., limited descriptions of personal feelings [in preschool]), (d) increasing understanding of how psychological states influence others' behaviors (in later preschool), (e) increasing sophistication in making inferences about others' psychological states (i.e., the realization that people's actions do not always reflect their true mental states [in early elementary]), (f) an understanding that others' have different interpretations of events than oneself (in later elementary), (g) the understanding that others’ thoughts and feelings are often intertwined (in later elementary), (h) increasing engagement in recursive thinking (e.g., thinking about what others’ thinking about oneself [in early adolescence]), and (i) the understanding and application of social perspective taking (e.g., imagining what others’ might be thinking and feeling; [in late adolescence]). Social information processing is the second category of social cognition development (Dodge, 1986). In order to interact effectively with other people, children must engage in TOM behaviors *and* social information processing. Social information processing is described as a series of steps used by individuals to understand and respond to social events (McDevitt & Ormrod, 2007; Dodge, 1986; Lemerise & Arsenio, 2000). According to Dodge (1986) children go through a series of steps when encountering others’ in social interactions. They use these steps to competently interpret and respond to specific social interaction initiations. The steps outlined by Dodge’s social information processing model include: (1) encoding social cues, (2) interpreting behavior, (3) generating alternative responses, (4) choosing a response after evaluating potential consequences of alternatives, and (5) performing the chosen response. In relation to Dodge’s model, Perry and Perry (1987) conducted a study on the use of the social processing model to enhance children’s prosocial behaviors. Study findings implicated that Dodge’s model can be used to explain the cognitive processing behind children’s engagement in altruistic behaviors. In summary, both TOM and social information processing (i.e., social cognition) are important aspects of children’s SCB.

Typical development: Interpersonal behaviors. Another important aspect of SCB is interpersonal behaviors, often referred to as social skills. Social skills are namely skills used to interact successfully with others (McDevitt & Ormrod, 2006). As children grow older they have increasing opportunities to expand their social skills repertoire, widely identified as one’s social competence. Children vary in their social skills levels, which can affect their development of friendships and overall adjustment (Pellegrini & Bohn, 2005). There are a wide variety of social skills that children acquire through infancy to later adolescence. In infancy, children show emerging social skills like smiling and babbling at another infant or looking where another child points (Mueller & Silverman, 1989). As toddlers, children may imitate one another, offer toys to another, and engage in associative play (Harris, 2006). As other SCB discussed earlier develop, they allow children to engage in more sophisticated social interactions (e.g., games: peekaboo, hide-and seek, sustained cooperative play; Bronson, 1981). Research has shown that cooperative play has a definite social function for the development of social skills (Rubin, Bukowski, & Parker, 1998; Gottman, 1983). More specifically, through play, children learn about peers' interests, and how to initiate and respond in social interactions. Children also learn how to use their imagination and engage in socially coordinated games with rules (e.g., sociodramatic play), which ultimately contribute to children's social competence (i.e., important skills like assertiveness, negotiation, conflict resolution, making appropriate requests, sharing behaviors, responding to others' mental states [see Howes, 1992, and Göncü, 1993, McDevitt & Ormrod, 2007]).

Gradually as children reach elementary and middle school, they spend more time with peers. During this time, children have a growing awareness of peers' opinions and socially acceptable social behaviors (McDevitt & Ormrod, 2007). Moreover, they are more interested in games governed by rules. Beginning in early adolescence, children increasingly rely on peers for emotional support and self-identification (McDevitt & Ormrod, 2007). For example, adolescents use peers as a forum for self-exploration and self-understanding.

As children mature through childhood, social skills allow for interpersonal relationships to flourish. Interpersonal relationships develop increasingly by children's engagement in prosocial behaviors—actions intended to help another. Prosocial behaviors are present from infancy and become gradually more mature as other aspects of SCB skills develop in children. For example, at two- years-old, toddlers may spontaneously give assistance to others with everyday tasks, and display comforting gestures (e.g., giving favorite teddy bear to another) to someone who seems to be in pain (McDevitt & Ormrod, 2006). Moreover, children at the age of two also show signs of empathy, as evidenced by concerned facial expressions (Lamb & Feeny, 1995), however, more deep concerns for others appears as children develop social perspective taking, which allows for children to feel empathy and sympathy for others (Eisenberg & Fabes, 1998); this begins to develop primarily in school-age children.

ASD development: Social communication behavior patterns. Whereas the developmental trajectory of these various SCB (discussed in earlier sections) is typical for children without ASD, the development of these SCB skills is characterized as underdeveloped or non-existent in children with ASD (McDevitt and Ormrod, 2006). SCB characteristics and features specific to children with ASD cited in the literature include a continuum of difficulties in core areas such as, social interaction, verbal and nonverbal communication (i.e., pragmatics), and restricted and repetitive patterns of behavior, interests and activities. More specifically, several studies have examined the associated characteristics and features of SCB, encompassing investigations of early-onset, sensory-perceptual deficits, communication and language deficits, cognitive deficits, social interaction deficits, motivational deficits, behavioral problems, circumscribed interests, skill generalization problems, and impaired joint attention and distractibility (Sigman & Ungerer, 1984; Filipek et al., 1999; O'Neill & Jones, 1997; Stone et al., 1999; Tidmarsh & Volkmar, 2003; Wetherby, Watt, Morgan, & Shumway, 2007; Frith & Baron-Cohen, 1987; Dyer, Dunlap, & Winterling, 1990; Boyd, Conroy, Mancil, Naketo, & Alter; 2006; Hauck, Fein, Waterhouse, & Feinstein, 1995).

These core SCB deficits, as elucidated through research, have many implications for children with ASD. Impairment in these areas prevents the acquisition of key SCB milestones as evidenced in typical development (Landa, Holman, & Garrett-Mayer, 2007). For example, a child with ASD who has early and persistent impairment in joint attention skills will evidence poor ability to: (a) learn words in incidental learning contexts, (b) develop a sense of self and others, and (c) have adequate social interpersonal skills to engage in reciprocal social interactions (Tomasello, Carpenter, Call, Behne, & Moll, 2005; Sigman, Ruskin, Arbelle et al., 1999; Scaife & Bruner, 1975). Additional systematic investigations of SCB in school-age children with ASD will lead to a better understanding of the implications and differences in SCB for children with and without ASD.

Sigman and Ungerer (1984) examined early SCB, such as sensorimotor skills, imitation, and play behaviors of children diagnosed with autism, children diagnosed with mental retardation, and typically developing children using videotapes of two test sessions and rating scale measures. Children ranged in age from 39 to 75 months. Sensorimotor behaviors such as vocal and gestural imitation, and receptive and expressive language were assessed using the *Stages of Sensorimotor Intelligence in the Child* rating scales and the *Hunt Ordinal Scales of Psychological Development* and various behavior probes, respectively. Play behaviors were assessed across two sessions that involved the experimenter completing a checklist that coded the child’s play behavior into four categories: (a) simple manipulation (b) relational play, (c) functional play, and (d) symbolic play. The number of different sequences of related functional and symbolic play acts was also rated as well as the duration and involvement with toys in structured (i.e., with cueing) and unstructured settings (i.e., without cueing).

Sigman and Ungerer found that the children with autism differed from children with mental retardation and typically developing children in several areas. Children with autism presented with several deficits in functional play and symbolic play, particularly for spontaneous play and play directed by cueing. In addition, children with autism also showed lower ability to comprehend verbal labels and imitate gestures and words; however, they did appear to have similar sensorimotor skills as the other groups. The patterns seen in relationship differences between play, imitation and language were similar within the three groups. In particular, functional and symbolic play were associated with higher receptive language skills within all three groups, while sensorimotor skills and language were found to be negatively associated for children with autism. These findings suggest that young children with autism are a distinct group in that they can be characterized by adequate sensorimotor skills, but deficits in language, imitation and symbolic abilities, particularly with regards to functional and symbolic play. It is likely that these deficits will continue into adolescence unless steps and opportunities are taken to develop and address these SCB deficits.

Another line of research has focused on the elucidation of key social deficits and circumscribed behaviors and interests apparent in children with autism spectrum disorders. Research has described young children with ASD as having an impairment in their ability to recognize, understand, and infer others' thoughts, emotions, and intentions (regularly referred to a *Theory of Mind* deficit; Peterson, Slaughter, & Paytner, 2007; Blacher & Howell, 2007). Children with ASD have been divided into three groups based on their level of social aptness, which include: "(1) aloof children who are essentially cut off socially, (2) passive children who are more reachable but tend to gravitate away from social interactions unless actively engaged, (3) active-but-odd children who can initiate interactions but do so in awkward, stilted, inappropriate ways (Rapin, 1991, p. 753).” Moreover, others have characterized children with ASD as being (a) unavailable, (b) remote, (c) inappropriately socially interactive, or (d) pseudosocial. These groupings further suggest the heterogeneity of children diagnosed with ASD and the need for interventions based on one’s specific social needs.

Researchers have suggested a consistent link between the lack of social interaction skills and the repetitive interests and behaviors present among children with ASD (Lee & Odom, 1996; Lord & Hopkins, 1986). For example, Loftin, Odom and Lantz (2008) investigated the relationship between ASD social initiations and the appearance of repetitive motor movements in later elementary children with ASD. The study was interested in the validation of a peer intervention package that incorporated: (a) training a peer to initiate with a child with autism, (b) training a child with autism to initiate with a peer, and (c) training a child with autism to self-monitor behaviors during social interactions. Participants were three students with autism and age-matched peers. The intervention took place in an elementary school during lunch and recess periods. The researchers collected data during lunch periods. Reinforcers were used throughout the study. Observational sample about social initiations, social interactions, and stereotypy behavior was collected daily from participants using a partial interval-based recording method. Participants with autism were first taught social initiation skills in a 1:1 format, and then practiced the skills with selected peers. Subsequently, they were taught a self-monitoring intervention targeting social initiation behaviors.

Using a visual analysis procedure, the results indicated an increase in social interaction skills from baseline to intervention. The results also showed repetitive motor behaviors decreased and social interactions increased. Overall, the findings suggested that with explicit instruction and self-monitoring in social interaction skills, children with autism can demonstrate appropriate social initiations with peers and reduced repetitive motor movements. These findings corroborate with Lee et al. 2007. However, there was no initial individual assessment conducted to select and formulate the intervention that was evaluated. Therefore, there was no direct functional relationship to explain this behavior change in children with autism, which does not further our understanding of why the intervention was successful or for whom this type of intervention would be most useful. Future studies should consider using applied behavior analysis procedures, in particular descriptive and experimental analysis, to investigate the utility of an intervention for individual repetitive behaviors.

Another key SCB deficit area in children with ASD is communication and language development. Children with ASD show delays or deficits to develop receptive and/or expressive language abilities. Although, some children with ASD may develop receptive and expressive language at a later time. In particular, children with ASD have been observed to perseverate by answering and asking the same question continuously even if they know the answer to the question (Rapin, 1991). Research has also shown that children with ASD often present with more ritualized social communication initiations (Hauck, Fein, Waterhouse, & Feinstein, 1995). Verbal communication with others is characterized as predominantly deficient. More specifically, children with ASD show difficulties with participating in a conversation, maintaining a conversation topic, interpreting voice tone and pitch and the meaning of facial expressions and body language (Rapin, 1991). Equally related to verbal communication deficits, children with ASD also show deficits in nonverbal communication, commonly referred to as pragmatics. They fail to communicate their ideas with gestures or pantomime. Likewise, children with ASD also fail to use and understand certain communication behaviors like pointing, following others' gazes, and shaking one's head for disagreement purposes. These communication problems have been further elucidated in empirical research (Bauminger et al., 2008; Chiang, Soong, Lin, & Rogers, 2008; Gray & Tonge, 2001; Hedenbro & Tjus, 2007; Sigman & Ungerer, 1984; Shopler & Mesibov, 1986; Stone et al., 1999; Wetherby, Watt, Lindee, & Shumway, 2007). Overall, trends found in research indicate that children with ASD have abnormalities in the use of language and verbal and nonverbal communication skills, semantic problems, prosodic abnormalities, difficulties in the comprehension of language, and inappropriate affective-social communication behavior for the context. From these observations, there are obvious differences apparent in the developmental trends of SCB for children with ASD in comparison to typical development.

Carter et al. (2005) conducted a descriptive analysis study with 16 high school students with intellectual disabilities that focused on factors influencing social interaction. They used nine measures (e.g., prompting for interaction, functional communication level of participant, interaction occurrence, reciprocity of interaction, frequency of social interaction, quality of interaction, conversational topics, overall affect of participants) to assess characteristics of the observation setting or characteristics of the participant and general education peer being observed. The nine dependent measures were analyzed according to two independent measures: level of integration and proximity of peer buddy. Conversation topics were analyzed separately by school location and categorized (task-related, peers, greetings, school events, jokes, work, food, etc.). Several direct observation Likert scales were developed for the purposes of rating functional communication (*simple gestures, 1; multiple words, 3*), reciprocity of interaction *(peer initiator, 1; participant initiator, 7),* frequency of social interaction *(low, 1; high, 5),* quality of interaction *(low, 1; high, 5),* participants' affect *(discouraging interaction, 1; encouraging interaction, 5).*

Findings revealed moderate levels of interaction in both more and less integrated settings; a higher interaction percentage in less integrated; a higher rated frequency for interaction in less integrated; and both groups displayed equally encouraging affect and more positive affect in less integrated settings. In was also found that peer buddy proximity elicited more social interaction across dependent measures. Activity-related tasks, peers, greetings and food were topics discussed the greatest across all school locations and levels of integration. In particular, activity-related task and academic school event topics were almost exclusively discussed by students in the general education classroom vs. the special education classroom where topics about peers, food, jokes, in addition to activity-related task topics, were discussed by students. These study findings suggest that peer buddy support systems may be an avenue to increase positive social outcomes among children with ASD, particularly in less integrated settings. It also points to other avenues for intervention and assessment, such as conversation topics and an individual's affect as being important contributors to social outcomes. These avenues would be important to identify in school-age children in order to document normative and ASD patterns of conversation topics and affect that relate to positive social outcomes.

Brady and Halle (1997) described a "functional" approach to the assessment of communication for individuals with severe disabilities with an emphasis on SCB. They described a functional approach as one in which both the learner's communicative repertoire and the context (e.g., social partners, physical settings, opportunities) in which it occurs, are both important determinants of communicative function. This approach emphasizes individualized assessment to identify the child's communication repertoire, the context in which the repertoire is displayed, and the relationships that form between the child and the communication context. In other words, assessment is undertaken to facilitate decision making. They described 3 interrelated components of communication, form, function, and context. Communicative form refers to the topography, structure, mode or modality of communication. Reichle (1992) divided communicative form into three broad categories, verbal, gestural, and graphic. The important aspect from an assessment standpoint is to identify those forms that are currently functioning as SCB for the child.

Communicative function can be defined in at least 2 ways. First, from the perspective of pragmatics, communication is studied within a social context. For example, functions such as requesting, protesting, commenting and greeting (Reichle, Feely, & Johnson, 1992) or gaze between object and listener, persistent signaling until the goal is accomplished or failure indicated (Wetherby & Prizant, 1989) are all focused on intentionality. A second perspective emanates from Skinner (1957), who categorized communicative acts by their effect on listeners. For example, cries as an infant may produce a bottle or being picked up or changed. Overtime a child may learn to cry when hungry, when wanting attention, or when wet. From this perspective communication functions to obtain reinforcers or to escape or avoid unpleasant situations. The goal for assessment then is to identify whether a particular communicative form functions as a request, a rejection, a comment, or a means to escape or avoid a situation, to obtain attention, or some other function.

Communicative context denotes a set of conditions that occur prior to, concurrent with, or subsequent to a communicative act and determine the probability of the act itself, as well as its form and function. These contexts may include deprivation/satiation states; illness, pain, or infection; presence/absence of objects, materials, or people; and recent history of interactions.

Drawing on Bronfenbrenner's (1979) conceptualization of three levels of ecological factors influencing child development, Peck (1989) distinguished three levels of environmental variables affecting communicative interactions; (a) dyadic variables (e.g., specific partner behaviors, interaction styles); (b) situational variables (i.e., the extent to which daily occasions provide motivation, opportunity, and responsive outcomes for communicative acts); and (c) setting variables (i.e., characteristics of the home or other environments). However, context is more than just examination of antecedent variables, it also includes an examination of consequence conditions under which communicative responses occur. Determining which contextual features influence a learner's ability to produce or understand communicative acts is critical in designing effective communication interventions (Brady & Halle, 1997). These types of details regarding the SCB of school-aged children and how they approximate or differ from typical peers SCB is absent in the literature. Brady and Halle give us an excellent roadmap as to how to document and describe the SCB for these two groups.

This section has described the patterns of SCB in children with ASD. The majority of the studies have focused on very young children with autism, which highlights that there is still a need for further investigation of SCB specificity for school-aged children, in particular there is limited research with adolescents with ASD. Thus, the conclusions have limited application to systematically understanding the patterns of SCB skills that school-age children possess, which is important for informing future assessment and intervention practices for this age group. The knowledge of ASD SCB skills specificity may contribute to the development of systematic assessment approaches that have more treatment utility in natural contexts.

Current Assessment Approaches for ASD Social Communication Behaviors

As previously discussed, there are several instruments that are used to determine the degree to which ASD indicators are present in a child. The instruments are also used to measure SCB since deficits in these areas are the most prevalent feature of ASD. However, while these measures are informative for screening and diagnostic purposes, they are not very useful for measuring and quantifying specific SCB deficits and competencies in natural contexts and yielding information that can be used for intervention purposes. Several additional instruments have been developed for the purposes of assessing specific SCB deficits and competencies. While several of the instruments that have been developed do enhance our understanding of ASD SCB, there are still several challenges in SCB measurement. More specifically, the measurement of SCB is influenced by the interactive context, the social partner involved, the source of information, and the psychometric properties of the scale being used. In addition, there are difficulties of gathering meaningful and representative data for SCB (Wetherby, 2006). To reduce the impact of these challenges, Wetherby (2006) has proposed several measurement considerations, such as to carefully consider: (a) how information will be gathered, (b) what SCB will be examined, (c) what measurement scales will be used, (d) how many raters will be involved in judging the SCB, (d) how stable the measure is from test to retest, (e) if the measure is designed to capture growth or change in the SCB construct, (f) if the measure has an empirical association with some other SCB criterion measure, (g) if the measure clearly differentiates ASD SCB from other populations' SCB, and (h) if the measure demonstrates adequate construct validity. These outlined considerations ensure the specificity of SCB measurement.

There are several approaches to measuring SCB, which are elucidated below. Information can be gathered using observations in natural contexts, from interactive sampling procedures in a laboratory or clinic setting, or from parents and teachers familiar with the child. Each of these measurements approaches has strengths and limitations. For example, naturalistic observations of a child will capture a variety of SCB and how ecological variables influence the SCB outcomes; however, these outcomes may be influenced by the number of opportunities available for a child to demonstrate SCB. Moreover, there are limited measures that allow for the quantification of SCB in naturalistic contexts (Wetherby, 2006). Measures based on informant reports capitalize on the knowledge of the participant but may present biases because an informant may over- or underestimate the child's SCB. Laboratory or clinic settings also present with limitations because the child may be with an unfamiliar experimenter or person, which could influence the child's SCB performance and outcomes. Several personal factors may also influence a child's SCB performance, including a child's comfort level, interest, attention, fatigue, anxiety, and previous experiences in unfamiliar settings (Wetherby, 2006).

The most common approaches to measure SCB of children with ASD are the use of rating scales with parents and teachers. The *Social Communication Questionnaire* (SCQ; Berument et al., 1999) and the *Developmental Behavior Checklist-Autism Screening Algorithm* (DBC-ASA; Brereton et al., 2002) are two developed instruments for this purpose. The *SCQ* contains 40-items that are based on the *ADI-R* (previously mentioned). The scale includes four SCB domain areas, such as social interaction, communication, abnormal language, and stereotyped behavior. The *DBC-ASA* is a 96-item questionnaire designed to assess emotional and behavior problems in children and adolescents with autism. It was developed from the *Developmental and Behavior Checklist* (DBC), a measure of behavior and emotional problems in children and adolescents with intellectual disabilities. Witmer and LeCavalier (2007) investigated the use of *SCQ* and *DBC-ASA* with school-age children and found that these scales had good psychometric properties, but the measures seemed to reveal more of a global understanding of SCB and was more appropriate for clinical purposes.

The *Children's Communication Checklist-2* (CCC-2; Bishop, 2006), another SCB measure, is a 70-item questionnaire that asks parents or teachers to rate aspects of communication such as speech, vocabulary, sentence structure, and social language skills of children and adolescents ages 4 to 16. The *CCC-2* evaluates aspects of language (e.g., speech, syntax, and semantics) and pragmatics (e.g., initiations, scripted language, nonverbal communication, and interests). A four point Likert scale ranging from 0 = less than once a week (or never) to 3 = several times (more than twice) a day (or always) is used to help raters determine the degree to which a child's SCB is observed. Overall, the *CCC* can be used to glean information about SCB strengths and difficulties in children.

As discussed earlier, the *Autism Diagnostic Observation Schedule* (ADOS; Lord, Rutter, DiLavore, & Risi, 1999) is a semi-structured assessment that can be used to evaluate SCB in children suspected of having ASD. Specifically, the *ADOS* measures communication and social interactions and behaviors. It is a standardized procedure consisting of standardized ratings and materials, where children are observed doing various tasks (i.e., free play, telling a story from a book, responses to various environmental cues) that are designed to elicit SCB. Observers rate a child's communication and social behaviors on a scale and use prescribed cut-offs to construct a diagnosis. While this task is informative for identifying and measuring SCB among children, it is primarily suited for clinical and laboratory settings. Therefore, there is limited application for natural contexts or for linking SCB to intervention planning in such settings.

Most SCB measurements discussed in this section share similar strengths and weaknesses; and thus gather the same types of SCB information. Unfortunately, what they fail to do is use theoretically-derived principles and methods that systematically describe and link a child's SCB performance to intervention practices. The next section discusses the current need for SCB assessment that is informed by data and linked to intervention design and implementation.

The Need for Social Communication Behavior Skills Assessment Linked with Intervention

A considerable amount of research has defined the social skill deficits that children with autism experience. For example, children with autism experience considerable difficulty with peer relationships and displaying typical social skills. More specifically, they lack the ability to discriminate and label the emotions of others, the ability to take on the perspectives of others while simultaneously considering their own point of view, and the ability to express mutual social communication reciprocation (Rapin, 1991). Overall, children with autism have the most serious problems with play interactions and peer communication. Previous research has shown that there are predictive links between social maladjustment and poorer mental health functioning, which reinforces the idea that early intervention of social functioning could prevent or decrease the occurrence of poor mental health outcomes (Cowen et al., 1973).

Surprisingly, as researchers have spent much time on characterizing ASD social deficits, they have failed to develop systematic social skill assessments, much less social communication behavior skills assessments that are tied to interventions. Some of the main problems with the current assessment-intervention approaches are: (a) they generally have weak effects (see Bellini et al., 2007), (b) they were mostly implemented in self-contained classrooms (Stichter & Conroy, 2005), (c) most of the interventions were targeted for preschoolers and are not feasible for school-aged children (see NCSER [2001]), (d) they were generally prepackaged interventions not specifically related to an individual skill deficit (Gresham, 2002), and finally (e) most of the interventions were not tied to an evidenced-based assessment approach. It is with the consideration of the extant literature base and the lack of connection between social assessment and interventions that the present study goal is to systematically develop a *social assessment approach* via *descriptive assessment* that will describe and determine a first step toward identification of which social-related behaviors of individual children with ASD should be targeted as goals for intervention (i.e., building overall assessment utility).

The Use of Applied Behavior Analysis to Ameliorate ASD Social Communication Behaviors

As previously mentioned, ABA procedures have been well-documented in empirical research for their use with ameliorating challenging behaviors, particularly challenging behaviors. Although challenging behaviors are a central feature of ASD and likely inhibit inclusionary placement; SCB deficits result in equally devastating outcomes and are often less researched. Unlike the area of challenging behaviors, limited research has adapted ABA procedures to better assess antecedent events, contextual factors, and consequent factors that surround the occurrence of prosocial, adaptive behaviors. Moreover, research has not adequately investigated the SCB of children with ASD using ABA procedures. One potential way to investigate the SCB of children with ASD is to utilize a descriptive analysis approach. Descriptive analysis would be the first step toward more adequately developing, systematically defining and assessing the appearance of SCB deficits in children with ASD in naturalistic settings. Descriptive analysis information gathered may also be useful for making comparisons with typical peers' SCB. Social comparison descriptive data would help professionals better understand the specific skills that promote positive social interactions. By strengthening the descriptive assessment process, it is likely that the later ABA procedures (e.g., structural analysis, functional analysis) will carry greater command in the individualized assessment and treatment of SCB. Therefore, for this purpose, the descriptive analysis process of SCB will be underscored since the present study rests on ABA theory and procedures.

Descriptive assessment of social communication behaviors. As mentioned earlier, there is a variety of indirect and direct descriptive assessment approaches that have been developed to facilitate the functional behavioral assessment process. These measures vary greatly in their rigor of gathering information about a target behavior. While, past research has used both indirect and direct assessment approaches to gather information about social behavior, subsequent research has expanded to focus on *student factors* and *contextual factors* that influence the occurrence of either appropriate or inappropriate social behaviors (Carr et al., 1999; Horner et al., 1997). However, this research has focused very little on identifying specific contextual factors that surround appropriate social behaviors among children with ASD. It has been demonstrated clearly that children with ASD have inappropriate social communication skills, especially when interacting with TD peers during play activities (Cress, Arens, & Zajicek, 2007). However, there are instances in which they produce appropriate social communication skills, such as through “peer buddy programs” or when provided direct instruction (Carter & Hughes, 2005; Cress, Arens, & Zajicek, 2007). In this respect, research needs to identify the characteristics (type, form, rate, contextual factors) that define these instances of prosocial communication behaviors. Research that centers on specific antecedents and /or setting events characterizing these social outcomes, or the consequences maintaining these prosocial communication outcomes would be beneficial to the development of more effective individualized intervention to increase SCB for children with ASD. The theoretical foundations of ABA can be used as a mechanism to examine SCB for children with ASD.

Numerous studies have investigated setting events that produce appropriate social interaction for preschool children with special needs (Hughes & Carter, 2002; Chandler, Fowler & Lubeck, 1992; Carter, Hughes et al., 2005). Moreover, these studies have examined specific contextual factors that contribute to problematic social behaviors. For example, Hughes and Carter (2002) examined toys and materials as setting events for preschool children with special needs during social interactions. During the course of this study, children were directed to play with various toys. Toys were categorized into isolate toys (e.g., puzzles) and social toys (e.g., role play materials, dolls and doll house). Findings revealed that social interaction increased overtime with the use of isolate toys and remained stable overtime using social toys. In a later study, Hughes & Carter (2010) found there was no consistent overall difference found in interaction patterns across social and isolate toy conditions among students with special needs. The authors also reported that students with special needs tended to interact more with each other when using isolate toys and tended to interact more with regular peers when using social toys. Ultimately, these studies suggest that the analysis of setting events (e.g., toy materials) may help to produce viable information that could potentially be used to increase the occurrences of prosocial communication behaviors among children with ASD.

Additionally, Chandler, Fowler, and Lubeck (1992) examined four different settings events and social interaction outcomes among integrated play groups. Setting events examined were teacher status (i.e., presence or absence) and behavior, peers present, activity materials, and type and rate of prompting. Findings revealed that the level of social interactions differed across the four settings events. Interestingly, the optimal level of social interactions between children with special needs and typical peers was promoted by peers present, teacher absence from the activity, and a limited number and forms of materials. Overall, pairing a skilled social partner with an unskilled social partner had the greatest impact on social interactions for children with special needs. These finding also offer support for the placement of children with special needs in inclusive settings.

Likewise, Boyd (2008) identified setting events in a classroom environment of preschool children with autism that actually promoted appropriate social engagement with typical peers. For example, Boyd found that such setting events as small group size, child-directed activities, and limited teacher engagement positively influenced the occurrence of pro- social behaviors. Correspondingly, Carter, Hughes, et al. (2005) found that the peer proximity influenced the type and rate of peer interaction among high school children with autism. Together these findings suggest that setting events may hold value for the assessment and remediation of problematic social behaviors among children with autism.

Carter and colleagues (2008) conducted a descriptive study with 23 middle and high school students with and without developmental disabilities. The study was designed to investigate: (a) the type of peer interactions, initiations, and responses that children with and without developmental disabilities perform in inclusive secondary classrooms, (b) the degree of academic engagement that students with disabilities have in these classrooms, and (c) the contextual factors (e.g., instructional format, educator proximity) that may contribute to peer interaction and academic engagement outcomes in these classrooms. Participants were observed in core academic (e.g., math, science, language arts) and/or elective (e.g., art, consumer/family education, health, music) general education classes across 10 weeks for a total of 124.5 hours.

Study findings revealed that both groups engaged in interactions (e.g., conversation turn) that involved task and social-related topics. More specifically, children with disabilities engaged in slightly more task-related conversations with peers in core academic classrooms, but engaged in social-related conversations more than twice as much in elective classrooms. Moreover, in core academic classrooms, both groups were found to engage in the highest peer interactions, in particular social-related interactions, during small group than during any other instructional formats (e.g., independent seatwork, large group). Similarly both groups showed the highest degree of academic engagement in small group and one-to-one formats for elective and core academic classrooms, respectively. Overall social-related interaction was significantly higher when special and general educators were out of proximity during class time. In contrast, the academic engagement of children with disabilities improved with closer educator proximity. In general, these findings hold value for measuring specific SCB interactions (e.g., conversation topics) in older youth, and although the study does not address early school-aged children with autism, it does highlight the importance of direct observation and individual measurement of SCB. Collecting data as described in this study will assist with documenting the SCB of early elementary children with autism and their typical peers in order to improve their social outcomes in inclusive elementary classrooms.

With consideration to these studies, which have mostly focused on preschool children with a few studies focused on middle and high school students, there have been limited studies done incorporating various contextual factors (e.g., “setting events”) and antecedent events in relation to social skill outcomes among early school-aged children with autism and inclusive settings. Using the same principles as the above studies, the present study seeks to expand on the current literature and propose an investigation using ABA procedures (i.e., DA) for school-aged children with autism.

In summary, little research had paid close attention to systematically describing and exploring antecedents, contextual factors, and consequent factors (Carr, 1994; Wahler & Fox,

1981) as being variables that impact ASD social outcomes. As previously noted, current research has been particularly focused on setting events, antecedent events, and consequence events in relation to the assessment of challenging behaviors (e.g., self-injury, aggression, destructive behaviors; Axelrod, 1987; Horner et al., 1997; Iwata, Dorsey, Slifer, Baumann, & Richman, 1982/ 1994; Sasso et al., 1998). In this view, the descriptive assessment of setting events, antecedent events, and consequent events of social behavior difficulties, specifically social communication behaviors, has lagged behind. Two strong examples are the study by Boyd et al. (2008) and Carter et al. (2007) which focused on identification and quantification of SCB and the antecedents surrounding SCB for students. Although research has explored contextual factors and antecedent events in predicting or facilitating social outcomes among preschoolers; research in regard to school-aged children or adolescents is limited. The findings from these studies suggest that the use of ABA descriptive assessment procedures can close the discrepancy between assessment and intervention implementation. More specifically, descriptive assessment procedures offer a systematic approach (vs. anecdotal recordings) to assessing social communication behavior problems and potentially designing meaningful and effective social interaction interventions that are data driven.

Previous research has compared the social skills of school-aged children with high functioning autism and Asperger’s disorders (Macintosh & Dissanayake, 2006); however, research has not *methodically* characterized the social commination behavior differences among typically developing (TD) adolescents or adolescents with autism spectrum disorders, nor compared these differences in an efficient way to those with similar characteristics (Developmentally Disabled [DD]). Interestingly, several studies have demonstrated that when young or school-aged children with autism are paired with TD peers in multi-contexts and for multi-intervention settings; they generally have improved social and academic outcomes (Carter & Hughes, 2005; DiSalvo & Oswald, 2002; Goldstein, Kaczmarek, Pennington, & Shafer, 1992; McConnell, 2002). In contrast, there is a paucity of research examining adolescents with autism spectrum disorders and their social outcomes relative to precise intervention models. More specifically, it is unclear how ASD SCB compare or differ in relation to multi-contexts or multi-intervention models to those of TD or those with similar characteristics (DD). It also unclear how environmental factors are associated with SCB occurrences and how those factors differ for ASD and DD adolescents. Drawing on the previous literature gaps and goals presented thus far, the next step would be to conduct a *descriptive and quantitative analysis* to systematically describe and compare the SCB among high school adolescents with ASD, high school adolescents with DD, and high school adolescents with typical development. It would not be sufficient to nearly describe their SCB occurrences without examining them in relation to different contextual factors and intervention models. This goal stems from the fact that the current literature base has made limited formal attempts to actively identify, describe, quantify, and compare adolescents with ASD to TD in their SCB within natural contexts. More precisely, a descriptive and quantitative approach would describe the SCB in natural settings, and thus be used to create a more data-informed experimental analysis to help systematically identify and manipulate (i.e. for intervention purposes) variables (or factors) that serve as facilitators and consequences for appropriate social communication behaviors for adolescents with ASD and similar characteristics (e.g., DD)

An Alternative Approach to Intervention with ASD

The Need for a Different Service Delivery Model

There is little doubt that the experiences students take pleasure in during high school play a prominent role in shaping the outcomes they encounter early in and throughout adulthood. For substantial numbers of youth with severe intellectual disabilities, however, the important social, learning, and school experiences that equip most youth for life after high school remain elusive. Best practices in secondary transition indicate that youth with disabilities should access meaningful learning opportunities within the general curriculum that promote attainment of important social and functional skills, extracurricular and school activities that provide avenues for exploring one's strengths and interests, and opportunities to develop social competence and meaningful relationships with their peers without disabilities. Despite much progress over the years, as seen through federal legislation and varying service delivery models, studies suggest many students with severe disabilities continue to have limited involvement in inclusive learning opportunities and few social connections with peers without disabilities, particularly in secondary schools (e.g., Bouck, 2017; Carter, Sisco, Brown, Brickham, & Al-Khabbaz, 2008; Raghavendra, Olsson, Sampson, Mcinerney, & Connell, 2012). Shattuck, Orsmond, Wagner, and Cooper (2011) found that 16% of adolescents with intellectual disability and 43% of adolescents with autism spectrum disorders were reported by their parents to *never* see friends; almost one quarter of students with intellectual disability and half of students with autism have *not* been invited by friends to any social activity in the past year. Additionally, parent interview data collected from the NLTS-2 study demonstrated that only 33% of high school youth with intellectual disabilities and 30% of high school youth with ASD participated in any organized school activity outside of class with peers without disabilities during a given year (Wagner et al., 2004). In comparison, 90% to 100% of typical peers were found to participate in any outside school activity with one another during a given year. Hence, findings from this research suggest that a new service delivery model that supports the inclusion of students with disabilities, particularly those with ASD, in-and outside classroom participation is immensely needed.

The social challenges experienced by adolescents with disabilities coupled with an increasingly challenging secondary curriculum, a complex peer culture during adolescence, and diminished time spent in general education can all make high school a particularly challenging time for them. Yet, relatively few interventions involving students with severe disabilities or students with autism spectrum disorders have been evaluated in high school settings (see reviews by Carter et al., 2010; Hughes et al., 2013). This paucity of research leaves secondary educators with few evidence-based approaches to draw upon to support inclusion.

As described earlier, there is continuum of special education service delivery models comprising of: exclusion, full day inclusion, co-teaching, push-in, and pull out. Assigned paraprofessionals, special educators, or other specialized staff are among the prevalent approaches for supporting the inclusion of students with severe disabilities in secondary schools (e.g., Fisher & Pleasants, 2012; Giangreco, Suter, & Hurley, 2013). Peer-mediated interventions have emerged as a promising alternative to one-to-one adult-delivered support models for improving peer interactions, social relationships, and school participation of students with severe disabilities. One group of students that have benefited immensely from such interventions is preschool-and elementary-aged students with ASD. Research has suggested that youth with severe disabilities (with and without ASD) benefit both academically and socially from inclusive classroom placements (Harrower & Dunlap, 2001; Hunt & Goetz, 1997; Meyer, 2001; Fisher & Meyer, 2002). Furthermore, research has identified an array of substantive benefits associated with inclusionary classroom practices for students with disabilities and their peers, which consists of: academic, functional, and increased social skill development; enhanced social competence; more exchanges of social support; increased friendship development; and improved quality of life (e.g., Carter & Hughes, 2005, 2007; Fisher & Meyer, 2002; Hunt & Goetz, 1997).

Given the benefits of inclusion, peer-mediated interventions have emerged as a compelling alternative to the widespread use of individually assigned paraprofessional supports in elementary and secondary schools (Downing, 2006; Giangreco, Carter, Doyle, & Suter, 2010). This educational support model involves equipping one or more peers to provide ongoing academic and/or social support to their same-age classmate with a significant disability while receiving needed assistance from paraprofessionals and/or educators (Carter, Cushing, & Kennedy, 2009). This is a flexible support model that can (and should) be individually tailored to meet the unique needs of a student with a significant disability within a particular classroom context. Peer-mediated intervention techniques can include: individualized peer support strategies where peers are placed in close proximity to the focus student providing ongoing monitoring, feedback and assistance in inclusionary classroom settings (Carter & Kennedy, 2006; Goldstein, Kaczmarek, & English, 2002) or peer network interventions, which involve contributing to higher levels of active engagement for students with disabilities on a school-wide basis (Shukla et al., 1998; 1999). To date, these techniques have not been well-defined in the literature and lack clear large-scale empirical support for promoting broader social outcomes for secondary students with ASD or those of similar characteristics (e.g., DD).

Peer support interventions. Recent research suggests that peer support interventions may have substantial impact on peer interactions and class participation of students with severe disabilities. Peer support interventions school staff establishing peer support arrangements (Carter, Cushing, & Kennedy, 2009) for focus students. Peer support arrangement can include typical peer partners supporting students with disabilities academically (e.g., encouraging contributions to class and group discussion, sharing materials, assisting in taking notes or sharing notes, writing down answers given orally/with a device, modifying or adapting assignment, helping student get organized, collaborating on class assignments) and socially (e.g., conversing about school and other activities, modeling appropriate social skills, making introductions to other classmates, praising student for social communication, teaching the student a specific social skills, providing emotional support) to participate in ordinary class activities (Carter, Cushing, & Kennedy, 2009). The effectiveness of peer support strategies have been isolated and evaluated in just four published single subject studies involving 13 students with severe disabilities, none of which had an ASD (Carter, Cushing et al., 2005; Carter, Sisco et al., 2007; Shukla et al., 1998; Shukla et al., 1999). In addition, only one of these published studies was conducted at the high school. Thus, additional information is needed to understand the effects of specific types of peer support interventions on the SCB of adolescents with ASDs and those of similar characteristics (DD).

Peer network interventions. Peer network interventions offer a promising approach for addressing both academic and social-related involvement outcomes beyond the classroom and across the school day by creating broad social contacts and cohesive social groups around a focus student with severe disabilities (Garrison-Harrell, Kamps, & Kravis, 1997; Kamps, Potucek, Lopez, Kravits, & Kemmer, 1997). Peer network interventions often involve: (a) talking with the focus student and his or her parents to determine interest in participating and to solicit suggestions regarding the focus and the composition of the network; (b) identifying and inviting a small group of 4-6 peers without disabilities to an initial meeting to organize the network; (c) providing students with information about peer networks, background about the focus student (e.g., interests, hobbies, talents, school and community activities), and guidance on student’s roles; (d) having peers discuss their daily schedules (e.g., their courses, extracurricular activities, and places they spend time between classes, at lunch, and before and after school) and arranging when and where each student will spend time with and support the focus student; (e) introducing the student to his or her network that will provide the support; (g) meeting regularly as a group for students to adjust their schedules; share ideas for providing support, expanding the size of the peer network, and increasing the student’s involvement in additional school activities; and collectively problem-solve any challenges that may arise (for standards and guidelines for implementing peer network interventions see Hughes & Carter, 2008).

Although an adult or paraprofessional may be involved in a peer network intervention, their role is to facilitate the network and to encourage students to assume increasing responsibility for sustaining the peer network which is different than encouraging one-on-one support confined to a single classroom setting. Peer Network interventions offer an alternative service delivery model for supporting students with ASD outside the classroom setting (Hughes & Carter, 2008). Several studies have found beneficial effects on students with disabilities: improve academic performance (Dugan et al., 1995), increase social interactions (Kennedy, Cushing, & Itkonen, 1997), decrease the occurrence of challenging behaviors (McDonnell, Mathot-Buckner, Thorson, & Fisher, 2001), and support the acquisition of functional skills (Werts, Caldwell, & Worley, 1996). More research is needed to understand the impact of peer network intervention on the SCB of secondary students with ASD and those of similar characteristics (e.g., DD).

Purpose of Current Study

The purpose of the proposed project is extend applied behavior analysis principles (i.e. descriptive approach, antecedent/contextual variables analysis) with the use of peer-mediated interventions for students with ASDs. More specifically, the purpose of the present study is to explore, identify, describe, and quantify social communication behaviors (SCB) among adolescents with ASDs as well as adolescents with similar characteristics (e.g., severe DD) in comparison to typically developing adolescents. In order to achieve this purpose, the SCB (e.g., social initiations, social responses) of adolescents from these two groups will be studied in relation to different intervention models: peer-mediated interventions (e.g., peer network intervention and peer support intervention) and "treatment-as-usual model" (TAU; i.e. one-on-one paraprofessional model). A third comparison will be typically developing peer's SCB, which will also be identified as they occur in interaction with adolescents with ASDs and with other typical adolescent peers. Differences across these comparisons will be statistically evaluated in relation to peer-mediated interventions. The project's overarching goals are to systematically: (1) describe and quantify the SCB occurrences among high school students with DD with and without ASDs as they change from pre-to-post-observation, (2) explore and identify the SCB occurrences among high school typically developing students, (3) compare and contrast the SCB occurrences of groups in relation to different peer-mediated intervention approaches, (4) investigate the quality of social interactions between typically developing high school students and high school students with ASDs before and after the implementation of peer-mediated interventions, and (5) explore and describe specific characteristics (i.e. variables) of high school students with DD with and without ASDs that lend to social behavior gains within the context of peer-mediated interventions.

Current Study Research Questions

Based on the aforementioned literature and areas of interest, the following study research questions are advanced:

1) How do social communication behaviors (initiations, responses) compare and contrast among (a) high school students with severe developmental disabilities with and without ASD, and (b) high school students with typical development at pre-and post-observation in general education classes by treatment condition? Are there significant differences found in groups by treatment condition and across treatment conditions at post-observation?
2) How do student variables (e.g., intellectual ability, communication skills, disability severity) relate to post-treatment gains in social behaviors seen among the treatment groups when engaged in peer-mediated intervention (Peer Support [PS], Peer Network [PN])?
3) What social interaction quality differences, as far as affect, reciprocity, content, communication mode, response relevance, and overall quality, were observed between high school students with severe developmental delays with and without ASD, and typically developing high school students at (pre-and) post-observations?

Table 2.1

DSM IV-TR Criteria for Autistic Disorder and Asperger's Disorder

Autistic Disorder ***(299.00)***	***Asperger's Disorder (299.80)***
A. "A total of six (or more) items from (1), (2), and (3), with at least two from (1), and one each from (2) and (3): 1. qualitative impairment in social interaction, as manifested by at least two of the following: a. marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction b. failure to develop peer relationships appropriate to developmental level c. a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest) d. lack of social or emotional reciprocity" 2. "qualitative impairments in communication as manifested by at least one of the following: a. delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime) b. in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others c. stereotyped and repetitive use of language or idiosyncratic language d. lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level" 3. "restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following: a. encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus b. apparently inflexible adherence to specific, nonfunctional routines or rituals c. stereotyped and repetitive motor manners (e.g., hand or finger flapping or twisting, or complex whole-body movements) d. persistent preoccupation with parts of objects" B. "Delays or abnormal functioning in at least one of the following areas, with onset prior to age 3 years: (1) social interaction, (2) language as used in social communication, or (3) symbolic or imaginative play." C. "The disturbance is not better accounted for by Rett's Disorder or Childhood Disintegrative Disorder.	A. "Qualitative impairment in social interaction, as manifested by at least two of the following: 1. marked impairment in the use of multiple nonverbal behaviors such as eye-to eye gaze, facial expression, body postures, and gestures to regulate social interaction 2. failure to develop peer relationships appropriate to developmental level 3. a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest to other people) 4. lack of social or emotional reciprocity" B. "Restricted repetitive and stereotyped patterns of behavior, interests and activities, as manifested by at least one of the following: 1. encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity of focus 2. apparently inflexible adherence to specific, nonfunctional routines or rituals 3. stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements) 4. persistent preoccupation with parts of objects" C. "The disturbance causes clinically significant impairment in social, occupational, or other important areas of functioning." D. "There is no clinically significant general delay in language (e.g., single words used by age 2 years, communicative phrases used by age 3 years)." E. "There is no clinically significant delay in cognitive development or in the development of age-appropriate self-help skills, adaptive behavior (other than in social interaction), and curiosity about the environment in childhood." F. "Criteria are not met for another specific Pervasive Developmental Disorder or Schizophrenia."

Source: American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR.* Washington, DC: Author.

Table 2.2

DSM IV-TR Criteria for Rett's Disorder and Childhood Disintegrative Disorder

Rett's Disorder (299.80)	***Childhood Disintegrative Disorder (299.10)***
A. "All of the following: 1. apparently normal prenatal and perinatal development 2. apparently normal psychomotor development through the first 5 months after birth 3. normal head circumference at birth" B. "Onset of all of the following after the period of normal development: 1. deceleration of head growth between ages 5 and 48 months 2. loss of previously acquired purposeful hand skills between 5 and 30 months with the subsequent development of stereotyped hand movements (e.g., hand-wringing or hand washing) 3. loss of social engagement early in the course (although often social interaction develops later) 4. appearance of poorly coordinated gait or trunk movements 5. severely impaired expressive and receptive language development with severe psychomotor"	A. "Apparently normal development for at least the first 2 years after birth as manifested by the presence of age-appropriate verbal and nonverbal communication, social relationships, play, and adaptive behavior." B. "Clinically significant loss of previously acquired skills (before age 10 years) in at least two of the following areas: 1. expressive or receptive language 2. social skills or adaptive behavior 3. bowel or bladder control 4. play 5. motor skills" C. "Abnormalities of functioning in at least two of the following areas: 1. qualitative impairment in social interaction (e.g., impairment in nonverbal behaviors, failure to develop peer relationships, lack of social or emotional reciprocity) 2. qualitative impairments in communication (e.g., delay or lack of spoken language, inability to initiate or sustain a conversation, stereotyped and repetitive use of language, lack of varied make-believe play) 3. restricted, repetitive, and stereotyped patterns of behavior, interest, and activities, including motor stereotypes and mannerisms" D. "The disturbance is not better accounted for by another specific Pervasive Developmental Disorder or by Schizophrenia"

Source: American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR.* Washington, DC: Author.

Table 2.3

DSM IV-TR Criteria for Pervasive Developmental Disorder-Not Otherwise Specified

***DSM IV-TR Pervasive Developmental Disorder-Not Otherwise Specified** (299.80)*
Includes all the following: • "Impairment in either verbal and nonverbal communication skills" • "Presence of stereotyped behavior, interests, and activities" • "Severity and pervasive impairments in the development of reciprocal social interaction" • "Criteria are not met for a specific Pervasive Developmental Disorder, Schizophrenia, Schizotypal Personality Disorder, or Avoidant Personality Disorder"

Source: American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR.* Washington, DC: Author.

Table 2.4

Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition Criteria for Autism Spectrum Disorder

DSM-5 ASD Criteria	
A. Persistent deficits in social communication and social interaction	A1: Deficits in social emotional reciprocity A2. Deficits in nonverbal communicative behaviors A3. Deficits in developing, maintaining, and understanding relationships
B. Restricted, repetitive patterns of behavior, interests, or activities, currently or by history	B1: Stereotyped or repetitive motor movements, use of objects or speech B2. Insistence on sameness, inflexible adherence to routines, or ritualized patterns of verbal or nonverbal behavior B3. Highly restricted interests that are abnormal in intensity or focus B4. Hyper- or hypo-reactivity to sensory input or unusual interest in sensory aspects of the environment
Historical PDD diagnosis	Any ASD diagnosis documented in a comprehensive evaluation, including a DSM-IV diagnosis of autistic disorder, Asperger disorder, or pervasive developmental disorder–not otherwise specified (PDD-NOS)
DSM-5 case determination	All three behavioral criteria coded under part A, and at least two behavioral criteria coded under part B OR Any ASD diagnosis documented in a comprehensive evaluation, whether based on DSM-IV-TR or DSM-5 diagnostic criteria Note: A child might be disqualified from meeting the DSM-5 surveillance case definition for ASD if, based on the clinical judgment of one or more reviewers, there is insufficient or conflicting information in support of ASD, sufficient information to rule out ASD, or if one or more other diagnosed conditions better account for the child's symptoms

Source: American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

CHAPTER 3

Method

The chapter describes the proposed methodology for the present study: (a) study participants and setting, (b) study measures, (c) study procedures, and (d) data analysis procedures. It is important to note that this study stems from a larger project completed by investigators Dr. Erik Carter (principal investigator), and Dr. Jennifer Asmus (co-principal investigator). This project, known as “Peer Support and Peer Network Interventions to Improve Peer Relationships and School Engagement”, was supported by the Institute of Education Sciences (R324A100133) and evaluated the efficacy of peer-mediated interventions for high school students with significant developmental disabilities (with and without autism) in comparison to paraprofessional interventions. Herein this project will be known as the Peer Partner Project (P3). Through the analysis of data collected from the P3, the present study sought to expand the current literature base with regards to social communication behaviors (SCB) of students with disabilities by systematically identifying the occurrence of SCB among high school adolescents with autism spectrum disorders (ASD) who having significant developmental disabilities in general education settings. As a comparison, the present study identified and analyzed the typically developing student’s (TD) and significant developmentally delayed student’s (DD without ASD) SCB as they occurred in interaction with adolescents during peer-mediated interventions (peer support and peer network) and during treatment as usual (TAU; i.e., the paraprofessional/special educator model). Due to the nature of the present study, the same setting, participants, measures, and interventions are described as in P3. The participating students were selected from this project, and all data had been previously collected and examined using the methodology described in this section.

Peer Partner Project (P3) Design

Project overview. The Peer Partner Project (P3) utilized a randomized control trial (RCT) to rigorously evaluate peer support and peer network interventions compared to TAU for high school students with autism spectrum disorders and other significant developmental delays. An ethnically and economically diverse group of students with severe developmental disabilities (with and without autism) between the ages of 14-21 were randomly assigned to receive the peer support or peer network interventions, with a comparison group receiving TAU. This project was designed to yield clear information on the impact of peer-mediated interventions on the interactions, skills, relationships, and school experiences of secondary students with significant developmental disabilities (with and without autism spectrum disorders). Using a Randomized Control Trial Design, the P3's invitations were sent to students with disabilities who met the inclusion criteria and were randomly assigned to one of three conditions. To participate, students with disabilities must have been (a) receiving special education services under a primary disability label of autism or cognitive disability (as defined by IDEA & Wisconsin and Tennessee state statutes), (b) eligible for the state's alternate assessment, and (c) enrolled in at least one general education class per day with paraprofessional or other adult support, excluding physical education. School staff nominated students (peers) without disabilities to be part of the study for two of the three conditions. Students were not excluded from the study on the basis of gender, race/ethnicity, nationality, religion, or income. P3 was conducted at 23 high schools from 12 districts in Dane County, Wisconsin and areas of Nashville, Tennessee. These schools employed various service delivery models, including instruction within the general education, resource classrooms, and community-based learning sites. Across schools, student ethnicity and socioeconomic status was diverse. One hundred-forty-six students with severe disabilities and/or autism (referred to collectively as students with disabilities in this paper) participated in the study out of the 206 students originally invited. The total number of students enrolled in the study each semester was 21 in fall 2011, 37 in spring 2012, 33 in fall 2012, 34 in spring 2013, and 21 in fall 2013. These students were randomly assigned to one of three conditions: peer support (N=51), peer network (N=47), or paraprofessional support (N=48). Interventions lasted one semester, with follow-up data collected for two additional semesters and new students joined the project each semester between 2011 and 2013.

P3 Participants

Participants in this multi-year study included 146 high school students with severe developmental disabilities and/or ASD (referred to collectively as student with disabilities in this paper), 298 peers without severe disabilities who served as peer partners, and 51 school staff.

Students with severe developmental disabilities. High school students with severe developmental disabilities with and without ASD were recruited. Students must have (a) qualified for the state's alternate assessment as students with significant cognitive impairments or received special education for an intellectual disability or autism, and (b) been enrolled in at least one general education class (excluding physical education) in which they received paraprofessional or special educator support. High school students were randomly assigned to one of three study conditions: no peer-mediated intervention (i.e., TAU), peer networks, or peer support arrangements (which take place inside the classroom during instructional time). Table 1 displays participant characteristics by group. No differences were reported between groups on the variables of gender, $\chi2(1, n = 99) = 1.053$, $p = .305$; race/ethnicity (i.e., White vs. non-White), $\chi2(1, n = 99) = .043$, $p = .835$; eligibility for free or reduced-price meals, $\chi2(1, n = 97) = 1.16$, $p = .281$; age, $t(97) = 0.880$, $p = .381$; or adaptive behavior composite scores, $t(97) = 0.72$,

p = .473 (Carter, Asmus, Moss, Biggs, et. al, 2016). However, they found that the Childhood Autism Rating Scale–2 (Schopler, Van Bourgondien, Wellman, & Love, 2010) scores of students with ASD in the peer support condition indicated more severe symptoms than students in the TAU condition, $t(41) = -2.06$, $p = .046$ (information gathered from: Carter, Asmus, Moss, Biggs, Bolt, et. al, 2016). Additionally, students in both groups were found not to differ in communication and daily living skills (subscales of the Vineland Adaptive Behavior Scale, Second Edition; Sparrow, Cicchetti, & Balla, 2005) or academic competence (subscale of the Social Skills Improvement System, Gresham & Elliott, 2008). The two groups were found to differ on the Problem Behavior Scale and Social Skills Scale, with the ASD group having elevated problem behavior standard scores and lower socialization standard scores as compared to the DD only group (see Carter, Asmus, Lequia, Vincent, Lyons, in press). Furthermore, in their analysis of individualized education programs (IEP), they found that participant annual goal areas most of often identified were cognitive and/or academic skills (82.7% of IEPs), communication (62.0% of IEPs), and post-secondary skills (62.0% of IEPs). Those that were least often explicitly addressed included problem behaviors (3.3% of IEPs), engagement (7.3% of IEPs), and fine or gross motor skills (20.0% of IEPs). In comparing the groups (ASD+DD, DD), they noted that DD students with ASD were significantly more likely to have communication, χ^2 (2) = 9.03, p = 0.01; and maladaptive behaviors, χ^2 (2) = 8.64, p = 0.01, addressed as annual goals in their IEP as compared to DD only students. In general, P3 study participants with disabilities had similar educational goals and objectives included in their IEPs that primarily centered on academics, communication skills, social skills, and post-secondary skills (refer to related study by Carter, Asmus, Lequia, Vincent, Lyons, in press).

Peer-mediated intervention partners. For each student with a disability assigned to the peer network condition, three or more typically developing peers (*M* = 4.1, range, 3-6) agreed to serve as peer partners. For each student with a disability assigned to the peer support condition, two or more peers (M = 2.1, range = 1–4) from the same classroom were invited to serve as peer partners. Facilitators asked the focus student for suggestions of schoolmates he or she would like to get to know. Facilitators also considered peers who they considered to be motivated to develop a social relationship with the focus student, would serve as a positive peer role model, were part of an established group of friends that could all take part in the group, or who were committed to staying involved through the semester and who had good attendance. Almost all peers who began the semester as a peer network member (93.8%) or a peer support member (95.2%) remained in this role throughout the semester.

Peer-mediated intervention adult facilitators. Peer network interventions were facilitated by 9 special educators, 11 paraprofessionals, 8 general educators, 3 school counselors/psychologists, and 10 other staff (e.g., club advisor, job coach, counselor, social worker); four networks were jointly facilitated. Facilitators were selected by the school liaison by (a) interest in or connections to students without disabilities, (b) asking principals to email an open invitation to all school staff, and (c) soliciting recommendations from previous facilitators. Some facilitators (*n* = 9) facilitated more than one peer network either across semesters or co-facilitated with another person. Most were female (75.6%) and White (82.9%). Average years of educational experience was 10.5 (*SD* = 8.7) and the number of years at their current school averaged 7.1 (*SD* = 6.9). About one third (36.6%) reported having facilitated some type of peer-mediated intervention at some time in the past. Peer support intervention arrangements were facilitated by 42 paraprofessionals and 9 special educators assigned to support the focus student. Most paraprofessionals were female (90.5%) and White (94.1%); they averaged 10.3 years (SD =

6.7) of total educational experience and 6.8 years (SD = 5.6) at their current school. All of the paraprofessionals worked under the direct supervision of a special educator at their school.

P3 Schools and Settings

Students attended 23 high schools within 12 districts across two states—Tennessee and Wisconsin, with the majority enrolled in Wisconsin schools. Average race/ethnicity of students across schools was 70.4% European American (range, 22.4-94.4%), 15.2% African American (range, 1.3-57.2%), 7.9% Hispanic/Latino/a (range, 1.5-18.9%), 3.8% Asian American (range, 0%-10.5%), 0.2% American Indian (range, 0-0.6%), and 3.6% multiple races (range, 0-9.8%). On average, 30.8% of students were eligible for free or reduced-price meals (range, 5.6-76.2%).

The settings for peer network meetings varied widely, including during lunch periods (85.1% of students), during advisory periods (6.4%), after school (4.3%), before lunch (2.1%), and alternating between lunch and after school (2.1%). Meetings were typically held in open classrooms (59.6%), while some were held in the cafeteria (4.3%), staff offices (12.7%), conference rooms (10.6%), the gym (2.1%), the school coffee shop (2.1%), or a variety of locations (8.5%). The average length of these meetings was 56.1 min (*SD* = 18.7) and the average number of peers present was 3.5 students (*SD* = 0.9).

Peer support intervention arrangements were observed within a single general education classroom for each focus student. Students were enrolled in an average of 3.3 (SD = 1.7; range = 1–7) general education classes during the semester they entered the study (M = 3.1 for peer support condition and M = 3.5 for the comparison condition).

P3 Measures

After obtaining parental consent and student assent, multiple measures were used to document the social outcomes and school participation of participating high students with severe disabilities (see Figure 1). These psychometrically sound measures were used previously with youth with disabilities similar in gender, racial/ethnic, and cultural composition to the population of students from which the P3 sample was drawn. Recognizing the complexity of adolescent social relationships and the challenges associated with documenting the multiple dimensions of interactions, relationships, and participation (Brown, 1999), P3 integrated multiple measurement approaches that enabled a more thorough investigation of the impact of peer-mediated interventions. The approaches included: (a) direct classroom observations; (b) skill assessments; (c) teacher and parent report; (d) student, classmate, and educator interviews; and (e) record reviews

Direct classroom observations. Tablet computers equipped with MOOSES (Version 4) were used to collect observation data on students, which included durational (i.e., academic engagement, instructional format, proximity) and frequency (i.e., social interactions) data second-by-second in real time (Multiple Option Observation System for Experimental Studies [MOOSES], Tapp, Webby, & Ellis, 1995). Each focus student was observed for three full-length class periods toward the beginning of the semester (pre) and three full-length class periods toward the end of the semester (post; i.e., 590 total observations; four students missed one post-observation). Each set of three observations was collected over a 2- to 3-week period and lasted an average of 56.8 min of classroom time per observation. Peer interaction measures gathered with MOOSES included students’ social related initiations and responses (directed to and received by classmates), task-related initiations and responses (directed to and received by classmates), interaction reciprocity (calculated automatically from initiation and response ratios), and class engagement. Additional peer comparison observations balanced across pre- and post-observations were also conducted on typically developing peers selected randomly.

IOA refers to a range of average interobserver agreement levels, which were used as reliable measures of reliability in data collection procedures among different individual coders. All data was gathered through live direct observations and collapsed across the three observations at each time point (i.e., pre and post).

Participant skill measures. A variety of measures were administered in the P3 project as pre-and post-assessments to provide information about the impact of peer-mediated interventions on students with disabilities. To assess whether students with disabilities acquired and used new social and behavioral skills, classroom teachers were asked to complete the *Social Skills Improvement System* (SSIS) rating scales (Greham & Elliot, 2008; 2nd edition of the Social Skills Rating System) at 4 time points (pre, post, and 1 and 2 semesters post). The Social Skills Rating Scale consists of items addressing behavior related to the subdomains of communication, cooperation, assertion, responsibility, engagement, empathy, and self-control. The Competing Problem Behavior Scale includes subdomains addressing externalizing, bullying, hyperactivity/inattention, internalizing, and autism spectrum behaviors. The SSIS evidences strong psychometric properties and the SSRS has been widely used in both research and practice (Gresham & Elliott). The SSIS has strong concurrent, convergent, and discriminant validity; test-retest reliability; and internal consistency.

The *Childhood Autism Rating Scale, Second Edition* (CARS2; Schopler, Van Bourgondien, Wellman, & Love, 2010) was used as a global assessment of autism symptoms for those students initially identified via their IEP to have a diagnosis of ASD. To obtain data on autism severity, all participants with autism were assessed using the Childhood Autism Rating Scale, Second Edition—Standard Version (CARS2-ST; Schopler, Van Bourgondien, Wellman, & Love, 2010). The CARS2-ST is one of the most widely used empirical tools for detecting symptoms of autism in children and determining the intensity and duration of these symptoms (Schopler et al., 2010). It is a 15-item behavioral rating scale that identifies children with autism and distinguishes them from children with intellectual disabilities without autism. In addition to informing diagnosis, the CARS2-ST creates functional profiles based on the severity of a child's symptoms: minimal to no symptoms of autism; mild to moderate symptoms of autism; severe symptoms of autism. The CARS2-ST is intended for use by a wide-range of professionals across clinical settings (e.g., schools, hospitals, clinics; Schopler et al., 2010; Vaughan, 2011). The Standard Version of the CARS2 was used and not the High Functioning Version, because the participants in the sample included students with suspected cognitive impairments. Psychometric properties for the original Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Renner, 1988) were based on a sample of 1,606 children and adults with autism. During CARS2-ST development studies, a verification sample of 1,034 individuals on the spectrum was used to determine the psychometric properties of the revised measure. Over two-thirds of the individuals in the verification sample were male, which is consistent with current diagnostic trends (CDC, 2012). Approximately 20% of individuals in the sample were between the ages of 11 and 15, while 7% were over the age of 15. Everyone in the sample had Full Scale IQ (FSIQ) estimates of 85 or lower (Schopler et al., 2010).

The *Vineland Adaptive Behavior Scale, Second Edition* (VABS-2; Sparrow et al., 2006) is one of the leading measures for supporting the diagnosis of intellectual disabilities, as well measuring the skills and behaviors that are needed to take care of oneself, to get along with others, and to handle the everyday demands of a school setting. It has strong psychometric properties and covers four domains: communication, daily living, socialization, and motor skills.

In addition to documenting changes in adaptive behavior, this tool was used to describe the functional level of P3 participants. This measure was used at the same 4 time points identified.

Classroom social status. For students in the PS condition, the perceived social status of students with disabilities was investigated at pre- and post-assessment using a peer nomination process (Mu et al., 2000; Sale & Carey, 1995) in the classrooms in which direct observation data was collected. Using procedures outlined by Coie and Dodge (1982, 1988), students' scores for peer acceptance and peer rejection were standardized at the classroom level and combined to derive scores for social preference and social impact. Preference refers to the standardized difference between the number of most liked and least liked nominations, while impact is conceptualized as the standardized sum of most liked and least liked scores. Preference and impact was combined to derive five mutually exclusive sociometric categories: popular, rejected, neglected, controversial, and average (e.g., Gifford-Smith & Brownell, 2003). This helped to determine whether the classroom social status of the student with severe disabilities and their peer supports had changed as a result of the peer-mediated intervention.

Quantifying educational progress. Because students with ASD were working toward individualized goals and enrolled in an array of general education courses each with a different set of content standards, each students' goals were documented so that those specific individualized education program (IEP) goals being addressed in the general education classrooms were targeted for the P3 observation (Brinker & Thorpe, 1984; Browder, Wallace, Snell, & Kleinert, 2005; Cushing, Clark, Carter, & Kennedy, 2005; Gelzheiser et al., 1998). IEP goal progress over the course of the intervention semester was measured using Goal Attainment Scaling (GAS). GAS was first described by Kiresuk & Sherman (1968) as a program evaluation tool and is accomplished by establishing a set of descriptive sequential criteria for assessing a student's progress. Within the P3 study, these criteria were assigned a scale number from +2 to -2. A support team member (special education teacher or paraprofessional) recorded over a semester the student's progress on the GAS goal. The scale begins with an operational definition of the criteria for the expected outcome, which is given a scale rating of 0. Better than expected outcomes (scale ratings of +1 to +2) and less than expected outcomes (scale ratings of -1 to -2) were delineated in advance. GAS is widely used within disability fields and appropriate for this context (e.g. Gliner, Ross, Duke, & Spencer, 1999; Hum, Kneebone, & Cropley, 2006; Schlosser, 2004) of the P3 study. Due to the highly individualized nature and focus of students' IEP goals, GAS scores allow for aggregating data across students to examine change.

Peer networks. Students' social networks, friendships, and social participation in school and community settings was assessed using the *School-based Social Network Form* (SSNF; Kennedy & Itkonen, 1995) at the beginning and end of each semester. Within the P3 study the SSNF was used to collect information regarding students' social affiliations by documenting individuals nominated as members of students' social network and those individuals' perceived importance to the student. Specifically, the SSNF was used to document the number of social contacts (i.e., interactions lasting 15 min or longer in the context of an activity) participants had with peers during the prior two week period. In particular, the instrument asked about when and where those interactions took place, how long each social partner interacted and how long they've known each other. The instrument allowed for both individuals who know the focus student as well as the focus student to respond. The SSNF is reported to have strong reliability and validity and yields an estimate size and composition of students' friendship network, as well as estimates of the number of social contacts.

Parent and teacher questionnaires. School participation and community participation was gathered as pre-and post-assessments by having parents and teachers complete a brief questionnaire about the previous two week period. More specifically there were 12 school participation categories and 25 community activities categories that each informant was asked to answer based on their adolescent's involvement. These questionnaires were adapted from prior research (Eisenmann et al., 2009; Kleinert et al., 2007a; Kleinert et al., 2007b).

Demographic information. Within the P3 project, students' IEP files were reviewed to obtain specific demographic (e.g., age, sex, grade, ethnicity) and disability-related information (e.g., recent formal evaluations). Information was collected about their general education participation, accommodations, social-related goals, functional-related goals, and overall IEP progress.

Social validity measures. Participants were interviewed about issues related to the feasibility, practicality, and acceptability of the intervention strategies; barriers to implementing those strategies; and recommendations for avenues for future professional development training on those interventions at post-observation during the semester in which they participated in study. Issues raised during informal conversations about those topics during training and coaching sessions were also documented. In addition, the P3 study assessed the social validity of the intervention package using a brief scale modified from the *Treatment Acceptability Rating Profile-Revised* (Reimers & Wacker, 1988) and the Intervention Rating Profile-5 (Witt & Elliott, 1985). This scale was used to assess acceptability of the intervention procedures and outcomes by asking all stakeholders (i.e., paraprofessionals, educators, students, parents) to rate a series of statements (e.g., "I liked the procedures used in this intervention," "This intervention was beneficial to the person.") using a 6-point Likert-type scale (1 = Strongly Disagree to 6 =

Strongly Agree). High ratings of social validity indicated that stakeholders agreed that the intervention steps were necessary, appropriate, supportive of positive values, and worth the effort to attain the goal (Kazdin, 1977; Schwartz & Baer, 1991). Peer network peers were motivated by multiple factors to work with their classmates with ASD, including reinforcement from teachers, increased access to adults, peer attention, or personal benefits (Carter, Swedeen, Moss, Saleem, & Hsin, 2009). Interviews were also conducted with peers who served in the peer network at the end of the post-intervention semester to explore what drew them to this role, maintained their involvement, and lead them to extend their involvement to noninstructional times of day (e.g., lunch, breaks, before and after school).

P3 Data Collection Procedures

Overview. After obtaining district- and school-level approvals, P3 staff worked with liaisons at the 23 high schools to invite students meeting inclusion criteria for the overarching project, as well as their teachers and parents. Permission forms were mailed home to parents, and were distributed to teachers at school. Assessment packets (including the informant measures) were distributed toward the beginning of the semester prior to the start of any intervention. Teacher packets were distributed directly to teachers, while home packets were mailed to parents, targeting the second to fourth weeks of the semester for completion. Teachers and parents completed the assessment packets independently. For participating families, parents were called at the start of the semester to foreshadow the arrival of the questionnaire packets. Up to 3 follow-up calls and/or emails were made up if packets were not returned within 4 weeks. For all participants, a small gift card was provided for completing packets.

Informant measure procedures. A variety of informant/participant skill measures were administered to describe the participant groups at pre-and post-intervention. The Childhood

Autism Rating Scale, Second Edition (CARS2; Schopler, Van Bourgondien, Wellman, & Love, 2010) was used as a global assessment of autism symptoms. The Social Skills Improvement System (SSIS; Gresham & Elliott, 2008) and Vineland Adaptive Behavior Scales, Second Edition (Vineland-II; Sparrow, Ciccetti, & Balla, 2006) were also used to describe the functional level of participants' social competence and adaptive behavior, respectively. P3 staff completed the CARS2 at pre-and post-intervention. Teachers and parents separately completed participant skill measures (described earlier) to characterize social and functional behaviors.

Observation procedures. Observers were trained in data collection procedures until they reached 85% or higher reliability for three consecutive videotaped and three consecutive in vivo training sessions. Observations occurred throughout the entire class period (e.g., 45-60 min) and data was collected unobtrusively by (a) having observers continually and intentionally scan the entire classroom so that one student is not recognized as the primary focal point; (b) using palm-size handheld computers to collect data; and (c) ensuring that observers were so fluent with the recording system so that they rarely have to look down, making it impossible for students to know exactly what behaviors are prompting the recording of data. These approaches have been successfully used in previous studies. For students enrolled in more than one general education class per day, interventions were implemented within a single classroom.

Observer training. Eighteen graduate and masters-level research assistants and staff across sites in Wisconsin and Tennessee carried out the classroom observations. All observers attended a series of data collection training sessions during which they (a) learned the operational definitions of target behaviors, (b) reviewed scoring examples, (c) completed conceptual quizzes, (d) practiced data collection procedures using videotaped scenarios and in vivo situations, and (e) discussed discrepancies and questions. Observers were trained in data collection until they achieved 90% reliability on two videotaped classroom observations and 80% reliability on one in vivo session in the field. For the videos, reliability was calculated by comparing observers’ ratings to an expert code file created by the principle investigators. For the in vivo sessions, reliability was calculated by comparing new observers’ ratings to those of someone who became reliable through practice with the principle investigator. To ensure continued high levels of reliability, observers participated in periodic refresher trainings.

Inter-observer reliability estimates were obtained by having a second observer simultaneously, but independently, collect data using identical procedures. Inter-observer reliability checks were balanced across all intervention conditions across all schools during a minimum of 20% of observations. Two methods for determining inter-observer reliability were used with MOOSES. First, a time window-based comparison was employed where matches were tallied using a time window around the primary observer's events and looking for matches in the second observer's events. Matches were tallied and the agreement ratio was calculated for each event code. Second, a time unit by time unit comparison was employed whereby each time unit was compared in the two observer's files and judged to be either in agreement or disagreement. The resulting agreement ratio and Kappa statistic were provided by MOOSES. Kappa coefficients (Cohen, 1960) were also calculated for duration variables. Sessions during which engagement measures were (a) not coded by either observer or (b) coded by both observers for the total session duration were not included in these calculations, as kappa is undefined under both circumstances. Mean kappa coefficients ranged from 0.919 (engaged consisted) to 0.966 (not engaged).

P3 Research Design and Data Analyses Procedures

With the use of experimental design, as outlined by Shadish, Cook, and Campbell (2002) and Odom et al. (2005), students were randomly assigned to each of two conditions. As viewed in figure 2, participant conditions included: (a) peer-mediated interventions or (b) individual paraprofessional/special educator support. A randomized controlled trial with pre, post, and follow-up measures were used to evaluate the efficacy of peer support interventions on the social and academic outcomes of students with disabilities**.**

A two-level hierarchical linear model (HLM; Raudenbush & Bryke, 2002) was applied to each studied outcome collapsing across cohorts with each school. Variables that were less amenable to linear modeling were fit using generalized linear models. Effect sizes and variance were also examined. Statistical assumptions were tested for proper model fitting. For more information on the P3 project, see paper published by Carter, Asmus, Moss, Biggs, et al. (2016). With background of the P3 project at hand, the present study is described next.

Present Study

In the present study, analyses of P3 data from Fall 2011 through Fall 2013 were conducted to evaluate the impact of peer-mediated interventions on high school students with autism spectrum disorders and/or significant developmental disabilities. Specifically, the focus of this study is on understanding whether peer support and peer network interventions increased social communication behaviors (initiations and responses) in students with autism spectrum disorders (i.e. ASD+DD) and how that compared to students with DD but no ASD (i.e. DD) and then how close in approximation to TD peers were the SCB of students with ASD+DD by treatment condition. Intervention outcomes were evaluated using direct observation procedures and examination of information from informal and formal questionnaires. Additionally, a quantitative and descriptive approach to data analysis were employed. The goal of this study was to contribute to the evaluation and refinement of peer support and peer network interventions by providing information that will assist school staff in determining which type of peer-mediated intervention (peer support, peer network) would be *most* successful (as in enhance social behaviors) for students with severe developmental disabilities with and without ASD.

Participants

The research sample was a subset of participants from P3. Seventy students with severe developmental disability with ASD were included in this study. All participants were receiving special education services under the primary (n=65) or secondary disability (n=5) categories of autism as defined by IDEA (2004) and the Wisconsin and Tennessee state eligibility criteria. Although there is variability in the language used by each state, the criteria for autism in Wisconsin and Tennessee are conceptually alike (see Appendix E for the Wisconsin State eligibility checklist and Appendix F for the Tennessee checklist). Participants were enrolled in P3 during the following five semesters: Fall 2011, Spring 2012, Fall 2012, Spring 2013, Fall 2013.

Participants were recruited from 23 high schools from 12 districts in rural and suburban areas of WI and TN. The majority of participants were drawn from sites in WI. Students were enrolled in courses that addressed academic and elective topics. For ease of understanding, courses were grouped together by broad subjects (e.g., Band, Orchestra, Chorus, and Dance were grouped together in the “Music” category). Table 1 shows participants by disability and treatment condition. Tables 2 and 3 present in-depth demographic information for DD with ASD, DD, and TD groups. Table 4 and 5 present IEP information for ASD and DD participants as found by Carter, Asmus, Lequia, Vincent, and Lyons (in press).

Present Study Conditions

Using the P3 randomized controlled trial design, pre and post measures were used to investigate how peer-mediated interventions (peer support and peer network) as compared to treatment as usual (i.e., paraprofessional support) impact social communication behaviors in high school students with severe developmental disability and autism spectrum disorders and severe developmental disability. In the P3 design, a variety of measures were administered to describe students with severe developmental disabilities (with and without ASD) and to assess intervention outcomes. Direct observations and informant measures of (a) peer interactions and class participation, (b) skill assessments that target autism symptoms in students, (c) student classroom social status, (d) student educational progress, (e) student peer networks and friendships, (f) student school participation, and (h) community participation were collected at pre-and post-intervention. Appendix D presents an overview of intervention fidelity components for peer-mediated interventions: peer support and peer network.

Peer support intervention. The peer support intervention package that was used in this study was developed and manualized by Carter and colleagues (2009). This intervention condition involved school staff establishing peer support arrangements (Carter, Cushing, & Kennedy, 2009) to be implemented for focus students. This intervention involved multiple components: (a) facilitator training, (b) peer support planning, (c) initial peer partner training, and (d) direct peer support intervention. Following facilitator training, peer support arrangements were developed into a peer support plan, which included specific support strategies, such as modeling ways to interact, highlighting similarities, and teaching interaction skills that could be used throughout the class period (i.e., beginning, middle, end) and in a variety of instructional formats (e.g., whole group, lecture, small group, labs) to help students access learning and other expectations within the classroom. Each written support plan listed strategies appropriate for the focus student, peer partners, and facilitator (Carter et al., 2011) and was shared with the general and special education teacher (if not already part of the planning). Once initial peer partners were trained by facilitators, they changed seats to be in physical proximity with student with disability (ASD, DD). As the students worked together daily throughout the remainder of the semester (M = 8.4 weeks, SD = 2.4), *peer partners* (N=106) supported students academically (e.g., encouraging contributions to class and group discussion, sharing materials, collaborating on class assignments) and socially (e.g., conversing about school and other activities, modeling appropriate social skills, making introductions to other classmates) to participate in ordinary class activities, as outlined on a written support plan and/ or prompted by facilitators. Aside from peer partner involvement, normative *peer comparison* data was collected at the beginning of the semester and at the end of the semester. Observers selected peers who (a) did not have severe disabilities and (b) were in close enough proximity to allow for accurate observation. One peer was chosen for the first half of the class and a different peer was observed for the second half; observations were combined to form a class-length observation. Treatment fidelity was collected by P3 research staff from an Intervention Coach or a Peer Support Facilitator. Intervention fidelity was decided as sufficient when the facilitator supported peer partners and the student, and peer partners were in close proximity to the focus student during class. Peer partners also had to have interacted with the focus student in class or had to have assisted the focus student academically. See Appendix D for an overview of peer support intervention components as collected for treatment fidelity. Fidelity averaged 96.2% (SD = 11.4%) and 87.6% (SD = 16.5%) across participants based on facilitator and coach reports, respectively.

Peer network intervention. A manualized program described by Breen, Kennedy, and Haring (1991) and Hughes and Carter (2008) was used to guide the implementation of peer network interventions. This intervention condition involved establishing a group of three to six peers to comprise a social network for each focus student. Network meetings occurred outside of class time and lasted up to one semester. Peers exchanged social interactions and support with their fellow student with severe disabilities under the guidance of school staff who served as the facilitator (Carter et al., 2013; Gardner et al., 2014). This intervention involved multiple components: (a) facilitator training, (b) initial peer partner training, (c) peer network intervention, and (d) coaching. In contrast to peer support interventions, peer networks target social participation and school involvement. Peers without disabilities (peer partners N=192) were recruited to participate in individualized social groups that met throughout one semester. Normative peer comparison data was collected for the peer network condition (N=52). See Appendix D for an overview of peer network intervention components as collected for treatment fidelity. Fidelity was measured as adherence to the components of the intervention and was calculated by the number of components observed, divided by the total number of components required, multiplied by 100%. Fidelity averaged 95.9% (SD = 7.4%) across participants based on P3 research staff, respectively.

Comparison condition. For students assigned to the ‘‘treatment as usual’’ comparison condition, special education services were provided as reflected in their individualized educational programs. All students attended at least one general education class within which they received individually assigned support from a paraprofessional or special educator. No new peer-mediated interventions were introduced to these students and none were observed independent of involvement in the P3 project. Unlike the other intervention conditions, general education students were not targeted during this intervention condition (i.e. no normative peer comparison data).

Present Study Measures and Procedures

P3 used a variety of direct observation and informant measures to describe students with severe developmental disabilities and to assess intervention outcomes. These direct observation and informant measures, including (a) peer interactions and class participation, (b) skill assessments that summarize autism symptom severity, (c) classroom social status, (d) educational progress, (e) peer networks and friendships, (f) school participation, and (h) community participation were collected at pre-and post-intervention. While the various measures provide a wealth of information, the present study only includes information from measures that are relevant to the research questions (see Table 6). Appendix G presents an overview of P3 methodology including measures.

Classroom observations, as described earlier, were collected on the SCB of high school adolescents with ASD and DD and their typically developing classroom peers' within social and academic interactions. Within these instances, the type and form of social behaviors including initiations, responses, and behavioral topography (e.g., sign, facial, verbal) were collected. The specific procedures used for P3 were based on the work of Carter, Hughes, and colleagues (2005) and Carter, Sisco, and colleagues (2007, 2008). Table 5 presents an overview of observation codes used for observations. Refer to Appendix H for observational coding manual, which defines codes and definitions.

Social communication behaviors. P3 research staff conducted three classroom observations for each participant in order to quantify participants' peer interactions at baseline. All observations were completed within inclusive classrooms. All social exchanges were coded between the focus student and other classmates without disabilities as social interactive behaviors. Social interactive behaviors included any verbal or nonverbal behavior with clear communicative intent produced by the focus student to another student without severe disabilities (or vice versa). Social initiations and responses were also coded according to topic (i.e., task- or social-related), as well as source and recipient (i.e., focus student, peer support, classmates without disabilities). These classes of categories were similarly used in Christianson (2009) and Horner (2012) to document prosocial behaviors among school-aged students with ASD. Like Christianson (2009) and Horner (2012) other studies have documented the use of similar social behavior categories of interest in preschool children (Doll, 1994; Tremblay et al., 1981), but only a paucity of studies have documented their use with school-aged students relative to intervention efficacy (Conroy, Boyd, Asmus, & Madera, 2007) and a very small subset has focused on high school students.

With the use of the P3 research, the present study sought to advance past research focusing on school-aged students with ASD. To do so, the current study conducted an in-depth exploratory study to further characterize social communication behaviors (initiations, responses, reciprocity, quality) among high school students with DD *and* ASD and those with similar characteristics (DD) while engaged in different interventions and finally compared to peer comparisons (without ASD and without DD). This information may yield important information about intervention components that naturally promote social communication behaviors between and within these groups of students.

Similar to earlier research, social initiation and responses were coded as task-related when they addressed activities, materials, or expectations related to the current class; all other interactive behaviors were considered social-related. Social interactive behaviors were coded as initiations if they were preceded by at least 5 seconds without an interaction, they reflected a change from task-to social-related topic, or they occurred with a new peer; all other interactive behaviors were coded as responses. All initiations and responses between the focus student and peers, whereas focus student contributions refers to only those initiations and responses made by the focus student. The number of different peers interacting with the focus student during each class period was tabulated. Observers collected frequency counts of target students' initiations and responses using touchscreen handheld computers. See Table 7 for an overview of observation codes. Refer to Appendix H for observational coding manual with defines codes and definitions.

Classroom engagement. Classroom engagement of students with disabilities was measured using duration recording via handheld computers. Students with disabilities were coded as *engaged in consistent activities* when they were actively involved in or attending to instruction or classroom activities that were aligned with those provided by the general education teacher to the majority of the class. Students with disabilities were coded as *engaged in inconsistent activities* when actively involved in or attending to instruction or activities that were not aligned with those provided to the majority of the class, but were assigned by a paraprofessional or teacher. Students were *not engaged* when not attending to any activities or materials related to instruction or when there was no instruction.

Environmental features and social quality. Observers completed a narrative form (see Appendix I) after each observation to (a) indicate the number of peers with whom the student interacted, (b) rate the interaction quality, and (c) record support behaviors provided by paraprofessionals and peers. Classroom features were also documented on narrative forms (e.g., curricular activities, number of students and adults in the classroom).

Instructional format. Instructional format was coded as a duration variable and converted it to proportion of total class time. Formats included *large group*, which occurred when seven or more students in addition to the focus student were receiving instruction from a single educator; *small group*, which occurred when the focus student worked in a group with between two and six other classmates; *independent work*, which occurred when the focus student primarily worked independently on assignments; *one-to-one peer*, which occurred when the focus student primarily worked with only one other peer; *one-to-one adult*, which occurred when the focus student primarily worked with an adult; and *no instruction*, which occurred when the focus student was not assigned any tasks, or was in a prolonged state of transition between tasks.

Data Analysis

Overview. A quantitative approach was used to examine each research question. In addition, exploratory and descriptive approaches were used to examine group and individual characteristics and social behavior topography pre and post observations among the intervention approaches (peer-mediated, treatment as usual). Prior to the present study analyses, direct observations were collected and analyzed using MOOSES software packages. Participant data were stored in a locked filing cabinet that was maintained within a secure office. All data were organized in SPSS.

Proposed preliminary analyses. Prior to main analyses for research questions 1 to 3, missing item values and data were identified, potential outliers were investigated, distributions of scores and data were examined through visual inspection methods (e.g., box plot, residual plots, histograms) and assumption testing (e.g., normality, homogeneity), and potential covariates/control variables were considered. Means and standard deviations were examined for each independent variable and dependent variable.

In order to assist with the analysis of research question one, a change (gain) score analysis was conducted, which comprised of: (a) computing the change scores between pre-and post-observation variables within participants (POST_Score (μ) – PRE_Score (μ)), and then (b) analyzing those change scores in an analysis of variance with treatment as the between-subjects factor. Correlations were also employed between pretest and posttest scores within the treatment groups in order to provide an estimate of the consistency of the treatment effect across participants. Means and standard errors were examined as well as inspection of the 95% to (at times 97.5%) confidence intervals around each mean of the pre-and post-observations according to participant (disability) group. While primary analyses assume normality, normality and homogeneity of variance assumptions were assessed by examining histograms and the skewness and kurtosis for each of the dependent variables. Robustness checks were also carried out to examine data that appeared suspect (Q-Q plots, Levene's test, Shapiro-Wilks test).

As with research question one, descriptive statistics were carried out for research question two to gain a better understanding of the variables. Mean, standard error, range, and correlations were conducted among potential covariates.

For research question three, descriptive statistics were also computed for variables (referred to as indicators) of social interaction quality. As with research question one, average change (gain) scores were computed for the social interaction quality indicators examining between pre-and post-observations. While primary analyses assume normality, normality and homogeneity of variance assumptions were assessed by examining histograms and the skewness and kurtosis for each of the dependent variables. Robustness checks were also carried out to examine data that appeared suspect (Q-Q plots, Levene's test, Shapiro-Wilks test).

Proposed main analyses. A 2 x 3 two-way ANOVA was used with Intervention Group (PS, PN, TAU) as the between-subjects factor and Participant Group (ASD+DD, DD) as the within-subjects factor. The rejection level for all analyses was set at $p = .05$; trending significance is reported as $p > .05$ to $p > .10$. Change (gain) scores from pre-to post-observations were used to conduct ANOVAs. When an interaction term was found, simple main effects were attempted. Post-hoc analyses were examined for main and interaction effects. Pairwise comparisons were run as relevant for each simple main and/or interaction effect with reported 95% (at times 97.5% or lower) confidence intervals and Bonferroni-adjusted p-values. Aside from these inferential statistics reported, information is summarized as pertaining to individual changes and patterns (mean, standard deviations, ranges).

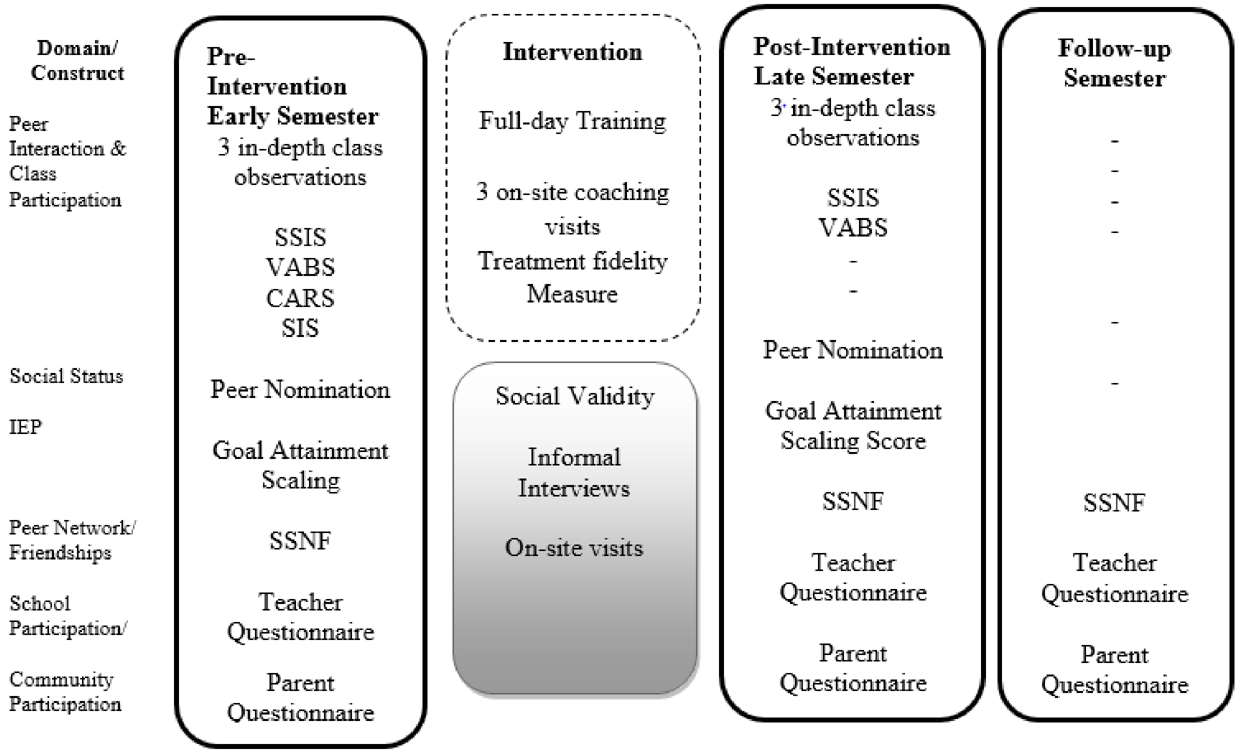

Figure 1. Overview of P3 Measures according to domain and data collection timeline.

SOURCE: Carter, E. W., & Asmus, J. A. (2009). Peer support & peer network interventions to improve peer relationships and school engagement. Madison, WI: University of Wisconsin-Madison.

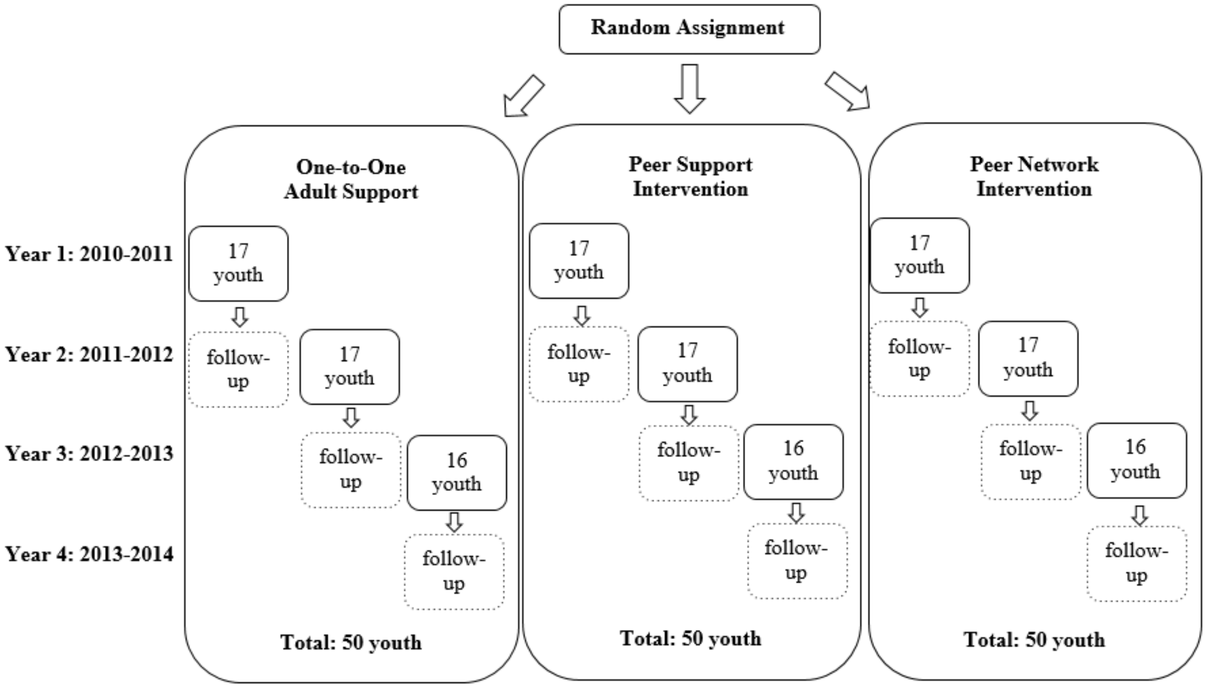

Figure 2. P3 Design overview and timeline.

SOURCE: Carter, E. W., & Asmus, J. A. (2009). Peer support & peer network interventions to improve peer relationships and school engagement. Madison, WI: University of Wisconsin-Madison. Note. Sample size numbers varied from the N=50.

Table 1

Overview of Participation by Treatment Condition and Disability

	Treatment Condition			
	PS	PN	TAU	Total N
Participant Disability[1]				
ASD with DD	22 (43.1%)	25 (53.1%)	20 (71.4%)	67 (45.9%)
Significant DD	29 (56.9%)	22 (46.9%)	28 (28.6%)	80 (54.1%)
Total N	51	47	48	146

Note. Table summarizes students with disabilities only. ASD with DD = Autism Spectrum Disorder with Development Disability; Significant DD = Significant Developmental Disability;

PS = Peer Support; PN = Peer Network; TAU = Treatment as Usual (referring to Special Education Model). [1]Frequency (percentage).

Table 2

Overview of Students with Disabilities Participant Demographics by Treatment Condition

	Treatment Condition		
	Peer Support (*n* = 51) n (%)	Peer Network (*n*= 47) n (%)	TAU (*n* = 48) n (%)
Gender			
Female	21 (41.2%)	17 (36.2%)	15 (31.2%)
Male	30 (58.8%)	30 (63.8%)	33 (68.8%)
Grade Level			
Ninth	9 (17.6%)	11 (23.4%)	9 (18.8%)
Tenth	19 (37.3%)	18 (38.3%)	19 (39.6%)
Eleventh	11 (21.6%)	10 (21.3%)	15 (31.3%)
Twelfth	12 (23.5%)	8 (17.0%)	5 (10.4%)
Ethnicity			
European American	34 (66.7%)	34 (72.3%)	32 (66.7%)
African American	7 (13.7 %)	6 (12.8%)	8 (16.7%)
Asian American	4 (7.8%)	1 (2.1%)	3 (6.3%)
Native or Alaskan American	2 (3.9%)	0 (0.0%)	1 (2.1%)
Hispanic American	0 (0.0%)	4 (8.5%)	0 (0.0%)
Other	3 (5.9%)	2 (4.3%)	3 (6.3%)
Eligible for free/reduced-price meals			
Yes	14 (27.5%)	10 (21.3%)	18 (37.5%)
No	36 (70.6%)	37 (78.7%)	29 (60.4%)
I don't know	1 (2.0%)	0 (0.0%)	1 (2.1%)
Primary disability eligibility category			
Cognitive/intellectual disability	29 (56.9%)	21 (44.7%)	24 (50.0%)
Autism/ASD	20 (39.2%)	24 (51.1%)	19 (39.6%)
Emotional disturbance/EBD	0 (0.0%)	1 (2.1%)	1 (2.1%)
Multiple disabilities	1 (2.0%)	0 (0.0%)	1 (2.1%)
Other health impairment	1 (2.0%)	1 (2.1%)	1 (2.1%)
Orthopedic impairment	0 (0.0%)	0 (0.0%)	1 (2.1%)
Visual impairment	0 (0.0%)	0 (0.0%)	1 (2.1%)
Secondary disability eligibility category			
Speech/language impairment	15 (29.4%)	18 (38.3%)	11 (22.9%)
Cognitive/intellectual disability	6 (11.8%)	3 (6.4%)	1 (2.1%)
Orthopedic impairment	5 (9.8%)	1 (2.1%)	1 (2.1%)
Other health impairment	2 (3.9%)	5 (10.6%)	3 (6.3%)
Autism/ASD	2 (3.9%)	1 (2.1%)	2 (4.2%)
Hearing impairment	2 (3.89)	0 (0.0%)	1 (2.1%)
Visual impairment	1 (2.0%)	0 (0.0%)	2 (4.2%)
Emotional disturbance/EBD	0 (0.0%)	1 (2.1%)	0 (0.0%)
Multiple Disabilities	0 (0.0%)	0 (0.0%)	1 (2.1%)
Traumatic brain injury	0 (0.0%)	0 (0.0%)	1 (2.1%)
Other	1 (2.0%)	1 (2.1%)	0 (0.0%)

None	11 (21.6%)	11 (23.4%)	13 (27.1%)
Participation in state assessments			
Eligible for state alternate assessment in past three years	47 (92.2%)	39 (83.0%)	39 (81.3%)
Participates in assessment with accommodations	3 (5.9%)	8 (17.0%)	6 (12.5%)
Unclear	2 (2.0%)	0 (0.0%)	3 (6.3%)
Receives extended school year services			
Yes	12 (23.5%)	9 (19.1%)	14 (29.2%)
No	33 (64.7%)	36 (76.6%)	27 (56.3%)
I Don’t Know	6 (11.8%)	2 (4.3%)	7 (14.6%)
Student is verbal	49 (96.1 %)	40 (85.1%)	46 (95.8%)
Student was observed in an academic class	22 (43.1%)	16 (34.0%)	18 (37.5%)
Discipline of class students were observed in			
Art	8 (15.7%)	13 (27.7%)	6 (12.5%)
Science	10 (19.6%)	5 (10.6%)	9 (18.8%)
Language Arts	5 (9.8%)	6 (12.8%)	6 (12.5%)
Food	5 (9.8%)	5 (10.6%)	6 (12.5%)
Chorus	3 (5.9%)	1 (2.1%)	5 (10.4%)
Social Studies	3 (5.9%)	3 (6.4%)	3 (6.3%)
Digital Arts	5 (9.8%)	1 (2.1%)	3 (6.3%)
Mathematics	2 (3.9%)	0 (0.0%)	1 (2.1%)
Health & Wellness	0 (0.0%)	4 (8.5%)	2 (4.2%)
Computer Technology	0 (0.0%)	1 (2.1%)	2 (4.2%)
Band	0 (0.0%)	2 (4.3%)	1 (2.1%)
Dance	2 (3.9%)	0 (0.0%)	1 (2.1%)
Theatre	0 (0.0%)	1 (2.1%)	0 (0.0%)
Other	8 (15.7%)	5 (10.6%)	3 (6.3%)
Site			
Vanderbilt	17 (33.3%)	13 (27.7%)	16 (33.3%)
Wisconsin	34 (66.7%)	34 (72.3%)	32 (66.7%)
Participating Semester			
Fall 2011	12 (23.5%)	6 (12.8%)	3 (6.3%)
Spring 2012	10 (19.6%)	13 (27.7%)	14 (29.2%)
Fall 2012	13 (25.5%)	8 (17.0%)	12 (25.0%)
Spring 2013	11 (21.6%)	8 (17.0%)	15 (31.3%)
Fall 2013	5 (9.8%)	12 (25.5%)	4 (8.3%)
High school attended			
HS Site 1	0 (0.0%)	1 (2.1%)	0 (0.0%)
HS Site 2	2 (3.9%)	1 (2.1%)	5 (10.4%)
HS Site 3	2 (3.9%)	1 (2.1%)	3 (6.3%)
HS Site 4	3 (5.9%)	2 (4.3%)	1 (2.1%)
HS Site 5	2 (3.9%)	1 (2.1%)	2 (4.2%)
HS Site 6	2 (3.9%)	1 (2.1%)	1 (2.1%)
HS Site 7	2 (3.9%)	1 (2.1%)	3 (6.3%)
HS Site 8	0 (0.0%)	1 (2.1%)	0 (0.0%)
HS Site 9	3 (5.9%)	2 (4.3%)	1 (2.1%)
HS Site 10	3 (5.9%)	4 (8.5%)	2 (4.2%)
HS Site 11	2 (3.9%)	1 (2.1%)	2 (4.2%)
HS Site 12	2 (3.9%)	4 (8.5%)	3 (6.3%)
HS Site 13	8 (15.7%)	8 (17.0%)	3 (6.3%)
HS Site 14	2 (3.9%)	3 (6.4%)	2 (4.2%)
HS Site 15	2 (3.9%)	0 (0.0%)	1 (2.1%)

HS Site 16	4 (7.8%)	3 (6.4%)	2 (4.2%)
HS Site 17	1 (2.0%)	2 (4.3%)	0 (0.0%)
HS Site 18	2 (3.9%)	2 (4.3%)	3 (6.3%)
HS Site 19	0 (0.0%)	0 (0.0%)	1 (2.1%)
HS Site 20	1 (2.0%)	1 (2.1%)	2 (4.2%)
HS Site 21	3 (5.9%)	4 (8.5%)	4 (8.3%)
HS Site 22	0 (0.0%)	3 (6.4%)	1 (2.1%)
HS Site 23	5 (9.8%)	1 (2.1%)	6 (12.5%)
CARS2-ST [b] Severity Groups	(n = 22)	(n = 26)	(n = 21)
Minimal to no symptoms of ASD	2 (9.1%)	6 (23.1%)	5 (23.8%)
Mild to moderate symptoms of ASD	6 (27.3%)	11 (42.3%)	14 (66.7%)
Severe symptoms of ASD	14 (63.3%)	9 (34.6%)	2 (9.5%)
CARS2-ST [b]	M (SD)	M (SD)	M (SD)
Total raw score	35.50 (6.60)	34.27 (8.17)	30.38 (6.10)
T-score	48.50 (9.16)	47.88 (9.18)	43.14 (7.82)
Percentile ranking	47.05 (24.20)	41.98 (27.82)	27.48 (19.78)

Note. Table summarizes participants with disabilities only. ASD = Autism Spectrum Disorder; TAU = Treatment as Usual (referring to Special Education Model). TN HS Site = Tennessee High School Site; WI HS Site = Wisconsin High School Site; CARS2-ST = Childhood Autism Rating Scale, 2nd ed. (Schopler, Van Bourgondien, Wellman, & Love, 2010); SSIS = Social Skills Intervention System (Gresham & Elliot, 2008); Vineland-II = Vineland Adaptive Behavior Scales-Second Edition (Sparrow, Cicchetti, & Balla, 2005).

[1] Frequency (percentage). [b] Mean (standard deviation).

Table 3.

Overview of TD participants by Treatment Condition

	Typically Developing Peer Partners	
	Peer Network (*N* = 192)	Peer Support (N=106)
Gender[1]		
Female	132 (68.8%)	33 (12.3%)
Male	60 (31.3%)	73 (68.9%)
Grade level[1]		
Ninth	31 (16.1%)	30 (28.3%)
Tenth	46 (24.0%)	23 (21.7%)
Eleventh	56 (29.2%)	23 (21.7%
Twelfth	58 (30.2%)	30 (28.3%)
Missing	1 (0.5%)	
Race/ethnicity[1]		
European American	140 (72.9%)	81 (76.4%)
African American	21 (10.9%)	13 (12.3%)
Asian American	9 (4.7%)	4 (3.8%)
Native or Alaskan American	1 (0.5%)	1 (0.9%)
Hispanic or Latino/a	10 (5.2%)	4 (3.8%)
Other or multiple	9 (4.7%)	3 (2.8%)
Missing	2 (1.0%)	--

Note. [1]Frequency (percentage).

Table 4

Overview of Students with Disabilities current IEP level of performance and related services

Variable	Total (*N* = 150)	DD (*N* = 77)	ASD+DD (*N* = 73)
Age (at last IEP meeting)	15.8 (1.3)	16.0 (1.4)	15.6 (1.1)
Grade level (at last IEP meeting)			
Before high school	6 (4.0%)	2 (2.6%)	4 (5.5%)
Ninth	41 (27.3%)	19 (24.7%)	22 (30.1%)
Tenth	54 (36.0%)	29 (37.7%)	25 (34.2%)
Eleventh	35 (23.3%)	18 (23.4%)	17 (23.3%)
Twelfth	14 (9.3%)	9 (11.7%)	5 (6.8%)
Number of annual goals	5.5 (1.8)	5.3 (1.9)	5.7 (1.7)
Number of objectives	14.4 (9.1)	15.2 (8.9)	13.5 (9.2)
Student invited			
Yes	85 (56.7%)	45 (58.4%)	40 (54.8%)
No	9 (6.0%)	6 (7.8%)	3 (4.1%)
Not indicated	56 (37.3%)	26 (33.8%)	30 (41.1%)

Student attended			
Yes	71 (47.3%)	42 (54.5%)	29 (39.7%)
No	36 (24.0%)	15 (19.5%)	21 (28.8%)
Not indicated	43 (28.7%)	20 (26.0%)	23 (31.5%)
Other IEP meeting attendees			
Special education	97 (64.7%)	50 (64.9%)	47 (64.4%)
General education	88 (58.7%)	43 (55.8%)	45 (61.6%)
LEA representative	87 (58.0%)	46 (59.7%)	41 (56.2%)
Parent(s)	85 (56.7%)	47 (61.0%)	38 (52.1%)
Other	85 (56.7%)	42 (54.5%)	43 (58.9%)
Not indicated	53 (35.3%)	27 (35.1%)	26 (35.6%)
Related services			
Transition/vocational	139 (92.7%)	74 (96.1%)	65 (89.0%)
Speech therapy	94 (62.7%)	40 (51.9%)	54 (74.0%)
Occupational therapy	64 (42.7%)	27 (35.1%)	37 (50.7%)
Physical therapy	33 (22.0%)	20 (26.0%)	13 (17.8%)
Frequency of related services (min/wk)			
Transition/vocational	837.5 (731.4)	836.1 (641.0)	839.4 (855.2)
Speech therapy	38.6 (24.6)	37.9 (29.7)	39.2 (19.9)
Occupational therapy	32.0 (54.9)	31.5 (54.8)	32.6 (56.1)
Physical therapy	25.5 (20.2)	25.7 (20.6)	25.3 (20.4)
Current levels of performance			
Academics	143 (95.3%)	73 (94.8%)	70 (95.9%)
Communication	129 (86.0%)	63 (81.8%)	66 (90.4%)
Social/emotional	110 (73.3%)	54 (70.1%)	56 (76.7%)
Overall quality	96 (64.0%)	56 (72.7%)	40 (54.8%)
General intelligence	76 (50.7%)	45 (58.4%)	31 (42.5%)
Health	82 (54.7%)	43 (55.8%)	39 (53.4%)

SOURCE: Carter, Asmus, Lequia, Vincent & Lyons (in press). Individualized Education Programs (IEPs) of High School Students with Severe Disabilities

Table 5

Overview of Students with Disabilities IEP Goals and/or Objectives in Relation to Selected Annual Goal Domains

Domain	Total (*N* = 150)	DD (*N* = 77)	ASD + DD (*N* = 73)
Cognitive/academics			
Explicitly addressed	124 (82.7%)	66 (85.7%)	58 (79.5%)
Incomplete	16 (10.7%)	7 (9.1%)	9 (12.3%)
Not addressed	10 (6.7%)	4 (5.2%)	6 (8.2%)
Postsecondary life			
Explicitly addressed	93 (62.0%)	49 (63.6%)	44 (60.3%)

Incomplete	34 (22.7%)	17 (22.1%)	17 (23.3%)
Not addressed	23 (15.3%)	11 (14.3%)	12 (16.4%)
Communication			
Explicitly addressed	93 (62.0%)	40 (51.9%)	53 (72.6%)
Incomplete	29 (19.3%)	16 (20.8%)	13 (17.8%)
Not addressed	28 (18.7%)	21 (27.3%)	7 (9.6%)
Social skills			
Explicitly addressed	67 (44.7%)	30 (39.0%)	37 (50.7%)
Incomplete	33 (22.0%)	21 (27.3%)	12 (16.4%)
Not addressed	50 (33.3%)	26 (33.8%)	24 (32.9%)
Organizational skills			
Explicitly addressed	45 (30.0%)	26 (33.8%)	19 (26.0%)
Incomplete	33 (22.0%)	15 (19.5%)	18 (24.7%)
Not addressed	72 (48.0%)	36 (46.8%)	36 (49.3%)
Fine/gross motor			
Explicitly addressed	30 (20.0%)	19 (24.7%)	11 (15.1%)
Incomplete	18 (12.0%)	5 (6.5%)	13 (17.8%)
Not addressed	102 (68.0%)	53 (68.8%)	49 (67.1%)
Functional communication system			
Explicitly addressed	24 (16.0%)	9 (11.7%)	15 (20.5%)
Incomplete	4 (2.7%)	0 (0.0%)	4 (5.5%)
Not addressed	3 (2.0%)	1 (1.3%)	2 (2.7%)
Not applicable	119 (79.3%)	67 (87.0%)	52 (71.2%)
Engagement			
Explicitly addressed	11 (7.3%)	4 (5.2%)	7 (9.6%)
Incomplete	37 (24.7%)	16 (20.8%)	21 (28.8%)
Not addressed	102 (68.0%)	57 (74.0%)	45 (61.6%)
Problem behaviors			
Explicitly addressed	5 (3.3%)	0 (0.0%)	5 (6.8%)
Incomplete	11 (7.3%)	3 (3.9%)	8 (11.0%)
Not addressed	134 (89.3%)	74 (96.1%)	60 (82.2%)

SOURCE: Carter, Asmus, Lequia, Vincent & Lyons (in press). Individualized Education Programs (IEPs) of High School Students with Severe Disabilities.

Table 6

Overview of Present Study Measures and Data Collection Procedures Selected from P3

Constructs and Measures	Pre-intervention	Post-intervention	Follow-Up Semesters
Peer interaction and class participation			
3 in-depth class observations	◉	◉	
Narrative Form	◉	◉	
Skill assessments			
SSIS	◉	◉	
Vineland-II	◉	◉	
CARS2		◉	
SIS	◉		
Social Status			
Teacher ratings	■	■	
Educational progress			
Goal Attainment Scaling	■	■	
Peer networks/friendships			
SSNF	■	■	■
School participation			
Teacher questionnaire	◉	◉	■
Community participation			
Parent questionnaire	◉	◉	■

Note. Components of present study are circled. SSIS = *Social Skills Improvement System* (Gresham & Elliott, 2008). Vineland-II = *Vineland Adaptive Behavior Scale, Second Edition* (Sparrow, Cicchetti, & Balla, 2006). CARS2 = *Childhood Autism Rating Scale, Second Edition* (Schopler, Reichler, DeVillis, & Daly, 2010). SIS = *Support Intensity Scale* (SIS; Thompson et al., 2009). SSNF = *School-Based Social Network Form* (Kennedy, 1991).

Table 7.

Overview of Social Communication Categories and Sub-categories Used for Observations

Level 1: Focus Student and Peer Behaviors		
Focus Student and Peer Behaviors	▪ SWD Initiation- Task ▪ SWD Response- Task ▪ SWD Initiation- Social ▪ SWD Response- Social ▪ Peer Initiation- Task ▪ Peer Response- Task ▪ Peer Initiation- Social ▪ Peer Response- Social ▪ Peer Support Initiation- Task ▪ Peer Support Response-Task ▪ Peer Support Initiation- Social ▪ Peer Support Response- Social	Frequency
Level 2: Instructional Format		
Instructional Format/Peer Group Size (mutually exclusive)	▪ Large Group ▪ Small Group ▪ Independent work ▪ 1:1 Peer ▪ 1:1 Adult ▪ No Instruction ▪ Gone	Duration
Level 3: Proximity		
Proximity (*not* mutually exclusive)	▪ To peer supports (for post-intervention) ▪ To peers without disabilities ▪ To direct support personnel (special education assistant or teacher)	Duration
Level 4: Academic Engagement		
Academic Engagement (mutually exclusive)	▪ Engaged in consistent instructional activities ▪ Engaged in inconsistent instructional activities ▪ Not engaged	Duration

Note. SWD = Student with Disability. The present study focused on summarizing Level 1: Focus Student and Peer Behaviors observational data.

CHAPTER 4

Results

The present study investigated the social communication behaviors among adolescents with severe developmental disabilities with and without ASD and their typically developing peers. More specifically, the goals were to: (a) systematically explore and describe the social communication (e.g., verbal and gestural initiations and responses) behaviors among adolescents with severe developmental disabilities with and without ASD and typically developing (TD) adolescents, (b) pinpoint group changes in social communication behaviors relative to treatment conditions (i.e. peer mediated vs. TAU), (c) examine how student variables (communication, severity, gender, inclusion) relate to SCB group changes, and (d) explore and describe social interaction quality differences among and between the groups and at pretreatment to posttreatment. To achieve these stated goals, the following chapter reports the social communication behavioral outcomes yielded from direct observations of the three participant groups (ASD, DD, and TD peers), as afforded by the P3 research design. TD peers were observed within the normal classroom environment at pre-observation.

Chapter Overview

The results of the present study are summarized according to research question. Descriptive and inferential analyses are presented. The chapter begins with addressing research question one. For research question one, a descriptive analysis is presented that narrates the mean pre-and post-observational outcomes per disability (IV), per treatment condition (IV) as related to a specific social communication behavior outcome measure (DV; i.e. gain score). A description of how scores have changed from pre-to post-observation, as seen through a gain score, is explained. Further, inferential analysis are conducted and presented. Upon testing assumptions, data transformations as warranted are reviewed, and test assumptions are re-tested and presented thereafter. Descriptive statistics are presented in tables.

Treatment fidelity results are available for review through Carter, et al. (2016) and Asmus et al. (2017). Within these studies, descriptive statistics were summarized for (a) all measures by group and data collection wave, (b) intervention fidelity measures, (c) social validity findings, and (d) generalization and maintenance data.

Research Questions Analyzed

Research Question 1: How do social communication behaviors (initiations, responses) compare and contrast among (a) high school students with severe developmental disabilities with and without ASD, and (b) high school students with typical development at pre-and post-observation in general education classes by treatment condition? Are there significant differences found in disability groups by treatment condition and across treatment conditions at post-observation?

Overview. With respect to research question one, the present study investigated how being involved in a particular treatment condition (i.e. PS, PN, TAU) contributed to social communication behaviors from pre-treatment to post-treatment, but also how that effect might differ across the disability groups (DD with ASD, DD). Since there are different types of social communication behaviors that individuals can exhibit or rarely exhibit, social communication behaviors were investigated separately as well as pooled. As a result, each social communication behavior outcome measure is analyzed and summarized separately. Social communication behavior outcome measures are defined as gain (i.e. change, difference) scores, which here is defined as the difference between a social communication behavior obtained for a participant from the observations at pre-treatment and at the observations at post-treatment. As discussed in the methods chapter, three different observations were collected at pre-treatment and three different observations were collected at post-treatment. Due to potential confounds being introduced as observations are collected on three different occasions, sometimes differing of length and times, at pre-treatment and on three different occasions at post-treatment, pre-and post-observations were averaged as reflected as: pre-observation (μ) = $\text{pre}_{(1)} + \text{pre}_{(2)} + \text{pre}_{(3)}$; post-observation (μ) = $\text{post}_{(1)} + \text{post}_{(2)} + \text{post}_{(3)}$. After pre-and post-observations were separately averaged, a gain score was computed as such: treatment gain score = post (μ) – pretest (μ). When computing a gain score in this manner a positive gain score indicates that the post-observation (social communication behavior outcome) score is greater than the pre-observation (social communication behavior outcome) score, a negative gain score indicates that the post-observation (social communication behavior outcome) score was less than the pre-observation (social communication behavior outcome) score. In the present study the dependent variable is a social communication behavior outcome gain score so it would be expected that successful treatment would lead to higher social communication behaviors being observed at post-treatment. Thus, the gain score would be positive in this instance. The gain score controls for individual differences in pretest scores by measuring the post-observation score relative to each participant's pre-observation score. But, a gain score analysis does not control for the differences in pre-observation social communication behavior outcome scores between the treatment groups (DD with ASD and DD). After mean gain scores were commuted, descriptive statistics were commuted for each dependent variable (social communication behavior outcome score); these results are summarized below per dependent variable investigated.

Descriptive Statistics

Sixty seven high school students with DD with ASD participated and 80 students with significant DD participated in this study. Participants were randomly assigned to one of three conditions: Peer Support (n =51), Peer Network (n = 47), and TAU (n =48). Students attended 21 high schools within 12 districts across two states—Tennessee (n = 29 students) and Wisconsin (n = 66 students). Student enrollment at each of the high schools averaged 1,397 (SD = 458). Average race/ethnicity of students across schools was 70.4% European American (range, 22.4%–94.4%), 15.2% African American (range, 1.3%–57.2%), 7.9% Hispanic/ Latino/a (range, 1.5%–18.9%), 3.8% Asian American (range, 0%–10.5%), 0.2% American Indian (range, 0%–0.6%), and 3.6% multiple races (range, 0%-9.8%). The percentage of students eligible for free or reduced-price meals ranged from 5.6% to 63.1% (M = 28.7%).

Observations and interventions focused on a single general education classroom for each student with disability (DD and DD with ASD). According to teachers of the **Peer Support** condition, students were enrolled in an average of 3.3 (SD = 1.7; range = 1–7) general education classes during the semester they entered the study (M = 3.1 for Peer Support condition and M = 3.5 for the comparison condition). The student participants were observed in inclusive classrooms on six occasions (three times at pre-intervention and three times at post-intervention). Forty students (40.4%) in core academic classes (i.e., math, science, language arts, social studies) and 59 students (59.5%) in elective and related arts classes (e.g., music, chorus, band, art, theater, dance, digital arts, computer technology, wellness, culinary arts) were observed.

For the **Peer Network** condition, the implementation setting varied widely, including during lunch periods (85.1% of students), during advisory periods (6.4%), after school (4.3%), before lunch (2.1%), and alternating between lunch and after school (2.1%). Peer network meetings were typically held in open classrooms (59.6%), although some were held in the cafeteria (4.3%), staff offices (12.7%), conference rooms (10.6%), the gym (2.1%), the school coffee shop (2.1%), or a variety of locations (8.5%), average length of these meetings was 56.1 min (SD = 18.7) and the average number of peers present was 3.5 students (SD = 0.9). Refer to methods chapter for further information about participants and settings.

Descriptive Analysis of SCB by Disability and Treatment Condition

Adolescents with severe disabilities by treatment condition. As reported in Table 1, there were 19 DD with ASD adolescents receiving the **Peer Support** treatment condition. At pre-treatment DD with ASD participants had a mean of 0.579 task-related initiations that ranged from 0.00 to 4.67 observed task-related initiations. At post-treatment, they had a mean of 2.351 task-related initiations that ranged from 0.00 to 18.33 task-related initiations. The average mean pre-to post-observation gain score for task-related initiations was 1.772, with a range of 0.00 to 17.33 observed task-related initiations.

Table 1. *DD with ASD Task-Related Initiations* for *Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Task Related Initiations	19	4.67	.00	4.67	.5789	1.14849
Post Task-Related Initiations	19	18.33	.00	18.33	2.3509	4.29107
Change Score	19	17.33	.00	17.33	1.7719	3.92216

As reported in Table 2, there were 24 DD with ASD adolescents receiving the **Peer Network** treatment condition. At pre-treatment DD with ASD participants had a mean of 1.417 task-related initiations that ranged from 0.00 to 9.33 observed task-related initiations. At post-treatment, they had a mean of 1.514 task-related initiations that ranged from 0.00 to 11.00 task-related initiations. The average mean pre-to post-observation gain score for task-related initiations was .097, with a range of -5.33 to 6.67 observed task-related initiations.

Table 2. *DD with ASD Task-Related Initiations* for *Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Task Related Initiations	24	9.33	.00	9.33	1.4167	2.76669
Post Task-Related Initiations	24	11.00	.00	11.00	1.5139	2.70441
Change Score	24	12.00	-5.33	6.67	.0972	2.42467

There were 19 DD with ASD adolescents receiving the **TAU** condition. At pre-treatment DD with ASD participants within this condition had a mean of 1.053 task-related initiations that ranged from 0.00 to 14.67 observed task-related initiations. At post-treatment, they had a mean of .719 task-related initiations that ranged from 0.00 to 7.33 task-related initiations. The average mean pre-to post-observation gain score for task-related initiations was -0.333, with a range of -14.00 to 6.00 observed task-related initiations.

Table 3. *DD with ASD Task-Related Initiations* for *TAU Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Task Related Initiations	19	14.67	.00	14.67	1.0526	3.35044
Post Task-Related Initiations	19	7.33	.00	7.33	.7193	1.96658
Change Score	19	20.00	-14.00	6.00	-.3333	3.63284

There were 29 DD adolescents receiving the **Peer Support** treatment condition. At pre-treatment DD participants had a mean of 1.218 task-related initiations that ranged from 0.00 to 13.00 observed task-related initiations. At post-treatment, they had a mean of 3.247 task-related initiations that ranged from 0.00 to 16.00 task-related initiations. The average mean pre-to post-observation gain score for task-related initiations was 2.029, with a range of -4.00 to 14.33 observed task-related initiations.

Table 4. *DD Task-Related Initiations* for *Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Task Related Initiations	29	13.00	.00	13.00	1.2184	2.64766
Post Task-Related Initiations	29	16.00	.00	16.00	3.2471	4.36541
Change Score	29	18.33	-4.00	14.33	2.0287	3.67425

There were 21 DD adolescents receiving the **Peer Network** treatment condition. At pre-treatment DD participants had a mean of 1.127 task-related initiations that ranged from 0.00 to 12.00 observed task-related initiations. At post-treatment, they had a mean of 1.476 task-related initiations that ranged from 0.00 to 11.00 task-related initiations. The average mean pre-to post-observation gain score for task-related initiations was 0.349, with a range of -7.33 to 9.00 observed task-related initiations.

Table 5. *DD Task-Related Initiations* for *Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Task Related Initiations	21	12.00	.00	12.00	1.1270	2.65513
Post Task-Related Initiations	21	11.00	.00	11.00	1.4762	2.65533
Change Score	21	16.33	-7.33	9.00	.3492	2.88959

Table 6 shows that there were 24 DD adolescents receiving the **TAU** condition. At pre-treatment DD participants had a mean of 1.875 task-related initiations that ranged from 0.00 to 9.33 observed task-related initiations. At post-treatment, they had a mean of 3.778 task-related initiations that ranged from 0.00 to 24.00 task-related initiations. The average mean pre-to post-observation gain score for task-related initiations was 1.903, with a range of -5.00 to 23.67 observed task-related initiations.

Table 6. *DD Task-Related Initiations* for *TAU Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Task Related Initiations	24	9.33	.00	9.33	1.8750	2.95344
Post Task-Related Initiations	24	24.00	.00	24.00	3.7778	6.83601
Change Score	24	28.67	-5.00	23.67	1.9028	5.68452

At pre-treatment, within the **Peer Support** condition, DD with ASD participants had a mean of 1.211 task-related **responses** that ranged from 0.00 to 13.67 observed task-related responses. At post-treatment, they had a mean of 5.930 task-related responses that ranged from 0.00 to 26.67 task-related responses. The average mean pre-to post-observation gain score for task-related responses was 4.719, with a range of -9.00 to 26.67 observed task-related responses.

Table 7. *DD with ASD Task-Related Responses* for *Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Task Related Responses	19	13.67	.00	13.67	1.2105	3.18990
Post Task-Related Responses	19	26.67	.00	26.67	5.9298	7.33130
Change Score	19	35.67	-9.00	26.67	4.7193	7.80809

DD with ASD adolescents receiving the **Peer Network** treatment condition had a mean of 1.764 task-related **responses** that ranged from 0.00 to 20.67 observed task-related responses.

At post-treatment, they had a mean of 4.458 task-related responses that ranged from 0.00 to 72.00 task-related responses. The average mean pre-to post-observation gain score for task-related responses was 0.097, with a range of -3.00 to 51.33 observed task-related responses.

Table 8. *DD with ASD Task-Related Responses* for *Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Task Related Responses	24	20.67	.00	20.67	1.7639	4.33554
Post Task-Related Responses	24	72.00	.00	72.00	4.4583	14.61910
Change Score	24	54.33	-3.00	51.33	2.6944	10.62352

At pre-treatment, within the **TAU** condition, DD with ASD participants had a mean of 0.825 task-related **responses** that ranged from 0.00 to 7.67 observed task-related responses. At post-treatment, they had a mean of 0.790 task-related responses that ranged from 0.00 to 7.33 task-related responses. The average mean pre-to post-observation gain score for task-related responses was -0.035, with a range of -7.33 to 4.67 observed task-related responses.

Table 9. *DD with ASD Task-Related Responses* for *TAU*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Task Related Responses	19	7.67	.00	7.67	.8246	1.89336
Post Task-Related Responses	19	7.33	.00	7.33	.7895	2.25041
Change Score	19	12.00	-7.33	4.67	-.0351	2.34098

At pre-treatment, within the **Peer Support** condition, DD participants had a mean of 2.023 task-related **responses** that ranged from 0.00 to 14.00 observed task-related responses. At post-treatment, they had a mean of 10.83 task-related responses that ranged from 0.00 to 57.33

task-related responses. The average mean pre-to post-observation gain score for task-related responses was 8.810, with a range of -1.33 to 43.33 observed task-related responses.

Table 10. *DD Task-Related Responses* for *Peer Support*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Task Related Responses	29	14.00	.00	14.00	2.0230	3.25007
Post Task-Related Responses	29	57.33	.00	57.33	10.8333	13.93594
Change Score	29	44.67	-1.33	43.33	8.8103	12.54782

At pre-treatment DD participants receiving the **Peer Network** treatment condition had a mean of 1.873 task-related **responses** that ranged from 0.00 to 22.00 observed task-related responses. At post-treatment, they had a mean of 3.857 task-related responses that ranged from 0.00 to 32.67 task-related responses. The average mean pre-to post-observation gain score for task-related responses was 1.984, with a range of -11.67 to 31.00 observed task-related responses.

Table 11. *DD Task-Related Responses* for *Peer Network*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Task Related Responses	21	22.00	.00	22.00	1.8730	5.12345
Post Task-Related Responses	21	32.67	.00	32.67	3.8571	7.61108
Change Score	21	42.67	-11.67	31.00	1.9841	7.61977

At pre-treatment, within the **TAU** condition, DD participants had a mean of 3.653 task-related **responses** that ranged from 0.00 to 23.67 observed task-related responses. At post-treatment, they had a mean of 5.014 task-related responses that ranged from 0.00 to 24.33 task-related responses. The average mean pre-to post-observation gain score for task-related responses was 1.361, with a range of -11.33 to 17.00 observed task-related responses.

Table 12. *DD Task-Related Responses* for *TAU condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Task-Related Responses	24	23.67	.00	23.67	3.6528	5.93319
Post Task-Related Responses	24	24.33	.00	24.33	5.0139	7.56644
Change Score	24	28.33	-11.33	17.00	1.3611	5.53244

At pre-treatment, within the **Peer Support** condition, DD with ASD participants had a mean of 0.491 **social-related initiations** that ranged from 0.00 to 3.33 observed social-related initiations. At post-treatment, they had a mean of 2.579 social-related initiations that ranged from 0.00 to 13.33 social-related initiations. The average mean pre-to post-observation gain score for social-related initiations was 2.088, with a range of 0.00 to 10.00 observed social-related initiations.

Table 13. *DD with ASD Social-Related Initiations for Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Social-Related Initiations	19	3.33	.00	3.33	.4912	.97099
Post Social Related	19	13.33	.00	13.33	2.5789	3.44237
Change Score	19	10.00	.00	10.00	2.0877	2.78852

At pre-treatment, within the **Peer Network** condition, DD with ASD participants had a mean of 1.292 **social-related** initiations that ranged from 0.00 to 10.33 observed social-related initiations. At post-treatment, they had a mean of 1.431 social-related initiations that ranged from

0.00 to 14.00 social-related initiations. The average mean pre-to post-observation gain score for social-related initiations was 0.139, with a range of -9.00 to 11.67 observed social-related initiations.

Table 14. *DD with ASD Social-Related Initiations for Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Social-Related Initiations	24	10.33	.00	10.33	1.2917	2.82896
Post Social-Related	24	14.00	.00	14.00	1.4306	3.14309
Change Score	24	20.67	-9.00	11.67	.1389	3.62615

DD with ASD adolescents receiving the **TAU** condition had a pre-treatment mean of 0.719 **social-related** initiations that ranged from 0.00 to 8.67 observed social-related initiations. At post-treatment, they had a mean of 0.667 social-related initiations that ranged from 0.00 to 6.33 social-related initiations. The average mean pre-to post-observation gain score for social-related responses was -.053, with a range of -7.33 to 5.33 observed social-related initiations.

Table 15. *DD with ASD Social-Related Initiations for TAU Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Social-Related Initiations	19	8.67	.00	8.67	.7193	2.02839
Post Social-Related	19	6.33	.00	6.33	.6667	1.50308
Change Score	19	12.67	-7.33	5.33	-.0526	2.15528

At pre-treatment, within the **Peer Support** condition, DD participants had a mean of 1.046 social-related initiations that ranged from 0.00 to 10.00 observed social-related initiations. At post-treatment, they had a mean of 3.103 **social-related** initiations that ranged from 0.00 to

16.33 social-related initiations. The average mean pre-to post-observation gain score for social-related initiations was 2.058, with a range of -7.33 to 13.67 observed social-related initiations.

Table 16. *DD Social-Related Initiations for Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Social-Related Initiations	29	10.00	.00	10.00	1.0460	2.19075
Post Social Related	29	16.33	.00	16.33	3.1034	3.93207
Change Score	29	21.00	-7.33	13.67	2.0575	3.66891

At pre-treatment, with the **Peer Network** condition, DD participants had a mean of 1.143 **social-related** initiations that ranged from 0.00 to 18.33 observed social-related initiations. At post-treatment, they had a mean of 1.492 social-related initiations that ranged from 0.00 to 11.33 social-related initiations. The average mean pre-to post-observation gain score for social-related initiations was 0.349, with a range of -7.00 to 10.33 observed social-related initiations.

Table 17. *DD Social-Related Initiations for Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Social-Related Initiations	21	18.33	.00	18.33	1.1429	3.97153
Post Social-Related	21	11.33	.00	11.33	1.4921	3.22252
Change Score	21	17.33	-7.00	10.33	.3492	2.87803

DD adolescents receiving the **TAU** condition had a pre-treatment mean of 1.569 **social-related** initiations that ranged from 0.00 to 17.00 observed social-related initiations. At post-treatment, they had a mean of 3.694 social-related initiations that ranged from 0.00 to 22.67

social-related initiations. The average mean pre-to post-observation gain score for social-related initiations was 2.125, with a range of -2.00 to 12.67 observed social-related initiations.

Table 18. *DD Social-Related Initiations for TAU Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Social-Related Initiations	24	17.00	.00	17.00	1.5694	3.51186
Post Social-Related	24	22.67	.00	22.67	3.6944	5.33597
Change Score	24	14.67	-2.00	12.67	2.1250	3.26127

At pre-treatment, within the **Peer Support** condition, DD with ASD participants had a mean of 0.684 **social-related responses** that ranged from 0.00 to 6.00 observed social-related responses. At post-treatment, they had a mean of 4.842 social-related responses that ranged from 0.00 to 22.67 social-related responses. The average mean pre-to post-observation gain score for social-related responses was 4.158, with a range of -2.00 to 22.67 observed social-related responses.

Table 19. *DD with ASD Social-Related Responses for Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Social-Related Responses	19	6.00	.00	6.00	.6842	1.58494
Post Social-Related Responses	19	22.67	.00	22.67	4.8421	6.47156
Change Score	19	24.67	-2.00	22.67	4.1579	6.48109

At pre-treatment, within the **Peer Network** condition, DD with ASD participants had a mean of 1.736 **social-related responses** that ranged from 0.00 to 13.00 observed social-related responses. At post-treatment, they had a mean of 2.500 social-related responses that ranged from 0.00 to 22.00 social-related responses. The average mean pre-to post-observation gain score for social-related responses was 0.764, with a range of -12.00 to 15.67 observed social-related responses.

Table 20. *DD with ASD Social-Related Responses for Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Social-Related Responses	24	13.00	.00	13.00	1.7361	3.80183
Post Social-Related Responses	24	22.00	.00	22.00	2.5000	5.84832
Change Score	24	27.67	-12.00	15.67	.7639	5.50053

DD with ASD adolescents receiving the **TAU** condition had a pre-treatment mean of 0.825 **social-related responses** that ranged from 0.00 to 6.00 observed social-related responses. At post-treatment, they had a mean of 3.632 social-related responses that ranged from 0.00 to 52.00 social-related responses. The average mean pre-to post-observation gain score for social-related responses was 2.807, with a range of -2.67 to 46.00 observed social-related responses.

Table 21. *DD with ASD Social-Related Responses for TAU Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Social-Related Responses	19	6.00	.00	6.00	.8246	1.70825
Post Social-Related Responses	19	52.00	.00	52.00	3.6316	11.91632
Change Score	19	48.67	-2.67	46.00	2.8070	10.60708

At pre-treatment, within the **Peer Support** condition, DD participants had a mean of 1.460 **social-related responses** that ranged from 0.00 to 16.33 observed social-related responses. At post-treatment, they had a mean of 3.68 social-related responses that ranged from 0.00 to

47.33 social-related responses. The average mean pre-to post-observation gain score for social-related responses was 4.908, with a range of -12.00 to 43.67 observed social-related responses.

Table 22. *DD Social-Related Responses for Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Social-Related Responses	29	16.33	.00	16.33	1.4598	3.27619
Post Social-Related Responses	29	47.33	.00	47.33	6.3678	9.54328
Change Score	29	55.67	-12.00	43.67	4.9080	9.20572

At pre-treatment, with the **Peer Network** condition, DD participants had a mean of 3.143 **social-related responses** that ranged from 0.00 to 54.00 observed social-related responses. At post-treatment, they had a mean of 3.127 social-related responses that ranged from 0.00 to 25.00 social-related responses. The average mean pre-to post-observation gain score for social-related responses was -.016, with a range of -29.00 to 19.67 observed social-related responses.

Table 23. *DD Social-Related Responses for Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Social-Related Responses	21	54.00	.00	54.00	3.1429	11.68882
Post Social-Related Responses	21	25.00	.00	25.00	3.1270	6.92698
Change Score	21	48.67	-29.00	19.67	-.0159	7.97738

DD adolescents receiving the **TAU** condition had a pre-treatment mean of 3.139 **social-related responses** that ranged from 0.00 to 37.67 observed social-related responses. At post-treatment, they had a mean of 5.868 social-related initiations that ranged from 0.00 to 50.00

social-related responses. The average mean pre-to post-observation gain score for social-related responses was 2.729, with a range of -8.00 to 19.33 observed social-related responses.

Table 24. *DD Social-Related Responses for TAU condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Social-Related Responses	24	37.67	.00	37.67	3.1389	7.65936
Post Social-Related Responses	24	50.00	.00	50.00	5.8681	11.19491
Change Score	24	27.33	-8.00	19.33	2.7292	6.14692

At pre-treatment, within the **Peer Support** condition, DD with ASD participants had a mean of 0.535 **SCB initiations** that ranged from 0.00 to 3.50 observed SCB initiations. At post-treatment, they had a mean of 2.465 SCB initiations that ranged from 0.00 to 9.67 SCB initiations. The average mean pre-to post-observation gain score for SCB initiations was 1.930, with a range of 0.00 to 9.17 observed SCB initiations.

Table 25. *DD with ASD SCB Initiations for Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Initiations	19	3.50	.00	3.50	.5351	.98848
Post Initiations	19	9.67	.00	9.67	2.4649	2.98121
Change Score	19	9.17	.00	9.17	1.9298	2.45158

At pre-treatment, with the **Peer Network** condition, DD with ASD participants had a mean of 1.354 **SCB initiations** that ranged from 0.00 to 7.83 observed SCB initiations. At post-treatment, they had a mean of 1.472 SCB initiations that ranged from 0.00 to 8.67 SCB initiations. The average mean pre-to post-observation gain score for SCB initiations was .118, with a range of -4.67 to 5.67 observed SCB initiations.

Table 26. *DD with ASD SCB Initiations for Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Initiations	24	7.83	.00	7.83	1.3542	2.27266
Post Initiations	24	8.67	.00	8.67	1.4722	2.47678
Change Score	24	10.33	-4.67	5.67	.1181	2.40796

DD with ASD adolescents receiving the **TAU** condition had a pre-treatment mean of 0.886 **SCB initiations** that ranged from 0.00 to 11.67 observed SCB initiations. At post-treatment, they had a mean of 0.693 SCB initiations that ranged from 0.00 to 5.67 SCB initiations. The average mean pre-to post-observation gain score for SCB initiations was -0.193, with a range of -10.67 to 4.00 observed SCB initiations.

Table 27. *DD with ASD SCB Initiations for TAU Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Initiations	19	11.67	.00	11.67	.8860	2.67306
Post Initiations	19	5.67	.00	5.67	.6930	1.63324
Change Score	19	14.67	-10.67	4.00	-.1930	2.76512

At pre-treatment, with the **Peer Support** condition, DD participants had a mean of 1.132 **SCB initiations** that ranged from 0.00 to 9.67 observed SCB initiations. At post-treatment, they had a mean of 3.175 SCB initiations that ranged from 0.00 to 14.33 SCB initiations. The average mean pre-to post-observation gain score for social-related initiations was 2.043, with a range of -3.83 to 8.67 observed SCB initiations.

Table 28. *DD SCB Initiations for Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Initiations	29	9.67	.00	9.67	1.1322	2.13083
Post Initiations	29	14.33	.00	14.33	3.1753	3.47256

Change Score	29	12.50	-3.83	8.67	2.0431	2.82778

At pre-treatment, within the **Peer Network** condition, DD participants had a mean of 1.134 SCB initiations that ranged from 0.00 to 15.17 observed SCB initiations. At post-treatment, they had a mean of 1.484 SCB initiations that ranged from 0.00 to 8.00 SCB initiations. The average mean pre-to post-observation gain score for SCB initiations was 0.349, with a range of -7.17 to 6.50 observed SCB initiations.

Table 29. *DD SCB Initiations for Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Initiations	21	15.17	.00	15.17	1.1349	3.27220
Post Initiations	21	8.00	.00	8.00	1.4841	2.44546
Change Score	21	13.67	-7.17	6.50	.3492	2.49439

DD adolescents receiving the **TAU** condition had a pre-treatment mean of 1.722 **SCB initiations t**hat ranged from 0.00 to 11.33 observed SCB initiations. At post-treatment, they had a mean of 3.736 SCB initiations that ranged from 0.00 to 15.00 SCB initiations. The average mean pre-to post-observation gain score for SCB initiations was 2.014, with a range of -1.33 to 15.17 observed SCB initiations.

Table 30. *DD SCB Initiations for TAU Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Initiations	24	11.33	.00	11.33	1.7222	2.60651
Post Initiations	24	15.50	.00	15.50	3.7361	4.82919
Change Score	24	16.50	-1.33	15.17	2.0139	3.73323

At pre-treatment, within the **Peer Support** condition, DD with ASD participants had a mean of 0.947 **SCB responses** that ranged from 0.00 to 9.83 observed SCB responses. At post-treatment, they had a mean of 5.386 SCB responses that ranged from 0.00 to 16.50 SCB responses. The average mean pre-to post-observation gain score for SCB responses was 4.439, with a range of -4.83 to 14.83 observed SCB responses.

Table 31. *DD with ASD SCB Responses for Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Responses	19	9.83	.00	9.83	.9474	2.29267
Post Reponses	19	16.50	.00	16.50	5.3860	5.50618
Change Score	19	19.67	-4.83	14.83	4.4386	5.69687

At pre-treatment, within the **Peer Network** condition, DD with ASD participants had a mean of 1.750 **SCB responses** that ranged from 0.00 to 10.83 observed SCB responses. At post-treatment, they had a mean of 3.479 SCB responses that ranged from 0.00 to 36.00 SCB responses. The average mean pre-to post-observation gain score for SCB responses was 1.729, with a range of -7.50 to 25.17 observed SCB responses.

Table 32. *DD with ASD SCB Responses for Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Responses	24	10.83	.00	10.83	1.7500	3.22281
Post Reponses	24	36.00	.00	36.00	3.4792	8.03454
Change Score	24	32.67	-7.50	25.17	1.7292	6.18609

DD with ASD adolescents receiving the **TAU** condition had a pre-treatment mean of 0.825 **SCB responses** that ranged from 0.00 to 5.83 observed SCB responses. At post-treatment, they had a mean of 2.211 SCB responses that ranged from 0.00 to 26.00 SCB responses. The average mean pre-to post-observation gain score for SCB responses was 1.386, with a range of -5.00 to 22.00 observed SCB responses.

Table 33. *DD with ASD SCB Responses for TAU Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Responses	19	5.83	.00	5.83	.8246	1.67910
Post Reponses	19	26.00	.00	26.00	2.2105	6.15987
Change Score	19	27.00	-5.00	22.00	1.3860	5.34347

At pre-treatment, within the **Peer Support** condition, DD participants had a mean of 1.741 **SCB responses** that ranged from 0.00 to 11.00 observed SCB responses. At post-treatment, they had a mean of 8.601 SCB responses that ranged from 0.00 to 38.00 SCB responses. The average mean pre-to post-observation gain score for SCB responses was 6.859, with a range of -6.00 to 27.33 observed SCB responses.

Table 34. *DD SCB Responses for Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Responses	29	11.00	.00	11.00	1.7414	2.85029
Post Reponses	29	38.00	.00	38.00	8.6006	8.95611
Change Score	29	33.33	-6.00	27.33	6.8592	8.01057

At pre-treatment, within the **Peer Network** condition, DD participants had a mean of 2.508 **SCB responses** that ranged from 0.00 to 38.00 observed SCB responses. At post-treatment, they had a mean of 3.492 SCB responses that ranged from 0.00 to 17.67 SCB responses. The average mean pre-to post-observation gain score for SCB responses was 0.984, with a range of -20.33 to 15.00 observed SCB responses.

Table 35. *DD SCB Responses for Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Responses	21	38.00	.00	38.00	2.5079	8.23179

Post Reponses	21	17.67	.00	17.67	3.4921	5.87993
Change Score	21	35.33	-20.33	15.00	.9841	6.58490

DD adolescents receiving the **TAU** condition had a pre-treatment mean of 3.396 **SCB responses** that ranged from 0.00 to 30.67 observed SCB responses. At post-treatment, they had a mean of 5.441 SCB responses that ranged from 0.00 to 37.17 SCB responses. The average mean pre-to post-observation gain score for SCB responses was 2.045, with a range of -9.67 to 11.83 observed SCB responses.

Table 36. *DD SCB Responses for TAU Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Responses	24	30.67	.00	30.67	3.3958	6.51101
Post Reponses	24	37.17	.00	37.17	5.4410	8.57316
Change Score	24	21.50	-9.67	11.83	2.0451	4.81625

At pre-treatment, within the **Peer Support** condition, DD with ASD participants had a mean of 0.741 **pooled SCB** that ranged from 0.00 to 6.67 observed. At post-treatment, they had a mean of 3.925 pooled SCB that ranged from 0.00 to 12.42 observed. The average mean pre-to post-observation gain score for pooled SCB was 3.184, with a range of -1.25 to 11.50 observed.

Table 37. *DD with ASD Pooled SCB for Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Pooled SCB	19	6.67	.00	6.67	.7412	1.59738
Post Pooled SCB	19	12.42	.00	12.42	3.9254	3.96414
Change Score	19	12.75	-1.25	11.50	3.1842	3.75335

At pre-treatment, within the **Peer Network** condition, DD with ASD participants had a mean of 1.522 **pooled SCB** that ranged from 0.00 to 8.17 observed. At post-treatment, they had a mean of 2.476 pooled SCB that ranged from 0.00 to 18.50 observed. The average mean pre-to post-observation gain score for pooled SCB was .924, with a range of -6.08 to 11.17 observed.

Table 38. *DD with ASD SCB Pooled SCB for Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Pooled SCB	24	8.17	.00	8.17	1.5521	2.64208
Post Pooled SCB	24	18.50	.00	18.50	2.4757	4.58327
Change Score	24	17.25	-6.08	11.17	.9236	3.55494

DD with ASD adolescents receiving the **TAU** condition had a pre-treatment mean of 0.855 **pooled SCB** that ranged from 0.00 to 8.75 observed. At post-treatment, they had a mean of 1.452 pooled SCB that ranged from 0.00 to 13.25 observed. The average mean pre-to post-observation gain score for pooled SCB was 0.597, with a range of -7.83 to 11.08 observed.

Table 39. *DD with ASD SCB Pooled SCB for TAU Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Pooled SCB	19	8.75	.00	8.75	.8553	2.07421
Post Pooled SCB	19	13.25	.00	13.25	1.4518	3.43270
Change Score	19	18.92	-7.83	11.08	.5965	3.41240

At pre-treatment, within the **Peer Support** condition, DD participants had a mean of 1.437 **pooled SCB** that ranged from 0.00 to 10.17 observed. At post-treatment, they had a mean of 5.888 pooled SCB that ranged from 0.00 to 26.17 observed. The average mean pre-to post-observation gain score for SCB responses was 4.451, with a range of -4.92 to 16.00 observed.

Table 40. *DD Pooled SCB for Peer Support Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Pooled SCB	29	10.17	.00	10.17	1.4368	2.44297

Post Pooled SCB	29	26.17	.00	26.17	5.8879	6.03048
Change Score	29	20.92	-4.92	16.00	4.4511	5.14466

At pre-treatment, within the **Peer Network** condition, DD participants had a mean of 1.821 **pooled SCB** that ranged from 0.00 to 26.58 observed. At post-treatment, they had a mean of 2.488 pooled SCB that ranged from 0.00 to 12.83 observed. The average mean pre-to post-observation gain score for pooled SCB was .667, with a range of -13.75 to 10.75 observed.

Table 41. *DD Pooled SCB for Peer Network Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Pooled SCB	21	26.58	.00	26.58	1.8214	5.74234
Post Pooled SCB	21	12.83	.00	12.83	2.4881	4.11487
Change Score	21	24.50	-13.75	10.75	.6667	4.49645

DD adolescents receiving the **TAU** condition had a pre-treatment mean of 2.559 **pooled SCB** that ranged from 0.00 to 21.00 observed. At post-treatment, they had a mean of 4.589 pooled SCB that ranged from 0.00 to 26.33 observed. The average mean pre-to post-observation gain score for SCB responses was 2.030, with a range of -4.33 to 13.50 observed SCB responses.

Table 42. *DD SCB Pooled SCB for TAU Condition*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre Pooled SCB	24	21.00	.00	21.00	2.5590	4.40606
Post Pooled SCB	24	26.33	.00	26.33	4.5885	6.41283
Change Score	24	17.83	-4.33	13.50	2.0295	3.94050

Upon further examination of pre-observation and post-observation gain scores, Pearson's partial correlation was run to assess the relationship between the pre-observation SCB outcome scores and post-observation SCB outcomes scores. This was completed to assess the consistency of the treatment effect across participants. In this case, if the pre-observation score – post-observation score correlation is high, then the rank ordering of the participants on the pre-observation is similar to the rank ordering of the participants on the post-observation and the effect of the treatment is similar for every participant. There was a strong, statistically significant linear relationship between pre-observation scores and post-observation scores for a specific SCB construct, $p < .05$. However, it is important to note that there are significant outliers, which impact the interpretation of the correlation matrix. Data transformation as warranted is discussed later.

Inferential Analyses

To further address research question one, a two-way ANOVA was conducted to examine the effects of treatment conditions and disability on separate social communication behaviors (see section following for results). Main and interaction effects were investigated as such:

1) Intervention main-effect: Do the social communication behaviors mean gain scores differ among peer-mediated (PS, PN) and TAU conditions? Mean gain scores (DV) are computed from pre-to post-observations.
2) Disability main-effect: Do the social communication behaviors mean gain scores differ by disability (DD with ASD, DD)?
3) Intervention x disability: Do the differences in the social communication mean gain scores among the three treatment conditions vary as a function of disability?

Analysis of social communication behavior task-related initiations. A two-way ANOVA was conducted to examine the effects of treatment and disability on observed social communication behaviors that were classified as task-related initiations. Residual analysis was performed to test for the assumptions of the two-way ANOVA. Outliers were assessed by inspection of a boxplot, normality by inspection of histograms and homogeneity of variances was assessed by Levene's test. There were 17 outliers observed across design cells (particularly in the TAU condition for DD participants n=6), as assessed as being greater than 3 box-lengths from the edge of the box in a boxplot. It was determined that the extreme outliers were not due to measurement errors or data entry errors. Residuals were not normally distributed as assessed by the Shapiro-Wilk's test ($p < .05$), but there was homogeneity of variances ($p = .177$). To address the two violations, a log transformation of the dependent variable (e.g., "task-related social initiation gain score”) was implemented to reduce the disproportionately affected ("reduced in size") compared to the other data points so that they were no longer classified as extreme outliers, as evidenced by box plot inspection. With the log transformation, normality and homogeneity of variance assumptions were met (Shapiro-Wilk's test, p >.05; Levene's test, p =.09).

There was no statistically significant interaction between intervention condition and disability on SCB task-related initiation gain scores, F (2, 118) = .294, p = .746, partial η2 = .005. Therefore, an analysis of the main effect for treatment condition and main effect for disability was performed. There was a statistically significant difference in mean "task-related initiation" gain scores between treatment conditions, F (2, 118) = 3.840, p = .024, partial η2 = .061. There was no statistically significant difference in mean “task-related initiation” gain scores for disability (F (1, 118) = .064, p =.029, partial η2 = .0). All pairwise comparisons were run, for the main effect of treatment conditions, where reported, 97.5% confidence intervals and p-values are Bonferroni-adjusted. The unweighted marginal means of "task-related response" gain scores for Peer Support, Peer Network and treatment as usual (TAU) were .321 (SE = .054), .127 (SE = .057) and .142 (SE = .057), respectively. Participation in the Peer Support intervention condition was associated with a mean “task-related initiation" gain score of .194, 95% CI [-.018, .406] than participation in the Peer Network intervention, a statistically significant difference, *p* = .046. Participation in the Peer Support intervention condition was associated with a mean "task-related response" gain score of .179, 95% CI [-.031, .390] than participation in the TAU condition, a borderline significant trend, *p* = 0.073.

Analysis of social communication behavior task-related responses. A two-way ANOVA was conducted to examine the effects of treatment and disability on observed social communication behaviors that were classified as task-related responses. Residual analysis was performed to test for the assumptions of the two-way ANOVA. Outliers were assessed by inspection of a boxplot, normality by inspection of histograms and homogeneity of variances was assessed by Levene's test. There were 14 outliers observed across design cells (particularly in the TAU condition for DD and DD with ASD participants n=8), as assessed as being greater than 3 box-lengths from the edge of the box in a boxplot. It was determined that the extreme outliers were not due to measurement errors or data entry errors. Residuals were not normally distributed as assessed by the Shapiro-Wilk's test ($p < .05$) and there was not homogeneity of variances ($p = .000$). To address the two violations, a log transformation of the dependent variable (e.g., "task-related responses gain score”) was implemented to reduce the disproportionately affected ("reduced in size") compared to the other data points so that they were no longer classified as extreme outliers, as evidenced by box plot inspection. With the log transformation, normality and homogeneity of variance assumptions were met (Shapiro-Wilk's test, $p > .05$; Levene's test, $p = .108$).

There was no statistically significant interaction between intervention condition and disability on SCB task-related response gain scores, $F(2, 118) = .625$, $p = .537$, partial η2

= .011. Therefore, an analysis of the main effect for treatment condition and main effect for disability were performed. There was a statistically significant main effect for "task-related response" gain scores between treatment conditions, *F* (2, 115) = 9.144, *p* = .000, partial η2 = .137. There was no main effect found for “task-related response” gain scores for disability (*F* (1, 115) = 3.435, *p* =.066, partial η2 = .029). All pairwise comparisons were run, for the main effect of treatment conditions, where reported 95% confidence intervals and p-values are Bonferroni-adjusted. The unweighted marginal means of "task-related response" gain scores for Peer Support, Peer Network and treatment as usual (TAU) were 0.620 (SE = .073), 0.230 (SE = .075) and .226 (SE = .081), respectively. Participation in the Peer Support intervention condition was associated with a mean “task-related response" gain score of 0.390, 95% CI [.135 and .645] than participation in the Peer Network intervention, a statistically significant difference, *p* < .001. Participation in the Peer Support intervention condition was associated with a mean "task-related response" gain score of 0.394, 95% CI [.129, .660] than participation in the TAU condition, a statistically significant difference, *p* < .001.

Analysis of social communication behavior social-related initiations. A two-way ANOVA was conducted to examine the effects of treatment and disability on observed social communication behaviors that were classified as social-related initiations. Residual analysis was performed to test for the assumptions of the two-way ANOVA. Outliers were assessed by inspection of a boxplot, normality by inspection of histograms and homogeneity of variances was assessed by Levene's test. There were 13 outliers observed across design cells (particularly in the Peer Network condition for DD and DD with ASD participants n=10), as assessed as being greater than 3 box-lengths from the edge of the box in a boxplot. It was determined that the extreme outliers were not due to measurement errors or data entry errors. Residuals were not normally distributed as assessed by the Shapiro-Wilk's test ($p < .05$), but there was homogeneity of variances ($p = .234$). To address the two violations, a log transformation of the dependent variable (e.g., "social-related initiations gain score”) was implemented to reduce the disproportionately affected ("reduced in size") compared to the other data points so that they were no longer classified as extreme outliers, as evidenced by box plot inspection. With the log transformation, normality and homogeneity of variance assumptions were met (Shapiro-Wilk's test, $p >.05$; Levene's test, $p =.114$).

There was a statistically significant interaction between intervention condition and disability on SCB social-related initiation gain scores, F (2, 119) = 3.681, $p = .028$, partial η2 = .058. Therefore, an analysis of separate simple main effects for disability and intervention condition was performed with statistical significance receiving a Bonferroni adjustment and being accepted at the $p < .025$ level. There was a statistically significant difference in mean "social-related initiation” gain score between DD participants and DD with ASD participants who were in the TAU condition, F (1, 119) = 3.799, $p = .054$, partial η2 = .031. For DD participants and DD with ASD participants who were assigned to the TAU condition, mean “social-related initiation” gain score was .399 (95% CI, .238 to .559) points higher for DD participants than DD with ASD participants, F (1, 119) = 3.799, $p = .054$, partial η2 = .031. In addition, there was a statistically significant difference in mean "social-related initiation” gain score between Peer Support intervention condition and Peer Network condition to either disability, F (2, 119) = 5.860, $p = .004$, partial η2 = .090. Participants in the Peer Support intervention condition had a mean “social-related initiation” gain score of .246 (97.5% CI, .262 to .488) points higher than Peer Network participants, a statistically significant difference, $p = .003$.

All pairwise comparisons were run for each simple main effect with reported 97.5% confidence intervals and p-values Bonferroni-adjusted within each simple main effect. Mean "social-related initiation” gain score for Peer Support, Peer Network, and TAU conditions for participants with DD with ASD were .352 (SD = .339), .1485 (SD = .346) and .054 (SD = .219), respectively. DD with ASD participants had a statistically significantly lower mean "social-related initiation” gain score than DD participants, -.117, 97.5% CI [.085, .285], *p* = .05. Mean "social-related initiation” gain score for Peer Support, Peer Network, and TAU conditions for participants with DD were .398 (SD = .376), .109 (SD = .318) and .399 (SD = .343), respectively.

Analysis of social communication behavior social-related responses. A two-way ANOVA was conducted to examine the effects of treatment and disability on observed social communication behaviors that were classified as social-related responses. Residual analysis was performed to test for the assumptions of the two-way ANOVA. Outliers were assessed by inspection of a boxplot, normality by inspection of histograms and homogeneity of variances was assessed by Levene's test. There were 13 outliers observed across design cells (particularly in the TAU condition and Peer Network for DD and DD with ASD participants n=8), as assessed as being greater than 3 box-lengths from the edge of the box in a boxplot. It was determined that the extreme outliers were not due to measurement errors or data entry errors. Residuals were not normally distributed as assessed by the Shapiro-Wilk's test (p < .05), however, there was homogeneity of variances (p = .645). To address the two violations, a log transformation of the dependent variable (e.g., "social-related responses gain score”) was implemented to reduce the disproportionately affected ("reduced in size") compared to the other data points so that they were no longer classified as extreme outliers, as evidenced by box plot inspection. With the log transformation, normality and homogeneity of variance assumptions were met (Shapiro-Wilk's test, *p* >.05; Levene's test, *p* =.503).

There was no statistically significant interaction between intervention condition and disability on SCB social-related response gain scores, *F* (2, 118) = .918, *p* = .402, partial η2 = .015. Therefore, an analysis of the main effect for treatment condition and main effect for disability was performed. There was a statistically significant difference in mean "social-related response" gain scores between treatment conditions, *F* (2, 118) = 6.028, *p* = .003, partial η2 = .093. There were no main effect for "social-related response" gain scores for disability (*F* (1, 65) = .805, *p* =.371, partial η2 = .007).

All pairwise comparisons were run where reported 97.5% confidence intervals and p-values were Bonferroni-adjusted. The unweighted marginal means of "social-related response" gain scores for Peer Support, Peer Network, and TAU were .520 (SE = .069), .178 (SE = .072) and .300 (SE = .178), respectively.

Participation in the Peer Support intervention condition was associated with a mean "social-related response" gain score .342, 97.5% CI [.073, .610] points higher than participation in the Peer Network condition, a statistically significant difference, *p* = 0.003. Peer support condition was associated with a mean "social-related response" gain score .220, 95% CI [-.053, .492] points higher than the TAU condition, which approached a trend of significance, *p* =.097.

Analysis of social communication behavior initiations pooled. A two-way ANOVA was conducted to examine the effects of treatment and disability on observed social communication behaviors that were classified as initiations. Residual analysis was performed to test for the assumptions of the two-way ANOVA. Outliers were assessed by inspection of a boxplot, normality by inspection of histograms and homogeneity of variances was assessed by Levene's test. There were 10 outliers observed across design cells (particularly in the Peer Network condition for DD participants n=6), as assessed as being greater than 3 box-lengths from the edge of the box in a boxplot. It was determined that the extreme outliers were not due to measurement errors or data entry errors. Residuals were not normally distributed as assessed by the Shapiro-Wilk's test ($p < .05$), nor were there homogeneity of variances ($p = .014$). To address the two violations, a log transformation of the dependent variable (e.g., "task-related social initiation gain score") was implemented to reduce the disproportionately affected ("reduced in size") compared to the other data points so that they were no longer classified as extreme outliers, as evidenced by box plot inspection. With the log transformation, normality and residuals were reduced as evidenced through histogram and box plot analysis (Shapiro-Wilk's test, $p >.05$). Levene's test remained significant, which violated the error variance assumption (p =.014); however, analyses were carried out with caution.

There was no statistically significant interaction between intervention condition and disability on SCB pooled initiation gain scores, F (2, 120) = .2.080, $p = .129$, partial η2 = .034. Therefore, an analysis of the main effect for treatment condition and main effect for disability was performed. There was a statistically significant difference in mean "pooled initiation" gain scores between treatment conditions, F (2, 120) = 3.772, $p = .026$, partial η2 = .059. There was no statistically significant difference in mean "pooled initiation" gain scores for disability (F (1, 120) = 1.367, $p =.245$, partial η2 = .011). All pairwise comparisons were run, for the main effect of treatment conditions, where reported 97.5% confidence intervals and p-values were Bonferroni-adjusted. The unweighted marginal means of "pooled initiation" gain scores for Peer Support, Peer Network and treatment as usual (TAU) were .341 (SE = .054), .129 (SE = .058) and .202 (SE = .057), respectively. Participation in the Peer Support intervention condition was associated with a mean “pooled initiation" gain score of .212, 95% CI [-4.318, .424] than participation in the Peer Network intervention, a statistically significant difference, *p* = .025. No other treatment condition pairwise comparisons were statistically significant.

Analysis of social communication behavior responses pooled. A two-way ANOVA was conducted to examine the effects of treatment and disability on observed social communication behaviors that were classified as responses. Residual analysis was performed to test for the assumptions of the two-way ANOVA. Outliers were assessed by inspection of a boxplot, normality by inspection of histograms and homogeneity of variances was assessed by Levene's test. There were 11 extreme outliers observed across design cells (particularly in the Peer Network condition for DD participants n=6), as assessed as being greater than 3 box-lengths from the edge of the box in a boxplot. It was determined that the extreme outliers were not due to measurement errors or data entry errors. Residuals were not normally distributed as assessed by the Shapiro-Wilk's test ($p < .05$). Homogeneity of variances was not observed ($p = .042$). To address the two violations, a log transformation of the dependent variable (e.g., "task-related social initiation gain score”) was implemented to reduce the disproportionately affected ("reduced in size") compared to the other data points so that they were no longer classified as extreme outliers, as evidenced by box plot inspection. With the log transformation, normality and residuals were reduced as evidenced through histogram and box plot analysis (Shapiro-Wilk's test, p >.05). Levene's test was significant, which provides evidence for the error variance assumption (p =.264)

There was no statistically significant interaction between intervention condition and disability on SCB pooled responses gain scores, *F* (2, 120) = .639, *p* = .529, partial η2 = .011.

Therefore, an analysis of the main effect for treatment condition and main effect for disability was performed. There was a statistically significant difference in mean "pooled responses" gain scores between treatment conditions, F (2, 120) = 10.238, $p < .001$, partial η2 = .146. There was no statistically significant difference in mean "pooled responses" gain scores for disability (F (1, 120) = 1.535, p =.218, partial η2 = .013). All pairwise comparisons were run, for the main effect of treatment conditions, where reported 97.5% confidence intervals and p-values were Bonferroni-adjusted. The unweighted marginal means of "pooled responses" gain scores for Peer Support, Peer Network and treatment as usual (TAU) were .638 (SE = .068), .243 (SE = .069) and .275 (SE = .073), respectively. Participation in the Peer Support intervention condition was associated with a mean "pooled responses" gain score of .395, 95% CI [.136, .655] than participation in the Peer Network intervention, a statistically significant difference, $p < .001$. Similarly, participation in the Peer Support intervention condition was associated with a mean "pooled responses" gain score of .363, 95% CI [.097, .629] than participation in the TAU condition, a statistically significant difference, $p = .001$. No other pairwise comparisons were significant for treatment condition.

Analysis of social communication behaviors pooled. A two-way ANOVA was conducted to examine the effects of treatment and disability on observed social communication behaviors that were classified as responses. Residual analysis was performed to test for the assumptions of the two-way ANOVA. Outliers were assessed by inspection of a boxplot, normality by inspection of histograms and homogeneity of variances was assessed by Levene's test. There were 11 extreme outliers observed across design cells (particularly in the Peer Network and TAU conditions for DD with ASD participants n=8), as assessed as being greater than 3 box-lengths from the edge of the box in a boxplot. It was determined that the extreme outliers were not due to measurement errors or data entry errors. Residuals were not normally distributed as assessed by the Shapiro-Wilk's test ($p < .05$) and histogram and Q-Q plot visual inspection. Homogeneity of variances was not observed ($p = .046$). To address the two violations, a log transformation of the dependent variable (e.g., "task-related social initiation gain score”) was implemented to reduce the disproportionately affected ("reduced in size") compared to the other data points so that they were no longer classified as extreme outliers, as evidenced by box plot inspection. With the log transformation, normality and residuals were reduced as evidenced through histogram and box plot analysis (Shapiro-Wilk's test, $p >.05$). Levene's test was significant, which provides evidence for the error variance assumption ($p =.118$)

There was no statistically significant interaction between intervention condition and disability on pooled SCB gain scores, F (2, 122) = .405, $p = .668$, partial η2 = .007. Therefore, an analysis of the main effect for treatment condition and main effect for disability was performed. There was a statistically significant difference in mean "pooled SCB” gain scores between treatment conditions, F (2, 122) = 9.737, $p < .001$, partial η2 = .138. There was no statistically significant difference in mean “pooled SCB” gain scores for disability (F (1, 122) = .842, $p =.361$, partial η2 = .007). All pairwise comparisons were run, for the main effect of treatment conditions, where reported 97.5% confidence intervals and p-values were Bonferroni-adjusted. The unweighted marginal means of "pooled SCB" gain scores for Peer Support, Peer Network and treatment as usual (TAU) were .540 (SE = .062), .192 (SE = .063) and .214 (SE = .065), respectively. Participation in the Peer Support intervention condition was associated with a mean “pooled SCB" gain score of .348, 95% CI [.111, .585] than participation in the Peer Network intervention, a statistically significant difference, $p < .001$. Similarly, participation in the Peer Support intervention condition was associated with a mean “pooled SCB” gain score of .326, 95% CI [.085, .566] than participation in the TAU condition, a statistically significant difference, p = .001. No other pairwise comparisons were significant for treatment condition.

Peer Comparison Analysis

Descriptive analysis of typical peer comparisons. Using the same observational measures as with students with disabilities, data was collected on normative peer comparisons Observers selected peers who (a) did not have severe disabilities and (b) were in close enough proximity to allow for accurate observation. One peer was chosen for the first half of the class and a different peer was observed for the second half; observations were combined to form a class-length observation. Note that change-scores are unavailable due to the absence of a consistent peer being used at post-observation.

TD Peer Comparisons within the **Peer Support** group (n=54) more frequently exhibited social-related responses than any other SCB (Range =0-85, M =13.704). They displayed a mean of 10.5185 task-related responses. They had a similar mean of task-related initiations and social-related initiations (M = 4.130, M = 4.722). TD peers assigned to the Peer Support condition demonstrated on average 12.111 SCB responses, 4.426 SCB initiations, and 8.269 pooled SCB behaviors as observed within a general education setting.

TD Peer Comparisons within the **Peer Network** group (n=53) were observed to have on average 11.902 pooled SCB. In closer examination, they had a mean frequency of 17.918 SCB responses and a mean frequency of 5.887 SCB initiations, which suggests that they are more likely to respond to than initiate an interaction within the general education setting. They more frequently exhibited social-related responses than any other SCB (M =22.724, Range =0-203,). They displayed a mean of 5.7170 task-related initiations, which was less than their mean of social-related initiations (*M* = 6.0566). They demonstrated a high tendency toward task-related responses (*M* =13.111) as compared to other SCB.

TD Peer Comparisons within the **TAU** condition (n =51) had more frequent social-related responses than any other SCB (Range =0-140, *M* =25.235). In closer examination, they were shown to have a mean of 11.157 for observed task-related responses. They also demonstrated more frequent mean SCB responses than mean SCB initiations (*M* =18.196, *M* =4.794). They had a higher mean frequency of social-related initiations than task-related initiations (*M* =5.726, *M* =4.794). TD peers assigned to the TAU condition demonstrated on average 11.4951 pooled SCB behaviors as observed within a general education setting.

In summary, TD Peer Comparisons are more likely to demonstrate social-related responses than any other SCB across treatment conditions (*M* =20.452). An independent-samples t-test was run to determine if there were differences in SCB frequency data to an intervention condition. TD comparison peers within the Peer Support condition (M = 13.704, SD = 16.898) were observed to have less social-related responses than those in the TAU condition (*M* = 25.235 *SD* = 32.372), statistically significant difference, M = 11.532, 95% CI [-21.445, -1.400], t (103) = 2.269, $p = .026$. No other statistically significant differences were found between SCB frequency scores and treatment conditions of the “type” of classes PS and TAU were assigned. Table 43 presents an overview of pre, post, and change scores per group and treatment (refer to Appendix K for additional graphical representations of pre, post, and change scores among groups and treatment conditions.

Table 43. *Pre, Post, and Change Scores per Participant Group and Treatment*

Population Category	**Treatment Condition**	**Mean Behavior (Pre)**	**Mean Behavior (Post)**	**Change (gain) Score**

DD w/ ASD				
	PS Task Initiations	.5789	2.3509	1.7719
	PN Task Initiations	1.4167	1.5139	.0972
	TAU Task Initiations	1.0526	.7193	-.3333
	PS Task Responses	1.2105	5.9298	4.7193
	PN Task Responses	1.7639	4.4583	2.6944
	TAU Task Responses	.8246	.7895	-.0351
	PS Social-Related Initiations	.4912	2.5789	2.0877
	PN Social-Related Initiations	1.2917	1.4306	.1389
	TAU Social-Related Initiations	.7193	.6667	-.0526
	PS Social-Related Responses	.6842	4.8421	4.1579
	PN Social-Related Responses	1.7361	2.5000	.7639
	TAU Social-Related Responses	.8246	3.6316	2.8070
	PS SCB Initiations	.5351	2.4649	1.9298
	PN SCB Initiations	1.3542	1.4722	.1181
	TAU SCB Initiations	.8860	.6930	-.1930
	PS SCB Responses	.9474	5.3860	4.4386
	PN SCB Responses	1.7500	3.4792	1.7292
	TAU SCB Responses	.8246	2.2105	1.3860
	PS SCB Pooled	.7412	3.9254	3.1842
	PN SCB Pooled	1.5521	2.4757	.9236
	TAU SCB Pooled	.8553	1.4518	.5965
DD				
	PS Task Initiations	1.2184	3.2471	2.0287
	PN Task Initiations	1.1270	1.4762	.3492
	TAU Task Initiations	1.8750	3.7778	1.9028
	PS Task Responses	2.0230	10.8333	8.8103
	PN Task Responses	1.8730	3.8571	7.61108
	TAU Task Responses	3.6528	5.0139	1.3611
	PS Social-Related Initiations	1.0460	3.1034	2.0575

	PN Social-Related Initiations	1.1429	1.4921	.3492
	TAU Social-Related Initiations	1.5694	3.6944	2.1250
	PS Social-Related Responses	1.4598	6.3678	4.9080
	PN Social-Related Responses	3.1429	3.1270	-.0159
	TAU Social-Related Responses	3.1389	5.8681	2.7292
	PS SCB Initiations	1.1322	3.1753	2.0431
	PN SCB Initiations	1.1349	1.4841	.3492
	TAU SCB Initiations	1.7222	3.7361	2.0139
	PS SCB Responses	1.7414	8.6006	6.8592
	PN SCB Responses	2.5079	3.4921	.9841
	TAU SCB Responses	3.3958	5.4410	2.0451
	PS SCB Pooled	1.4368	5.8879	4.4511
	PN SCB Pooled	1.8214	2.4881	.6667
	TAU SCB Pooled	2.5590	4.5885	2.0295
TD Peer Comparisons				
	PS Task Initiations	4.130		
	PN Task Initiations	5.7170		
	TAU Task Initiations	4.794		
	PS Task Responses	10.5185		
	PN Task Responses	13.111		
	TAU Task Responses	11.157		
	PS Social-Related Initiations	4.722		
	PN Social-Related Initiations	6.0566		
	TAU Social-Related Initiations	5.726		
	PS Social-Related Responses	13.704		
	PN Social-Related Responses	22.724		
	TAU Social-Related Responses	25.235		

PS SCB Initiations	4.426
PN SCB Initiations	5.887
TAU SCB Initiations	4.794
PS SCB Responses	12.111
PN SCB Responses	17.918
TAU SCB Responses	18.196
PS SCB Pooled	8.269
PN SCB Pooled	11.902
TAU SCB Pooled	11.4951

Note. SCB = Social Communication Behavior, PS = Peer Support Condition, PN = Peer Network Condition, TAU = Treatment as Usual.

Research Question 2: How do student variables (e.g., communication mode, severity of disability, gender, percent of inclusion) relate to post-treatment gains in social behaviors seen among the treatment groups when engaged in peer-mediated intervention (Peer Support [PS], Peer Network [PN])?

Overview

To further investigate findings from research question one, specific student variables, such as pre-observation SCB outcomes scores, communication mode, disability severity, and gender were examined in relation to independent and dependent variables. An examination of "non-significant interactions" from research question one were further assessed with the presence of a covariate to determine if the covariate had any effect on the interaction term. Findings for each covariate analysis are reported separately.

Covariate Preliminary Statistics

To investigate the initial relationships between specified covariates (e.g., intellectual ability, communication skills, disability severity), a Pearson's product-moment correlation was run. Preliminary analyses showed the relationships to be non-linear between variables, and there were some outliers. No statistically significant correlations were found among the covariates, *p* >.05 (refer to correlation matrix located in Table 44 in back of chapter). Covariate means and standard deviations are reported in table 45 per covariate.

Table 45. *Means and Standard Deviations Per Covariate*

Covariate	**M**	**SD**
Disability Severity (CARS2-ST)	2.1642	.73023
IQ Score	54.8966	12.37217
Communication Skills (SSIS)	3.1333	.67195
Verbal Communication*	2.6045	.81435
Student Gender*	1.37	.483
Student Age*	16.617	1.1727

Note. * = Supplementary covariate analyzed. M = Means. SD = Standard Deviation. CARS2-ST rating is based from CARS2-ST Likert rating, with 3.000 indicating significant disability severity. IQ score is a continuous scale with M =100, SD =15.

Effect of covariate intellectual ability. An ANCOVA was run to determine the effect of treatment condition on post-observation SCB gain score outcomes after controlling for participant intellectual ability. After adjustment for intellectual ability as represented by IQ score, there was no statistically significant interaction between disability and treatment condition on task-related responses, *F* (2, 63) = .768, *p* = .468, partial η2 = .024. This finding is consistent with the earlier two-way ANOVA model (see Research Question 1). This result suggests that IQ does not influence the mean gain score of social task-related responses in this sample.

SCB task-related initiations were tested with the covariate of intellectual ability. There was no statistically significant interaction between disability and treatment condition on social task-related initiations, whilst controlling for IQ, *F* (2, 63) = 0.324, *p* = 0 .725, partial η2 = 0.010.

SCB pooled initiations were tested in a covariation model. There was no statistically significant interaction between disability and treatment condition on SCB pooled initiations, whilst controlling for IQ, *F* (2, 67) = 1.130, *p* = .329, partial η2 = .033.

SCB pooled responses were tested in a covariation model. There was no statistically significant interaction between disability and treatment condition on SCB pooled responses, whilst controlling for IQ, *F* (2, 67) = .350, *p* = .706, partial η2 = .010.

Finally, pooled SCB were tested within a covariation analysis. There was no statistically significant interaction between disability and treatment condition on pooled SCB, whilst controlling for IQ, *F* (2, 68) = .283, *p* = .754 partial η2 = .008.

In the present study, it was not detected that participant IQ scores influenced the effect of intervention condition and disability on the various SCB gain outcomes scores. Supplementary analyses were attempted with IQ classification, but were not statistically significant (*p* > .05).

Effect of covariate communication skills. An ANCOVA was run to determine the effect of treatment condition on post-observation SCB gain score outcomes after controlling for participant communication ability (as assessed through the adapted mean SSIS social status composite). After adjustment for communication ability, there was no statistically significant interaction between disability and treatment condition on task-related responses, *F* (2, 114) = .681, *p* = .508, partial η2 = .012. This finding is consistent with the earlier two-way ANOVA model (see research question one). This result suggests that the mean SSIS composite score does not influence the mean gain score of social task-related responses in this sample.

SCB task-related initiations were tested with the covariate of communication ability. There was no statistically significant interaction, though on a trend of significance, between disability and treatment condition on social task-related initiations, whilst controlling for communication skills, *F* (2, 119) = 2.573, *p* = .081, partial η2 = .041.

SCB pooled initiations were tested in a covariation model. There was no statistically significant interaction between disability and treatment condition on SCB pooled initiations, communication skills, *F* (2, 118) = 2.027, *p* = .136, partial η2 = .033.

SCB pooled responses were tested in a covariation model. There was no statistically significant interaction between disability and treatment condition on SCB pooled responses, whilst controlling for communication skills, *F* (2, 118) = .944, *p* = .392, partial η2 = .016.

Finally, pooled SCB were tested within a covariation analysis. There was no statistically significant interaction between disability and treatment condition on pooled SCB, whilst controlling for communication skills, *F* (2, 121) = .695, *p* = .501, partial η2 = .011.

In the present study, it was not detected that participant SSIS communication ability score influenced the effect of intervention condition and disability on the various SCB gain outcomes scores. Supplementary analyses were attempted with verbal communication presence, but were not statistically significant (*p* > .05).

Effect of covariate disability severity. An ANCOVA was run to determine the effect of treatment condition on post-observation SCB gain score outcomes after controlling for disability severity (as assessed through the adapted CARS2-ST severity score). After adjustment for communication ability, there was no statistically significant interaction between disability and treatment condition on task-related responses, *F* (2, 55) = .756, *p* = .474, partial η2 = .027. This finding is consistent with the earlier two-way ANOVA model (see Research Question 1). This result suggests that the disability severity score does not influence the mean gain score of social task-related responses in this sample.

SCB task-related initiations were tested with the covariate of disability severity. There was no statistically significant interaction between disability and treatment condition on social task-related initiations, whilst controlling for disability severity, *F* (2, 56) = .896, *p* = .414, partial η2 = .031.

SCB pooled initiations gain score was tested in a covariation model. There was a statistically significant interaction between disability and treatment condition on SCB pooled initiations, whilst controlling for disability severity, *F* (2, 54) = 5.755, *p* = .005, partial η2 = .176. This result indicated a significant interaction term. Statistical significance was accepted at the Bonferroni-adjusted alpha level of .01667. Adjusted mean SCB pooled initiation gain scores in the DD with ASD group (.033) was lower than the DD group (.978) when involved in the TAU condition, *F* (2, 54) = 3.104, *p* =.019, partial η2 = .103. However, the effect of the other treatment conditions (TAU vs. Peer Support; Peer Network vs. Peer Support) was not statistically significant between groups, *p* >.05. Overall, disability severity served as a statistical significant covariate.

SCB pooled responses were tested in a covariation model. There was no statistically significant interaction between disability and treatment condition on SCB pooled responses, whilst controlling for disability severity, *F* (2, 56) = .838, *p* = .438, partial η2 = .029.

Finally, pooled SCB were tested within a covariation analysis. There was no statistically significant interaction between disability and treatment condition on pooled SCB, whilst controlling for disability severity, *F* (2, 56) = .584, *p* = .561, partial η2 = .020.

In the present study, it was detected that the participant disability severity score influenced the effect of intervention condition and disability on the SCB gain outcomes scores, specifically SCB pooled initiations.

Additionally Supplementary Analyses

Additional covariate analyses were completed for the variables of participant gender and age. No statistical significant effects were detected in creating a significant interaction term for individual SCB gain scores (p >.05).

Research Question 3: What social interaction quality differences, as far as affect, reciprocity, content, communication mode, response relevance, and overall quality, were observed between high school students with severe developmental delays with and without ASD, and typically developing high school students at (pre-and) post-observations?

Research question three sought to determine the differences in social communication behavior (SCB) quality indicators. Research question three reported observed gain scores between the frequencies of different SCBs (i.e. initiation types, response types). To further examine the *quality* of these social communication behaviors, Research Question 3 analyzed the *quality* ratings given by observers of the participants. Five different quality indicator ratings were completed by study observers for each participant observation with reliable IOA (90-100%, see Asmus, et al, 2017 and Carter et al., 2016 for more information). These quality indicators were: reciprocity, affect, content, response appropriateness, and overall social interaction quality. These quality indicator variables are summarized in Appendix H (Observational Coding Manual). Findings for each quality indicator are described below along with descriptive statistics and inferential statistics. Consistent with research question one, SCB quality indicator gain (i.e. change, difference) scores were commuted between a SCB quality indicator obtained for a participant from the observations at pre-treatment and at the observations at post-treatment. As discussed in the methods chapter, three different observations were collected a pre-treatment and at post-treatment. Similar to research question one, due to potential confounds being introduced as observations (and associated quality indicator ratings) were collected on three different occasions, pre-and post-SCB quality indicators were averaged as reflected as: pre-SCB quality indicator score (μ) = pre quality indicator$_{(1)}$ + pre quality indicator $_{(2)}$ + pre quality indicator $_{(3)}$; post-SCB quality indicator score (μ) = post quality indicator$_{(1)}$ + post quality indicator $_{(2)}$ + post quality indicator $_{(3)}$. After pre-and post-SCB quality indicator scores were separately averaged, a gain score was computed as such: SCB quality indicator gain score = (μ) post SCB quality indicator – (μ) pre SCB quality indicator. When computing a gain score in this manner a positive gain score indicates that the post-SCB quality indicator (outcome) score is greater than the pre-SCB quality indicator (outcome) score, a negative gain score indicates that the post-SCB quality indicator (outcome) score was less than the pre-SCB quality indicator (outcome) score. In the present study the dependent variable is SCB quality indicator (outcome) gain score so it would be expected that successful treatment would lead to higher SCB quality indicators gain scores being rated at post-treatment. Thus, the gain score should be positive. The gain score controls for individual differences in pretest scores by measuring the post-observation score relative to the each participant's pre-observation score. But, a gain score analysis does not control for the differences in pretest scores between the treatment groups (DD with ASD and DD). After mean gain scores were commuted, descriptive statistics were commuted for each dependent variable (social communication behavior outcome score); these results are summarized below per dependent variable (i.e. SCB quality indicator) investigated. Refer to table 46 for overview of mean and standard deviations per pre-and post-social interaction quality scores across conditions and table 47 (located at back of chapter) for the correlation matrix comparing the relationships between pre-and post-social interaction quality indicator scores. See Appendix L for additional graphical representations of pre, post, and change scores among groups and treatment conditions.

Table 46. *Mean and Standard Deviations for Social Interaction Quality Indicators*

Social Interaction Quality Indicator	M	SD
Pre Social Reciprocity	2.5323	.67644
Post Social Reciprocity	2.1409	.66394
Pre Content Quality	2.9142	.28372
Post Content Quality	2.8389	.30628
Pre Affect Quality	2.6969	.45202
Post Affect Quality	2.4743	.45869
Pre Responses Quality	2.9771	.12836
Post Responses Quality	2.9500	.14552
Pre Overall Quality	4.0884	1.15477
Post Overall Quality	3.3997	.99926

M = Mean, SD = Standard Deviation

Descriptive Analysis of SCB Quality Indictors by Intervention and Disability Groups

Social interaction reciprocity quality. Social reciprocity was rated by observers on a scale of 1 (“Low” Social Reciprocity) to 3 (“High” Social Reciprocity). Findings are summarized in figures 1 to 3. At pre-treatment, within the **Peer Support** condition, DD with ASD participants had a mean social reciprocity rating of 1.681 that ranged from 1.00 to 3.00. At post-treatment, they had a mean social reciprocity rating of 1.863 that ranged from 1.00 to 3.00. The average mean pre-to post-social reciprocity gain score was 0.375, with a range of -1.33 to 1.67. This finding suggests that DD with ASD participants had little gain from pre-to post-treatment within the Peer Support condition on the quality indicator of social reciprocity. Overall, they were rated as having generally “low” social reciprocity within the Peer Support condition.

At pre-treatment, within the **Peer Network** condition, DD with ASD participants had a mean social reciprocity rating of 1.635 that ranged from 1.00 to 3.00. At post-treatment, they had a mean social reciprocity rating of 1.947 that ranged from 1.00 to 3.00. The average mean pre-to post-social reciprocity gain score was 0.396, with a range of -1.00 to 2.00. This data suggests that DD with ASD participants had little gain from pre-to post-treatment within the Peer Network condition on the quality indicator of social reciprocity. In general, observers rated their social reciprocity as approaching "medium" social reciprocity quality at post-treatment within the Peer Network condition.

At pre-treatment, within the **TAU** condition, DD with ASD participants had a mean social reciprocity rating of 1.750 that ranged from 1.00 to 3.00. At post-treatment, they had a mean social reciprocity rating of 2.051 that ranged from 1.00 to 3.00. The average mean pre-to post-social reciprocity gain score was 0.352, with a range of -0.67 to 2.00. This data suggests that DD with ASD participants had little change from pre-to post-treatment within the TAU condition on the quality indicator of social reciprocity. However, their mean social reciprocity rating was higher at post-treatment when compared to PS and PN conditions. In general, observers rated their social reciprocity as "medium" at post-treatment.

At pre-treatment, within the **Peer Support** condition, DD participants had a mean social reciprocity rating of 2.288 that ranged from 1.00 to 3.00 ("Low" Social Reciprocity) to 3 ("High" Social Reciprocity). At post-treatment, they had a mean social reciprocity rating of 2.388 that ranged from 1.00 to 3.00. The average mean pre-to post-social reciprocity gain score was 0.087, with a range of -1.00 to 1.67. This data suggests that DD participants had no gain from pre-to post-treatment within the Peer Support condition on the quality indicator of social reciprocity. Overall, they were rated as having generally "medium" social reciprocity within the Peer Support condition.

At pre-treatment, within the **Peer Network** condition, DD participants had a mean social reciprocity rating of 2.122 that ranged from 1.00 to 3.00. At post-treatment, they had a mean social reciprocity rating of 2.102 that ranged from 1.00 to 3.00. The average mean pre-to post-social reciprocity gain score was 0.067, with a range of -0.67 to 1.00. This data suggests that DD participants had little to no detectable gain from pre-to post-treatment within the Peer Network condition on the quality indicator of social reciprocity. In general, observers rated their social reciprocity as approaching "medium" social reciprocity quality at post-treatment within the Peer Network condition.

At pre-treatment, within the **TAU** condition, DD participants had a mean social reciprocity rating of 2.176 that ranged from 1.00 to 3.00. At post-treatment, they had a mean social reciprocity rating of 2.258 that ranged from 1.00 to 3.00. The average mean pre-to post-social reciprocity gain score was 0.111, with a range of -2.00 to 2.00. This data suggests that DD participants had little detectable change from pre-to post-treatment within the TAU condition on the quality indicator of social reciprocity. Their mean social reciprocity rating was similar at post-treatment when compared to PS and PN conditions. In general, observers rated their social reciprocity as "medium" at post-treatment.

TD comparison peers assigned to the **Peer Support** condition had a mean social reciprocity rating of 2.827 that ranged from 1.00 ("Low" Social Reciprocity) to 3.00 ("High" Social Reciprocity). Data was not collected at post-treatment for TD peer comparisons. Overall, they were rated as having generally "medium" social reciprocity within the Peer Support condition, which was observed as similar to the DD participants' post-treatment scores.

TD comparison peers assigned to the **Peer Network** condition had a mean social reciprocity rating of 2.824 that ranged from 1.00 ("Low" Social Reciprocity) to 3.00 ("High"

Social Reciprocity). Data was not collected at post-treatment for TD peer comparisons. Overall, TD comparison peers had a social reciprocity that approached “high” quality within the Peer Network condition.

TD comparison peers assigned to the TAU condition had a mean social reciprocity rating of 2.917 that ranged from 2.00 (“Low” Social Reciprocity) to 3.00 (“High” Social Reciprocity). Data was not collected at post-treatment for TD peer comparisons. Overall, they were rated as having generally “medium to high” social reciprocity within the TAU condition.

Social interaction content quality. Social interaction content quality was rated by observers on a Likert scale of 1 to 3, with the following ratings: 1 = “Appropriate,” 2 = “Neutral,” 3 = “Inappropriate.” Findings are summarized in figures 4 to 6. At pre-treatment, within the **Peer Support** condition, DD with ASD participants had a mean content rating of 2.833 that ranged from 2.00 to 3.00. At post-treatment, they had a mean content rating 2.833 that ranged from 1.67 to 3.00. The average mean pre-to post-content gain score was 0.000, with a range of -1.33 to 1.00. In general, this data suggests that DD with ASD participants had no change from pre-to post-treatment within the Peer Support condition on the quality indicator of content. Overall, they were rated as having generally “neutral” (approaching “appropriate”) content quality within the Peer Support condition.

At pre-treatment, within the **Peer Network** condition, DD with ASD participants had a mean content rating of 2.786 that ranged from 1.00 to 3.00. At post-treatment, they had a mean content rating 2.824 that ranged from 2.00 to 3.00. The average mean pre-to post-content gain score was 0.115, with a range of -1.00 to 2.00. This data suggests that DD with ASD participants had little detected change from pre-to post-treatment within the Peer Network condition on the quality indicator of content. Overall, they were rated as having generally "neutral" (approaching "appropriate") content quality within the Peer Network condition, which is consistent with participants in the Peer Support condition.

At pre-treatment, within the **TAU** condition, DD with ASD participants had a mean content rating of 2.646 that ranged from 2.00 to 3.00. At post-treatment, they had a mean content rating of 2.597 that ranged from 2.00 to 3.00. The average mean pre-to post-content quality gain score was -0.143, with a range of -0.67 to 1.00. This data suggests that DD with ASD participants had little change from pre-to post-treatment within the TAU condition on the quality indicator of content. DD with ASD mean content quality rating was similar at post-treatment when compared to PS and PN conditions. In general, observers rated their content as "neutral" at post-treatment.

At pre-treatment, within the **Peer Support** condition, DD participants had a mean content rating of 2.894 that ranged from 2.00 to 3.00. At post-treatment, they had a mean content rating 2.935 that ranged from 2.33 to 3.00. The average mean pre-to post-content gain score was -0.024, with a range of -0.67 to 0.50. In general, this data suggests that DD participants had no meaningful change within the Peer Support condition on the quality indicator of content. Overall, they were rated as having generally "neutral" (approaching "appropriate") content quality within the Peer Support condition.

At pre-treatment, within the **Peer Network** condition, DD participants had a mean content rating of 2.933 that ranged from 2.00 to 3.00. At post-treatment, they had a mean content rating 2.944 that ranged from 2.00 to 3.00. The average mean pre-to post-content gain score was 0.000, with a range of -1.00 to 1.00. This data suggests that DD participants had no detected change from pre-to post-treatment within the Peer Network condition on the quality indicator of content. Overall, they were rated as having generally "neutral" (approaching "appropriate") content quality within the Peer Network condition, which is consistent with DD participants in the Peer Support condition.

At pre-treatment, within the **TAU** condition, DD participants had a mean content rating of 2.922 that ranged from 2.00 to 3.00. At post-treatment, they had a mean content rating of 2.808 that ranged from 2.33 to 3.00. The average mean pre-to post-content quality gain score was -0.118, with a range of -0.67 to 0.67. This data generally suggests that DD participants had no change from pre-to post-treatment within the TAU condition on the quality indicator of content. Their mean content rating was similar at post-treatment when compared to PS and PN conditions. In general, observers rated their content as “neutral” at post-treatment.

TD comparison peers assigned to the **Peer Support** condition had a mean content quality rating of 2.981 that ranged from 2.00 (“Neutral” Content) to 3.00 (“Appropriate” Content). Data was not collected at post-treatment for TD peer comparisons. Overall, they were rated as having generally “neutral” content quality within the Peer Support condition, which was not too different from students with disabilities’ post-treatment scores.

TD comparison peers assigned to the **Peer Network** condition had a mean quality content reciprocity rating of 2.939 that ranged from 2.00 (“Neutral” Content) to 3.00 (“Appropriate” Content). Data was not collected at post-treatment for TD peer comparisons. Overall, TD comparison peers had a content quality rating that approached “appropriate” within the Peer Network condition.

TD comparison peers assigned to the **TAU** condition had a mean content quality rating of 2.917 that ranged from 2.00 (“Neutral” Content) to 3.00 (“Appropriate” Content). Data was not collected at post-treatment for TD peer comparisons. Overall, they were rated as having generally “neutral” to “appropriate” content within the TAU condition.

Social interaction affect quality. Social interaction affect quality was rated by observers on a Likert scale of 1 to 3, with the following categories: 1 = "Negative," 2 = "Neutral," 3 = "Positive." Findings are summarized in figures 7 to 9. At pre-treatment, within the **Peer Support** condition, DD with ASD participants had a mean affect rating of 2.333 that ranged from 2.00 to 3.00. At post-treatment, they had a mean content rating 2.412 that ranged from 1.67 to 3.00. The average mean pre-to post-affect gain score was 0.111, with a range of -1.00 to 1.00. In general, this data suggests that DD with ASD participants had no change from pre-to post-treatment within the Peer Support condition on the quality indicator of affect. Overall, they were rated as having generally "neutral" affect quality within the Peer Support condition.

At pre-treatment, within the Peer Network condition, DD with ASD participants had a mean affect rating of 2.313 that ranged from 1.67 to 3.00. At post-treatment, they had a mean affect rating 2.263 that ranged from 2.00 to 3.00. The average mean pre-to post-affect gain score was -0.031, with a range of -1.00 to 0.50. This data suggests that DD with ASD participants had no meaningful change from pre-to post-treatment within the Peer Network condition on the quality indicator of affect. Overall, they were rated as having generally "neutral" affect quality within the Peer Network condition, which is consistent with participants in the Peer Support condition.

At pre-treatment, within the **TAU** condition, DD with ASD participants had a mean affect rating of 2.167 that ranged from 2.00 to 3.00. At post-treatment, they had a mean affect rating of 2.039 that ranged from 1.00 to 3.00. The average mean pre-to post-affect quality gain score was -0.019, with a range of -1.00 to 1.00. This data suggests that DD with ASD participants had no meaningful gain from pre-to post-treatment within the TAU condition on the quality indicator of affect. Their mean affect quality rating was consistent at post-treatment when compared to PS and PN conditions. In general, observers rated their affect as “neutral” at post-treatment.

At pre-treatment, within the **Peer Support** condition, DD participants had a mean affect rating of 2.712 that ranged from 1.00 to 3.00. At post-treatment, they had a mean affect rating 2.566 that ranged from 2.00 to 3.00. The average mean pre-to post-affect gain score was -0.167, with a range of -0.67 to 0.67. In general, this data suggests that DD participants had no change from pre-to post-treatment within the Peer Support condition on the quality indicator of affect. Overall, they were rated as having generally “neutral” affect quality within the Peer Support condition.

At pre-treatment, within the **Peer Network** condition, DD participants had a mean affect rating of 2.322 that ranged from 2.00 to 3.00. At post-treatment, they had a mean affect rating 2.593 that ranged from 2.00 to 3.00. The average mean pre-to post-affect gain score was 0.311, with a range of -0.33 to 1.00. This data suggests that DD participants had no meaningful change from pre-to post-treatment within the Peer Network condition on the quality indicator of affect. Overall, they were rated as having generally “neutral” affect quality within the Peer Network condition, which is consistent with participants in the Peer Support condition.

At pre-treatment, within the **TAU** condition, DD participants had a mean affect rating of 2.546 that ranged from 1.00 to 3.00. At post-treatment, they had a mean affect rating of 2.742 that ranged from 2.00 to 3.00. The average mean pre-to post-affect quality gain score was 0.222, with a range of -0.67 to 2.00. This data suggests that DD participants had no meaningful gain from pre-to post-treatment within the TAU condition on the quality indicator of affect. Their mean affect quality rating was consistent at post-treatment when compared to PS and PN conditions. In general, observers rated their affect as “neutral” at post-treatment within the TAU condition.

TD comparison peers assigned to the **Peer Support** condition had a mean affect quality rating of 2.904 that ranged from 2.00 (“Neutral” Content) to 3.00 (“Appropriate” Content). Data was not collected at post-treatment for TD peer comparisons. Overall, they were rated as having generally “neutral” to “positive” affect quality within the Peer Support condition, which was slightly higher than students with disabilities at post-treatment scores.

TD comparison peers assigned to the **Peer Network** condition had a mean quality affect rating of 2.843 that ranged from 2.00 (“Neutral”) to 3.00 (“Appropriate”). Data was not collected at post-treatment for TD peer comparisons. Overall, TD comparison peers had an affect quality rating that approached “positive” within the Peer Network condition.

TD comparison peers assigned to the **TAU** condition had an affect quality rating of 2.833 that ranged from 2.00 (“Neutral”) to 3.00 (“Positive”). Data was not collected at post-treatment for TD peer comparisons. Overall, they were rated as having generally “neutral” to “positive” affect within the TAU condition.

Social interaction responses quality. Social interaction responses quality was rated by observers on a Likert scale of 1 to 3, with the following categories: 1 = “Not Related,” 2 = “Somewhat Related,” 3 = “Mostly Related.” Findings are summarized in figures 10 to 12.   At pre-treatment, within the **Peer Support** condition, DD with ASD participants had a mean responses rating of 2.852 that ranged from 2.00 to 3.00. At post-treatment, they had a mean affect rating 2.863 that ranged from 2.33 to 3.00. The average mean pre-to post-responses gain score was 0.074, with a range of -0.33 to 1.00. In general, this data suggests that DD with ASD participants had no meaningful change from pre-to post-treatment within the Peer Support condition on the quality indicator of responses. Overall, they were rated as having generally “somewhat related” responses within the Peer Support condition.

At pre-treatment, within the **Peer Network** condition, DD with ASD participants had a mean responses quality rating of 2.897 that ranged from 2.50 to 3.00. At post-treatment, they had a mean responses rating of 2.956 that ranged from 2.33 to 3.00. The average mean pre-to post-responses gain score was -0.091, with a range of 0.00 to 0.50. This data suggests that DD with ASD participants had no meaningful change from pre-to post-treatment within the Peer Network condition on the quality indicator of responses. Overall, they were rated as having generally “somewhat related” responses within social interactions as they participated in the Peer Network condition, which is consistent with participants in the Peer Support condition.

At pre-treatment, within the **TAU** condition, DD with ASD participants had a mean responses rating of 2.857 that ranged from 2.00 to 3.00. At post-treatment, they had a mean responses rating of 3.000 that ranged from 3.00 to 3.00. The average mean pre-to post-responses quality gain score was 0.167, with a range of 0.00 to 1.00. This data suggests that DD with ASD participants had no meaningful gain from pre-to post-treatment within the TAU condition on the quality indicator of responses. Their mean responses quality rating was consistent at post-treatment when compared to PS and PN conditions. In general, observers rated their responses as “mostly related” at post-treatment.

At pre-treatment, within the **Peer Support** condition, DD participants had a mean responses rating of 2.950 that ranged from 2.00 to 3.00. At post-treatment, they had a mean responses rating 3.000 that ranged from 3.00 to 3.00. The average mean pre-to post-responses gain score was 0.056, with a range of 0.00 to 1.00. In general, findings suggest that DD participants had no meaningful change from pre-to post-treatment within the Peer Support condition on the quality indicator of responses. Overall, they were rated as having generally "mostly related" responses within the Peer Support condition at post-treatment.

At pre-treatment, within the **Peer Network** condition, DD participants had a mean responses rating of 3.000 that ranged from 3.00 to 3.00. At post-treatment, they had a mean responses rating 2.978 that ranged from 2.67 to 3.00. The average mean pre-to post-responses gain score was 0.000, with a range of 0.00 to 0.00. This data suggests that DD participants had no detected change from pre-to post-treatment within the Peer Network condition on the quality indicator of responses. Overall, they were rated as having generally "mostly related" responses within the Peer Network condition, which is consistent with participants in the Peer Support condition.

At pre-treatment, within the **TAU** condition, DD participants had a mean responses rating of 2.961 that ranged from 2.67 to 3.00. At post-treatment, they had a mean responses rating of 2.912 that ranged from 2.33 to 3.00. The average mean pre-to post-responses quality gain score was -0.059, with a range of -0.67 to 0.33. This data suggests that DD participants had no meaningful gain from pre-to post-treatment within the TAU condition on the quality indicator of responses. Their mean responses quality rating was consistent at post-treatment when compared to other treatment conditions. In general, observers rated their responses as "somewhat related" to "mostly related" at post-treatment within the TAU condition.

TD comparison peers assigned to the **Peer Support** condition had a mean responses quality rating of 3.000 that ranged from 3.00 to 3.00. Data was not collected at post-treatment for TD peer comparisons. Overall, they were rated as having "mostly related" responses on the responses quality indicator within the Peer Support condition, which was slightly better than students with disabilities' post-treatment scores. No rating variation was observed between TD peer comparisons within this condition.

TD comparison peers assigned to the **Peer Network** condition had a mean quality responses rating of 3.000 that ranged from 3.00 to 3.00. Data was not collected at post-treatment for TD peer comparisons. Overall, TD comparison peers had a responses quality rating that was characterized as "mostly related" within the Peer Network condition. No rating variation was observed between TD peer comparisons within this condition.

TD comparison peers assigned to the **TAU** condition had a mean responses quality rating of 3.000 that ranged from 3.00 to 3.00. Data was not collected at post-treatment for TD peer comparisons in this condition. Overall, TD comparison peers had a responses quality rating that was characterized as "mostly related" within the TAU, which is consistent with the other treatment conditions. No rating variation was observed between TD peer comparisons within the TAU condition.

Social interaction overall quality. Overall social interaction quality was rated by observers on a Likert scale of 1 to 5, with the following categories: 1 = "Low Quality," 2 = "Medium-Low Quality," 3 = "Medium Quality," 4 = "Medium-High Quality," and 5 = "High Quality." Findings are summarized in figures 13 to 15. At pre-treatment, within the **Peer Support** condition, DD with ASD participants had a mean overall social interaction quality rating of 2.458 that ranged from 1.00 to 4.33. At post-treatment, they had a mean social interaction quality rating of 3.216 that ranged from 1.33 to 5.00. The average mean pre-to post-overall social interaction quality gain score was 0.9306, with a range of -1.00 to 3.00. In general, this data suggests that DD with ASD participants had some change from pre-to post-treatment within the Peer Support condition on the quality indicator of overall social interaction quality.

Overall, they were rated as having generally “medium-low” to “medium” overall social interaction quality within the Peer Support condition.

At pre-treatment, within the **Peer Network** condition, DD with ASD participants had a mean overall social interaction quality rating of 2.458 that ranged from 1.00 to 4.50. At post-treatment, they had a mean overall social interaction quality rating of 2.816 that ranged from 1.00 to 5.00. The average mean pre-to post-overall social interaction quality gain score was 0.479, with a range of -1.50 to 2.50. This data suggests that DD with ASD participants had no meaningful change from pre-to post-treatment within the Peer Network condition on the quality indicator of overall social interaction quality. Overall, they were rated as having generally “medium-low” overall social interaction quality as they participated in the Peer Network condition, which is slightly lower than participants in the Peer Support condition.

At pre-treatment, within the **TAU** condition, DD with ASD participants had a mean overall social interaction quality rating of 2.750 that ranged from 2.00 to 4.50. At post-treatment, they had a mean overall social interaction quality rating of 2.974 that ranged from 1.00 to 4.00. The average mean pre-to post-overall social interaction quality gain score was 0.463, with a range of -0.67 to 2.00. This data suggests that DD with ASD participants had no meaningful gain from pre-to post-treatment within the TAU condition on the quality indicator of overall social interaction quality. Their mean overall social interaction quality rating was consistent at post-treatment when compared to PS and PN conditions. In general, observers rated their overall social interaction quality as approaching “medium” quality at post-treatment with the TAU condition.

At pre-treatment, within the **Peer Support** condition, DD participants had a mean overall social interaction quality rating of 3.758 that ranged from 1.00 to 5.00. At post-treatment, they had a mean overall social interaction quality rating 3.786 that ranged from 2.00 to 5.00. The average mean pre-to post-overall social interaction quality gain score was -0.016, with a range of 1.67 to -1.67. In general, this data suggests that DD participants had no meaningful change from pre-to post-treatment within the Peer Support condition on the quality indicator of overall social interaction quality. Overall, they were rated as having generally “medium” overall social interaction quality within the Peer Support condition.

At pre-treatment, within the **Peer Network** condition, DD participants had a mean overall social interaction quality rating of 3.389 that ranged from 1.00 to 4.67. At post-treatment, they had a mean overall social interaction quality rating 3.491 that ranged from 1.00 to 5.00. The average mean pre-to post-overall social interaction quality gain score was 0.211, with a range of -1.00 to 1.00. This data suggests that DD participants had no detected change from pre-to post-treatment within the Peer Network condition on the quality indicator of overall social interaction quality. Overall, they were rated as having generally “medium” overall social interaction quality within the Peer Network condition, which is consistent with participants in the Peer Support condition.

At pre-treatment, within the **TAU** condition, DD participants had a mean overall social interaction quality rating of 3.352 that ranged from 1.00 to 5.00. At post-treatment, they had a mean overall social interaction quality rating of 3.767 that ranged from 2.00 to 3.00. The average mean pre-to post-overall social interaction quality gain score was 0.444, with a range of -0.67 to 0.33. This data suggests that DD participants had no meaningful gain from pre-to post-treatment within the TAU condition on the quality indicator of overall social interaction quality. Their mean overall social interaction quality rating was consistent at post-treatment when compared to other treatment conditions. In general, observers rated DD overall social interaction quality as "medium" at post-treatment within the TAU condition.

TD comparison peers assigned to the **Peer Support** condition had a mean overall social interaction quality rating of 4.692 that ranged from 2.00 to 5.00. Data was not collected at post-treatment for TD peer comparisons. Overall, they were rated as having "mostly related" overall social interaction quality on the overall social interaction quality indicator within the Peer Support condition, which appeared higher than students with disabilities' mean post-treatment scores.

TD comparison peers assigned to the **Peer Network** condition had a mean quality overall social interaction quality rating of 4.640 that ranged from 2.00 to 5.00. Data was not collected at post-treatment for TD peer comparisons. Overall, TD comparison peers had an overall social interaction quality rating that was characterized as "medium-high" within the Peer Network condition.

TD comparison peers assigned to the **TAU** condition had a mean overall social interaction quality rating of 4.792 that ranged from 3.00 to 5.00. Data was not collected at post-treatment for TD peer comparisons in this condition. Overall, TD comparison peers had an overall social interaction quality rating that was characterized as "medium-high" approaching "high" quality within the TAU, which is consistent with the other treatment conditions.

Inferential Analyses of Social Interaction Quality Indicators by Disability and Treatment

To further address research question three, a two-way ANOVA was conducted to examine the effects of treatment conditions and disability on separate social interaction quality indicators (see section following for results). Main and interaction effects are investigated as such:

1) Intervention main-effect: Do the interaction quality indicators mean gain scores differ among peer-mediated (PS, PN) and TAU conditions? Mean gain scores (DV) are computed from pre-to post-treatment ratings.
2) Disability main-effect: Do the social interaction quality indicators mean gain scores differ by disability (DD with ASD, DD)?
3) Intervention x disability: Do the differences in the social communication mean gain scores among the three treatment conditions vary as a function of disability?

Overview. A two-way ANOVA was conducted to examine the effects of treatment and disability on observed mean changes scores of social interaction quality indicators (e.g., reciprocity, content, affect, responses, and overall quality). Residual analysis were performed to test for the assumptions of the two-way ANOVA. Outliers were assessed by inspection of a boxplot, normality by inspection of histograms and homogeneity of variances was assessed by Levene's test.

Effect of disability and treatment on social interaction reciprocity. Prior to running main inferential analyses, ANOVA assumptions were tested. There were 2 extreme outliers observed across design cells (TAU condition for DD with ASD participants n=2), as assessed as being greater than 3 box-lengths from the edge of the box in a boxplot. It was determined that the extreme outliers were not due to measurement errors or data entry errors. Residuals were fairly normally distributed as assessed by Q-Q plots and histograms by design cell, and homogeneity of variances was assessed by Levene’s test (p = .666). Assumptions were met for social interaction reciprocity dependent variable.

A two-way ANOVA revealed no statistically significant interaction between intervention condition and disability on social interaction reciprocity gain scores, F (2, 85) = .022, p = .978, partial η2 = .001. Therefore, an analysis of the main effect for treatment condition and main effect for disability was performed. There was no statistically significant difference in mean "social interaction reciprocity" gain scores between treatment conditions, *F* (2, 85) = 0.000, *p* = 1.000, partial η2 = .000. There was no statistically significant difference in mean "social interaction reciprocity" gain scores for disability (*F* (1, 85) = 2.892, *p* =.093, partial η2 = .033).

Effects of disability and treatment on social interaction content quality. Prior to running main inferential analyses, ANOVA assumptions were tested. There were 11 extreme outliers observed across design cells (PN condition for DD with ASD and DD participants n=6 total), as assessed as being greater than 3 box-lengths from the edge of the box in a boxplot. It was determined that the extreme outliers were not due to measurement errors or data entry errors. Residuals were fairly normally distributed as assessed by Q-Q plots and histograms by design cell, and homogeneity of variances was assessed by Levene's test (p = .061). Assumptions were met for social interaction content quality dependent variable.

A two-way ANOVA revealed no statistically significant interaction between intervention condition and disability on social interaction content quality gain scores, *F* (2, 77) = .401, *p* = .671, partial η2 = .010. Therefore, an analysis of the main effect for treatment condition and main effect for disability was performed. There was no statistically significant difference in mean "social interaction content quality" gain scores between treatment conditions, *F* (2, 77) = 0.170, *p* = .844, partial η2 = .004. There was no statistically significant difference in mean "social interaction content quality" gain scores for disability (*F* (1, 77) = 1.617, *p* =.207, partial η2 = .021).

Effects of disability and treatment on social interaction affect quality. Prior to running main inferential analyses, ANOVA assumptions were tested. There were 3 extreme outliers observed across design cells (TAU condition for DD with ASD participants n=3 total), as assessed as being greater than 3 box-lengths from the edge of the box in a boxplot. It was determined that the extreme outliers were not due to measurement errors or data entry errors. Residuals were fairly normally distributed (some positive skew noted for one cell in design) as assessed by Q-Q plots and histograms by design cell, and homogeneity of variances was assessed by Levene's test (p = .487). Assumptions were met for social interaction affect quality dependent variable.

A two-way ANOVA revealed a statistically significant interaction between intervention condition and disability on social interaction affect quality gain scores, F (2, 85) = 3.645, p = .030, partial η2 = .079. Therefore, an analysis of the simple main effects for treatment condition and simple main effects for disability was performed with statistical significance receiving a Bonferroni adjustment and being accepted at the $p < .025$ level. Participation in any treatment condition (either PS, PN, TAU) did not have a statistically significant effect on mean "social interaction affect quality" score for DD and DD with ASD participants, F (1, 85) = .958, p = .330, partial η2 = .011. The participation in a treatment condition (either PS, PN, TAU) did not have a statistically significant effect on mean "social interaction affect quality" gain score for DD or DD with ASD, p >.05. No significant post-hoc tests were found by independent variables.

Effects of disability and treatment on social interaction responses quality. Prior to running main inferential analyses, ANOVA assumptions were tested. There were 9 extreme outliers observed across design cells (PS: DD with ASD n=3 total, DD n=1; PN: DD with ASD n=1 total; TAU: DD with ASD n=1, DD n=3), as assessed as being greater than 3 box-lengths from the edge of the box in a boxplot. It was determined that the extreme outliers were not due to measurement errors or data entry errors. Residuals were not normally distributed as assessed by

Q-Q plots and histograms by design cell, and homogeneity of variances was violated as shown by Levene's test (p = .015). Therefore, assumptions were not met for social interaction responses quality dependent variable. To address these violations, a log transformation was applied to the dependent variable (i.e. "social interaction responses quality gain" score) to reduce the disproportionate effects of extreme outliers. As a result of the dependent variable transformation, assumptions were then met (Levene's test *p* =.398, Shapiro-Wilk *p* = 0.049). However, results were the same with and without the transformation, so original data findings are reported.

A two-way ANOVA revealed no statistically significant interaction between intervention condition and disability on social interaction responses quality gain scores, *F* (2, 68) = 1.327, *p* = .272, partial η2 = .038. Therefore, an analysis of the main effect for treatment condition and main effect for disability was performed. There was no statistically significant difference in mean "social interaction responses quality" gain scores between treatment conditions, *F* (2, 68) = .073, *p* = .930, partial η2 = .002. There was no statistically significant difference in mean "social interaction responses quality" gain scores for disability (*F* (1, 68) = 2.454, *p* =.122, partial η2 = .035).

Effects of disability and treatment on social interaction overall quality. Prior to running main inferential analyses, ANOVA assumptions were tested. There were no discernable extreme outliers observed across design cells, as assessed as being greater than 3 box-lengths from the edge of the box in a boxplot. Residuals were not normally distributed as assessed by Q-Q plots and histograms by design cell (Shapiro-Wilk *p* = 0.000) and homogeneity of variances was violated as shown by Levene's test (p = .015). Therefore, assumptions were not met for social interaction overall quality dependent variable. To address these violations, a "reflect and inverse" transformation was applied to the dependent variable (i.e. "social interaction overall quality gain” score) to reduce the disproportionate effects of extreme outliers (negative skewness). As a result of the dependent variable transformation, assumptions were then met (Levene’s test p =.387, normal histogram assessed).

A two-way ANOVA revealed no statistically significant interaction between intervention condition and disability on social interaction responses quality gain scores, F (2, 72) = .486, p = .617, partial η2 = .013. Therefore, an analysis of the main effect for treatment condition and main effect for disability was performed, which indicated that the main effect for intervention condition was on a trend of statistically significant, F (2, 72) = 2.950, p = .054, partial η^2 = .076. No main effect for disability was detected, F (1, 72) = .004, p =.950, partial η^2 = .000. All pairwise comparisons were run, for intervention condition, where reported 95% confidence intervals and p-values are Bonferroni-adjusted. The unweighted marginal means of "social interaction overall quality" gain scores for Peer Support, Peer Network, and TAU for DD and DD with ASD were -.260 (*SE* = .435), 1.076 (*SE* = .430) and -.266 (*SE* = .562), respectively. No pairwise comparisons were detected for intervention condition (p > .05).

Table 44. *Covariate Correlation Matrix*

		Disability Severity	IQ Score	Communication Skills	Verbal communication	Student Gender	Student Age
Disability Severity	r	1					
	p						
	N	67					
IQ score	r	-.370*	1				
	p	.040					
	N	31	87				
Communication Skills	r	-.183	.080	1			
	p	.139	.463				
	N	67	87	3437			
Verbal communication	r	.748**	-.149	-.151	1		
	p	.000	.423	.222			
	N	67	31	67	67		
Student Gender	r	-.167	-.081	-.080	-.180	1	
	p	.177	.454	.340	.145		
	N	67	87	145	67	145	
Student Age	r	.165	-.096	-.061	.153	.072	1
	p	.182	.376	.466	.215	.392	
	N	67	87	145	67	145	145

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 47. *Correlation Matrix for Pre-and Post-Social Interaction Quality Indicators*

Social Interaction Quality Indicator		Pre-Reciprocity	Post-Reciprocity	Pre-Content	Post-Content	Pre-Affect	Pre Responses	Post Responses	Pre Overall Quality	Post Overall Quality	Post Affect
Pre-Reciprocity	r	1									
	p										
	N	248									
Post-Reciprocity	r	.336**	1								
	p	.001									
	N	95	123								
Pre-Content	r	.258**	.089	1							
	p	.000	.411								
	N	239	88	239							
Post-Content	r	.095	.205*	.022	1						
	p	.365	.025	.839							
	N	93	120	87	120						
Pre Affect	r	.681**	.331**	.387**	.230*	1					
	p	.000	.001	.000	.027						
	N	248	95	239	93	248					
Pre Responses	r	.265**	.008	.244**	-.025	.182**	1				
	p	.000	.944	.000	.825	.005					
	N	233	82	233	81	233	233				
Post Responses	r	.181	.222*	-.074	.398**	.240*	-.035	1			
	p	.091	.020	.504	.000	.024	.760				
	N	88	110	83	110	88	78	110			
Pre Overall Quality	r	.890**	.437**	.357**	.194	.760**	.298**	.250*	1		
	p	.000	.000	.000	.063	.000	.000	.019			
	N	247	95	238	93	247	232	88	247		
Post Overall Quality	r	.415**	.776**	.107	.388**	.381**	.035	.249**	.531**	1	
	p	.000	.000	.321	.000	.000	.757	.009	.000		
	N	95	123	88	120	95	82	110	95	123	
Post Affect	r	.345**	.470**	.233*	.319**	.375**	.095	-.006	.417**	.696**	1
	p	.001	.000	.029	.000	.000	.398	.950	.000	.000	
	N	95	123	88	120	95	82	110	95	123	123

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

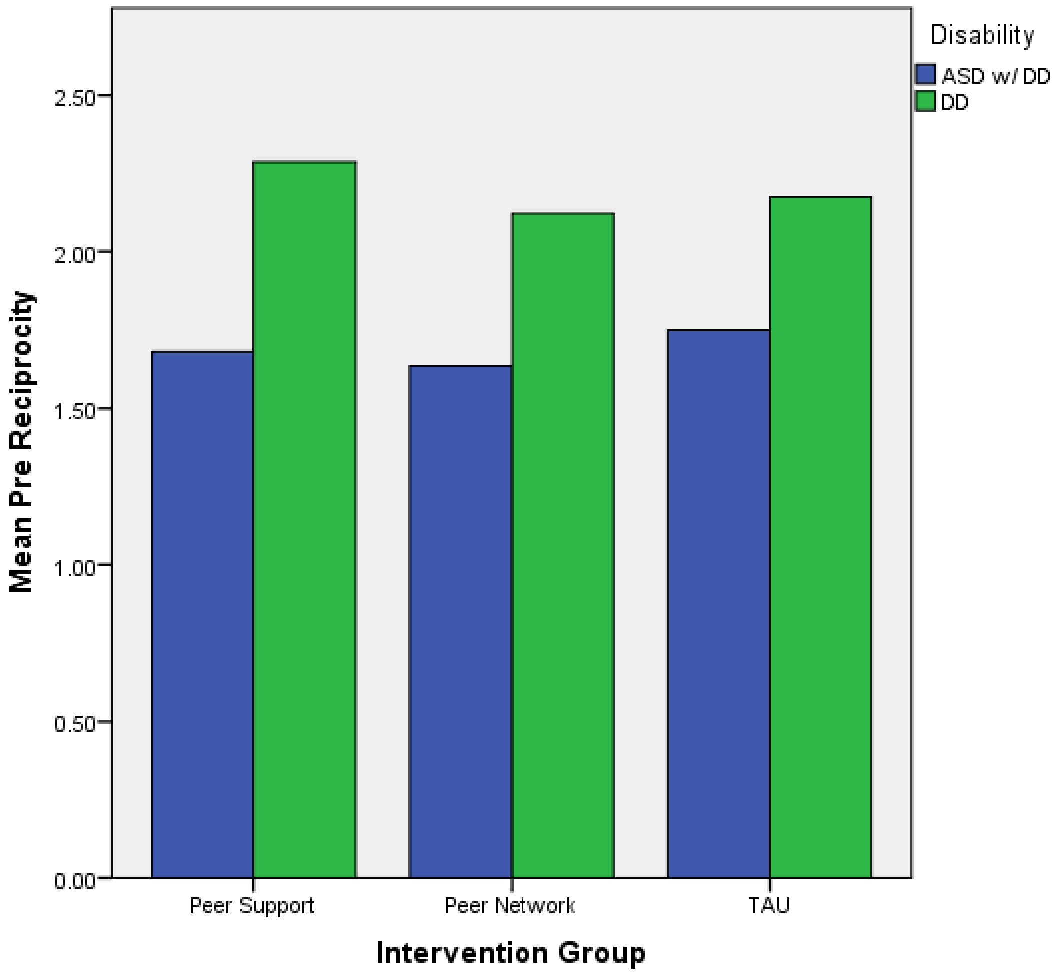

Figure 1. Mean Pre Reciprocity by Treatment Group and Disability

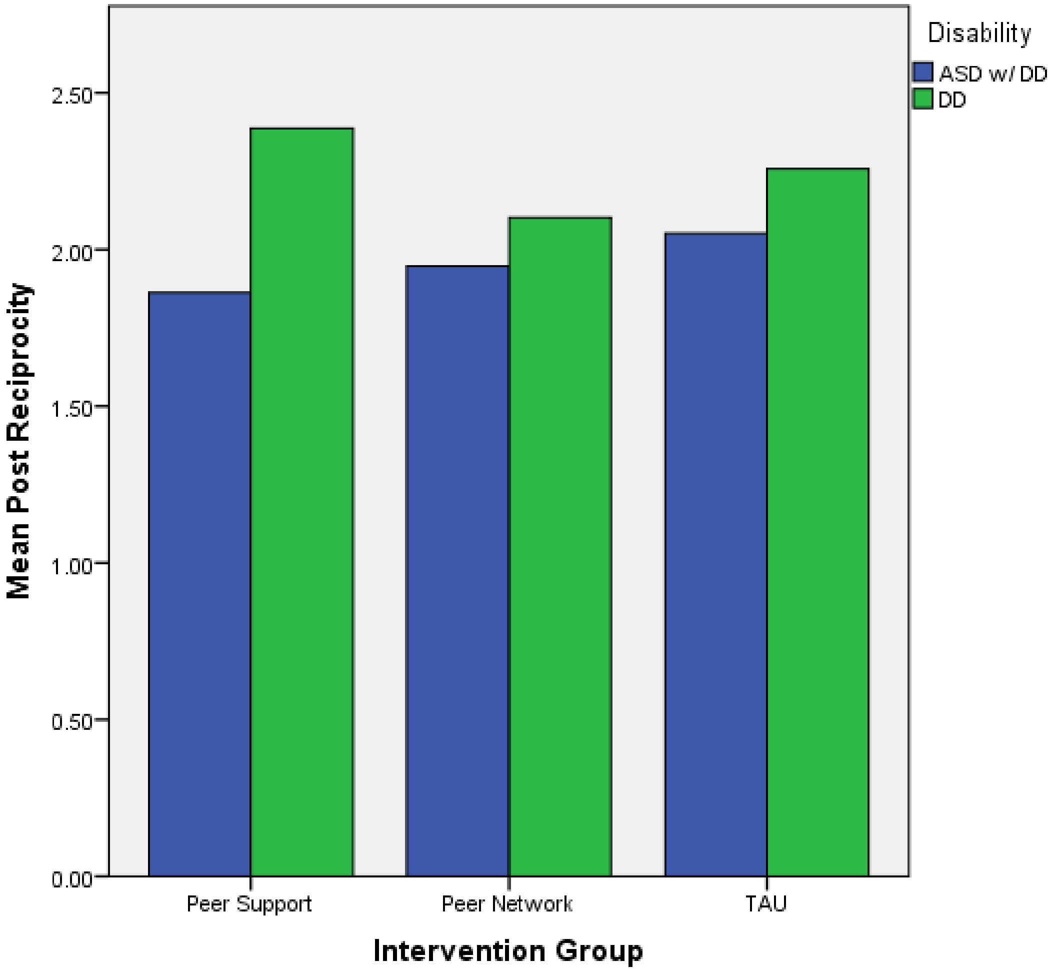

Figure 2. Mean Post Reciprocity by Treatment Group and Disability

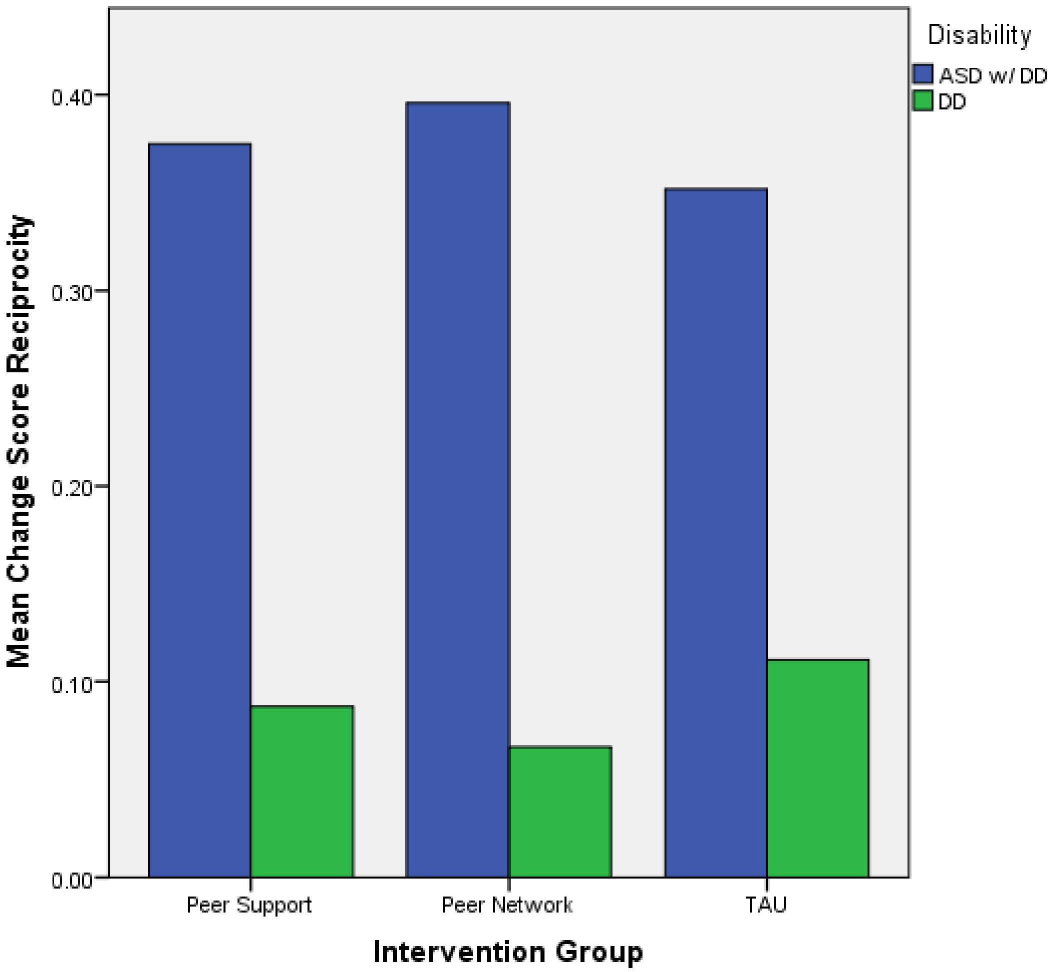

Figure 3. Mean Change Score Reciprocity by Treatment Group and Disability

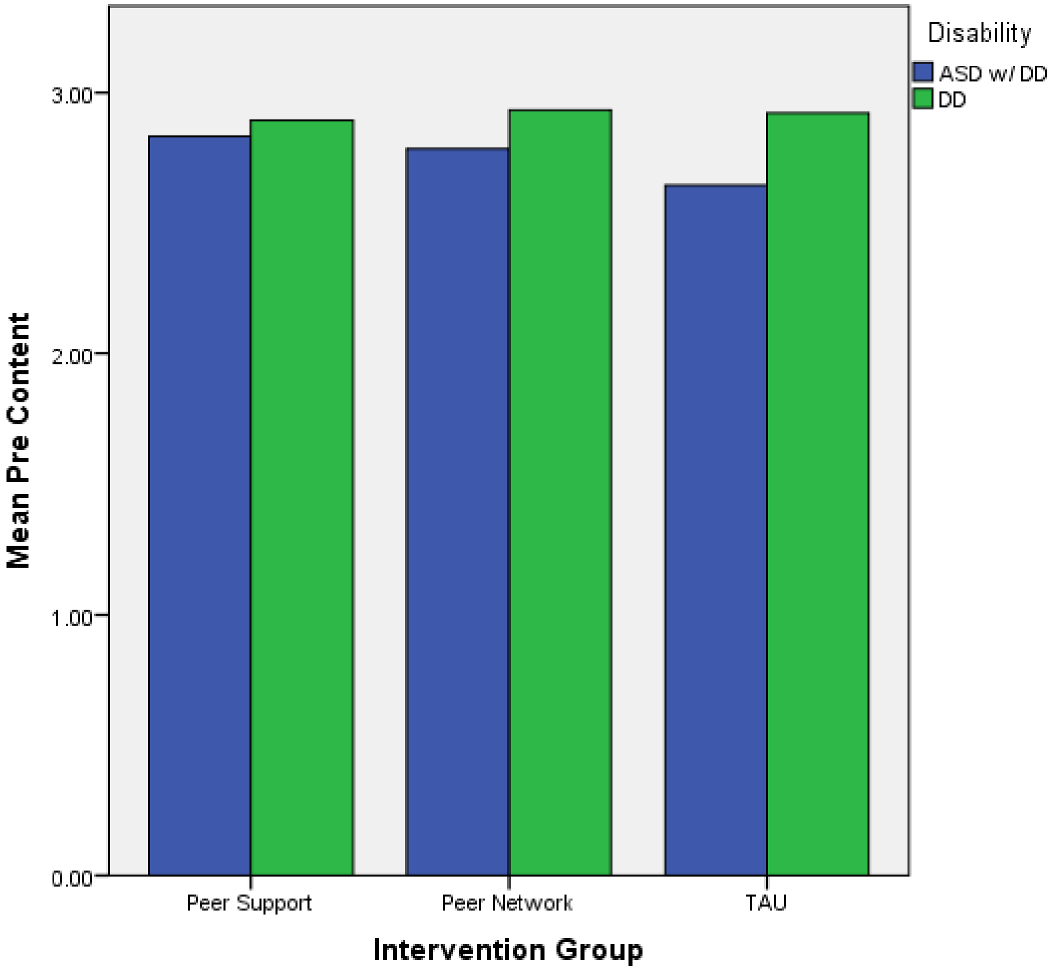

Figure 4. Mean Pre Content Quality by Treatment Group and Disability

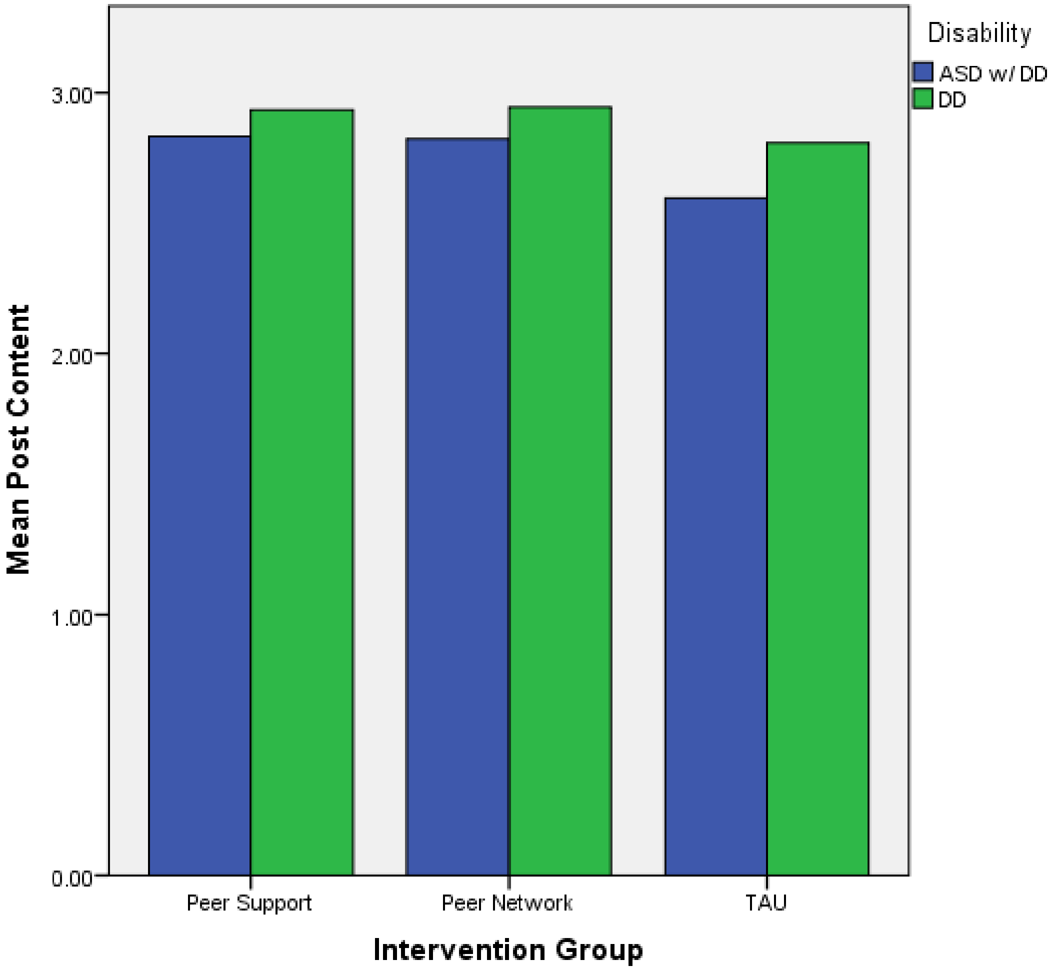

Figure 5. Mean Post Content Quality by Treatment Group and Disability

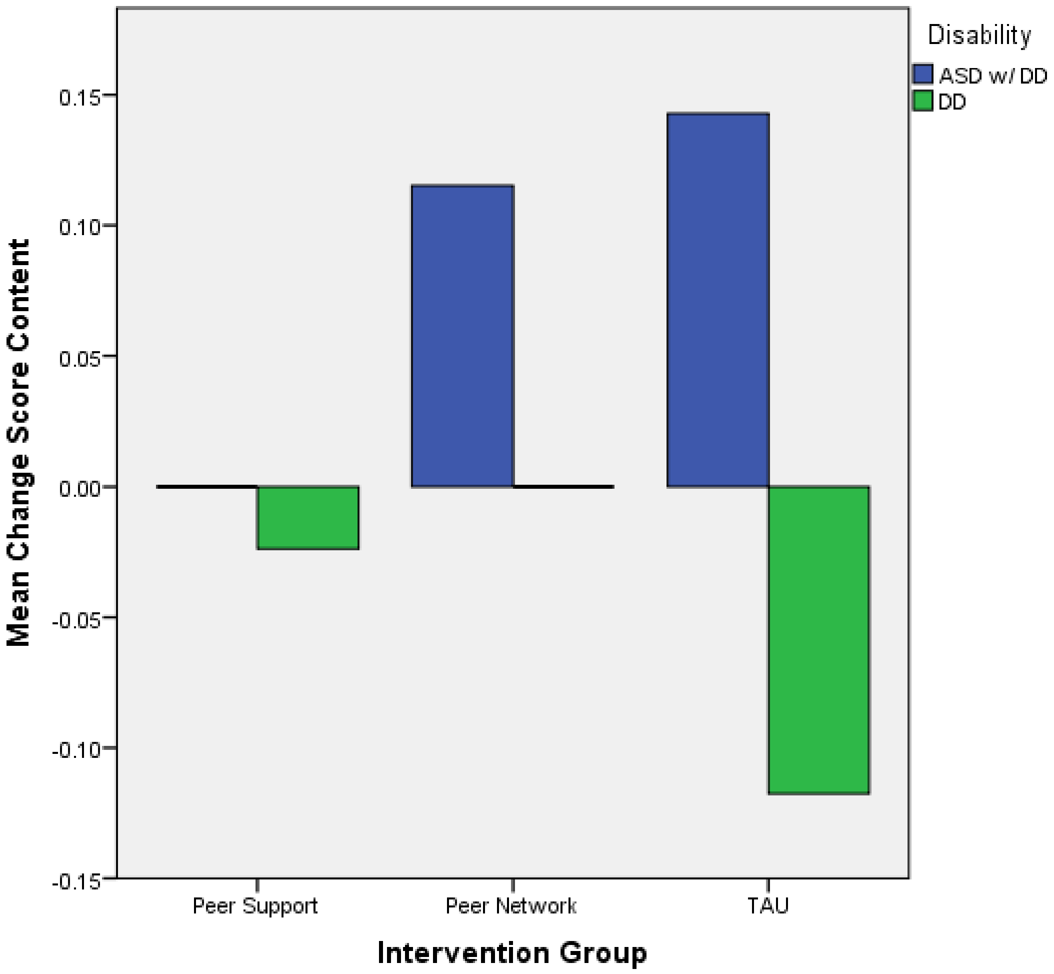

Figure 6. Mean Change Score for Content Quality by Treatment Group and Disability

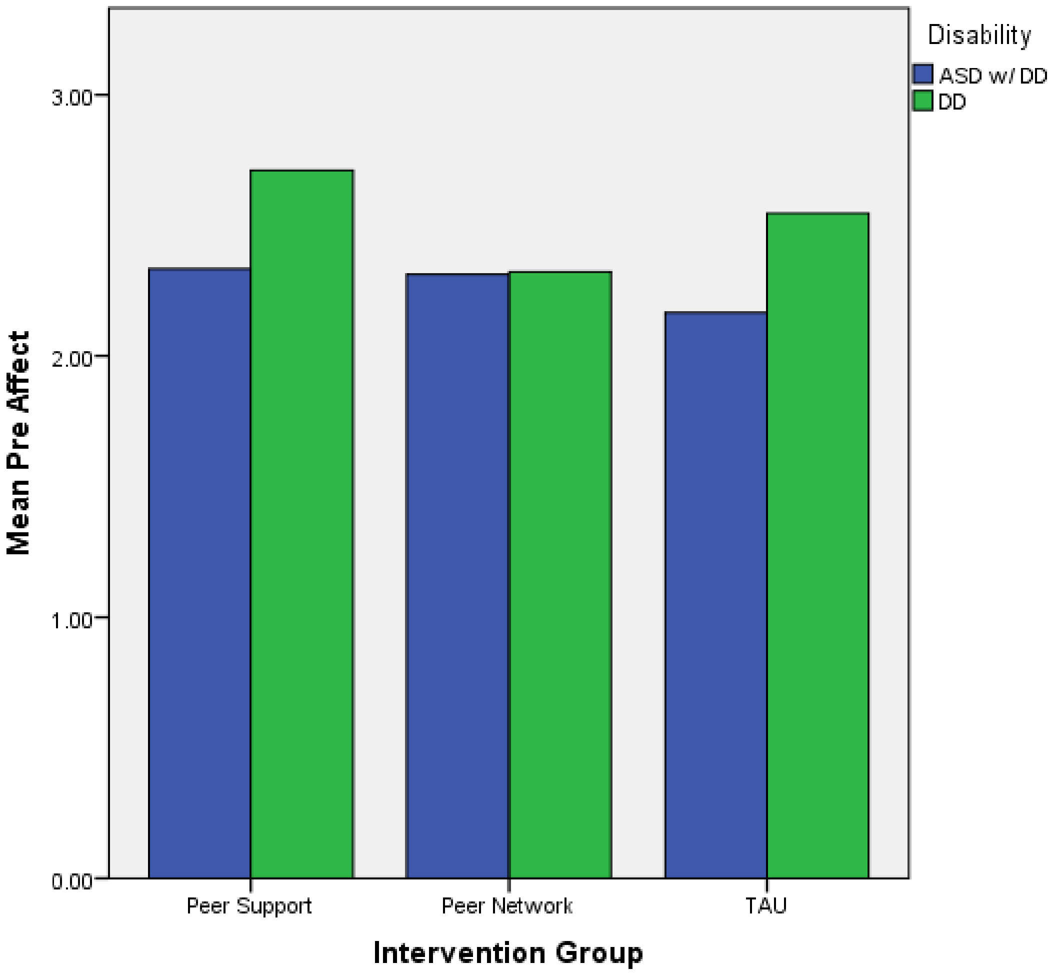

Figure 7. Mean Pre Affect Quality by Treatment Group and Disability

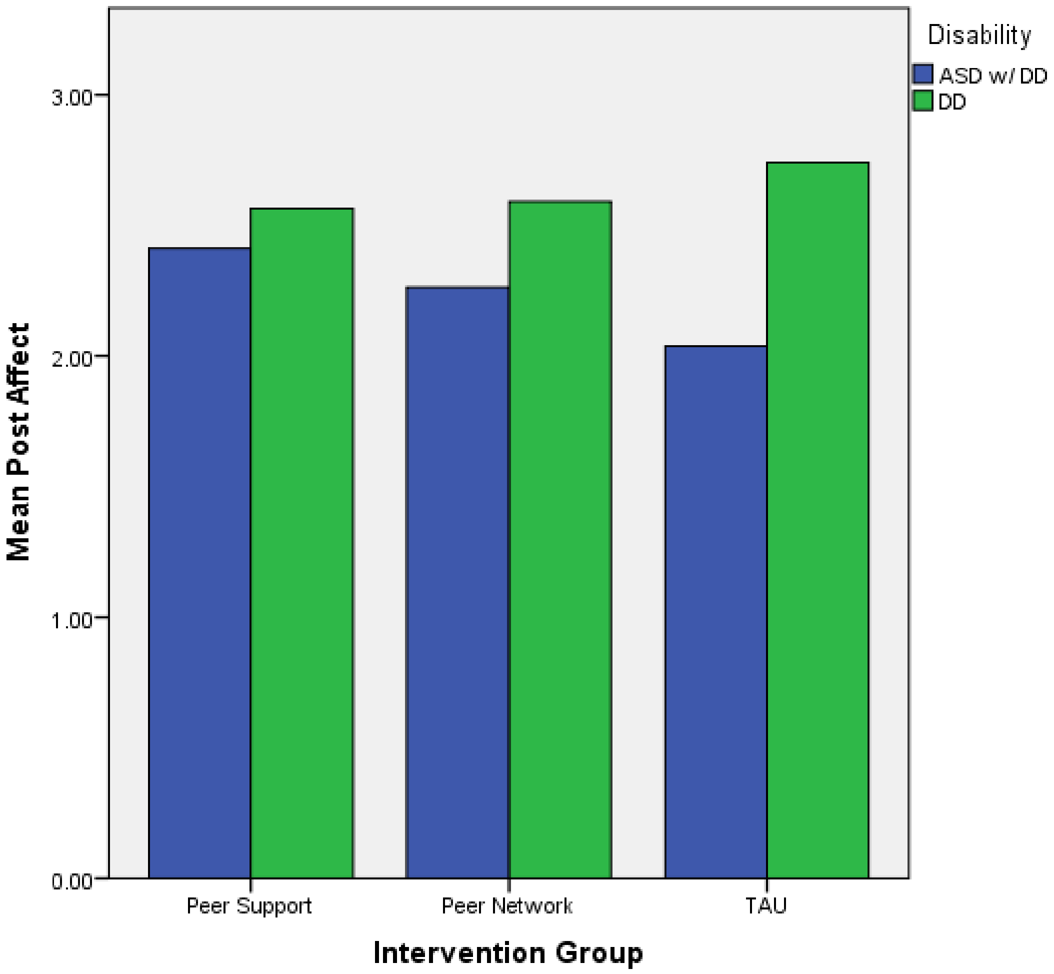

Figure 8. Mean Post Affect Quality by Treatment Group and Disability

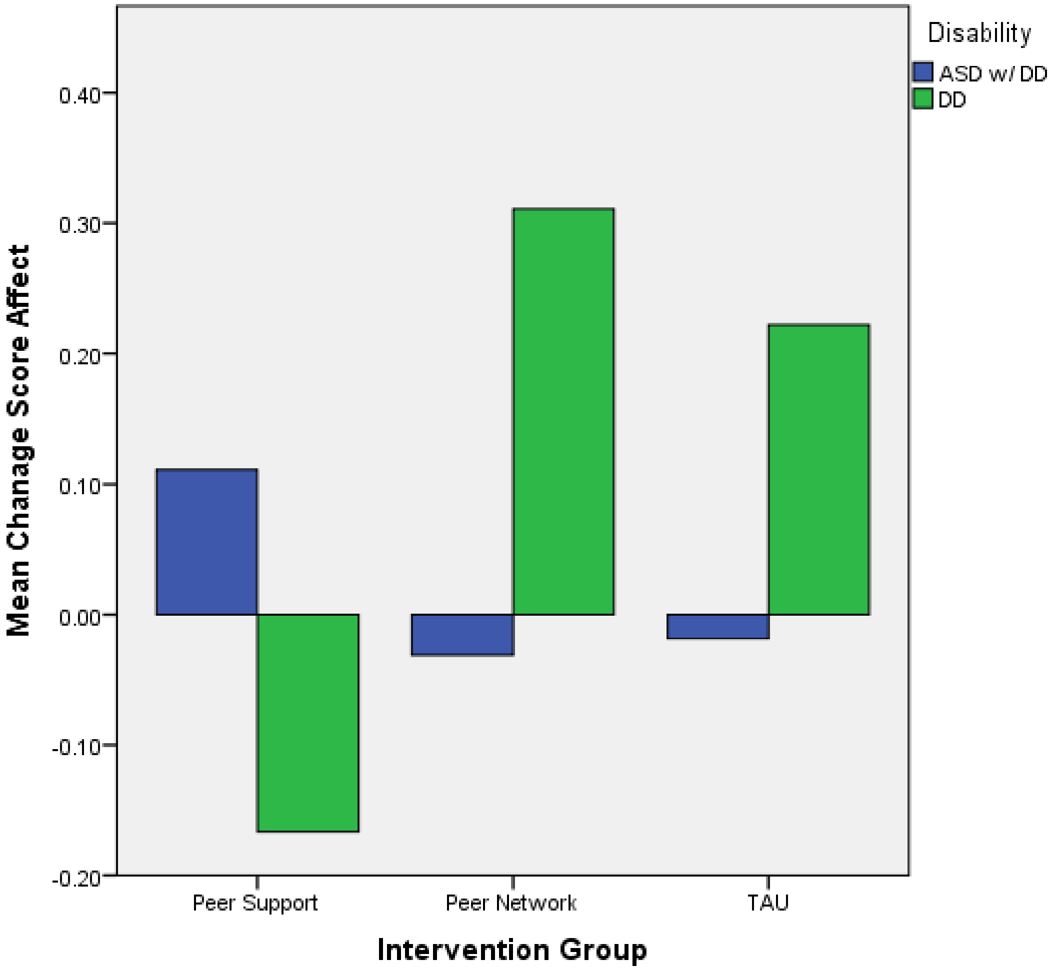

Figure 9. Mean Change Score Affect Quality by Treatment Group and Disability

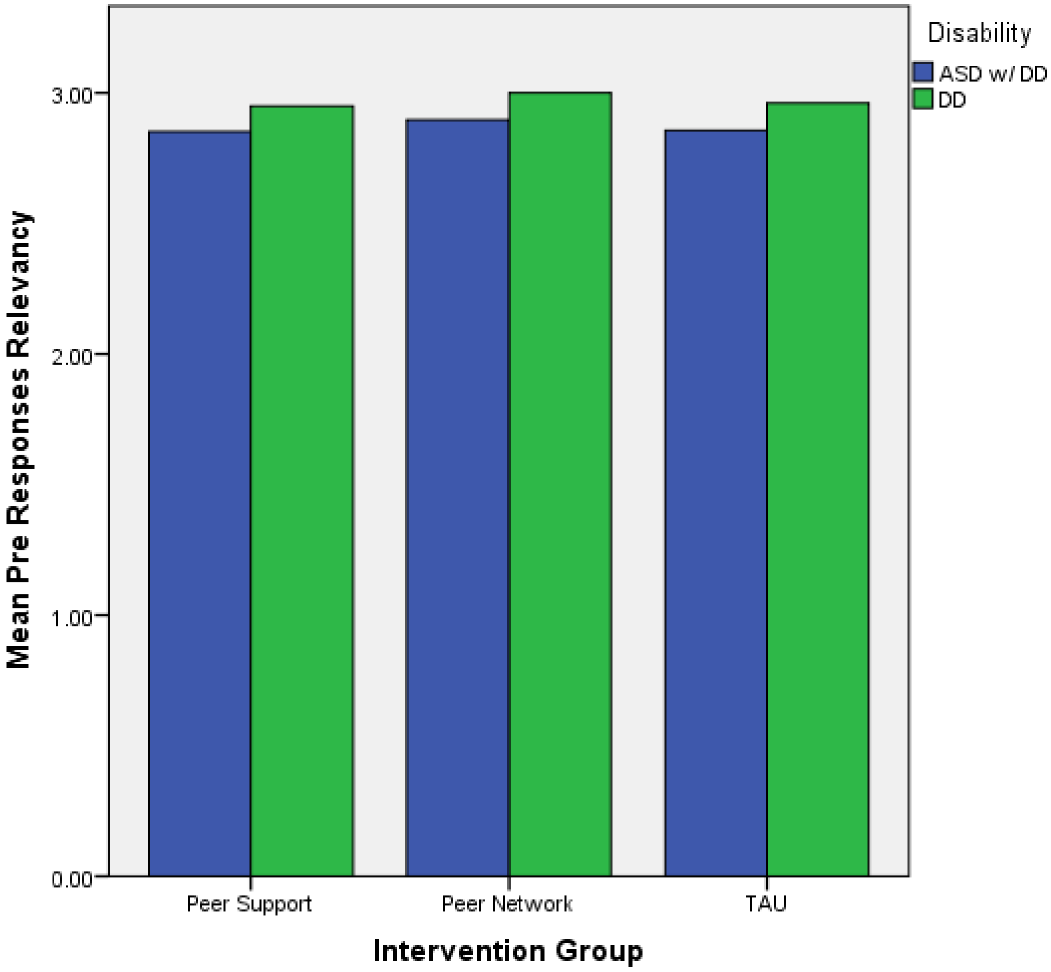

Figure 10. Mean Pre Responses Relevance Quality by Treatment Group and Disability

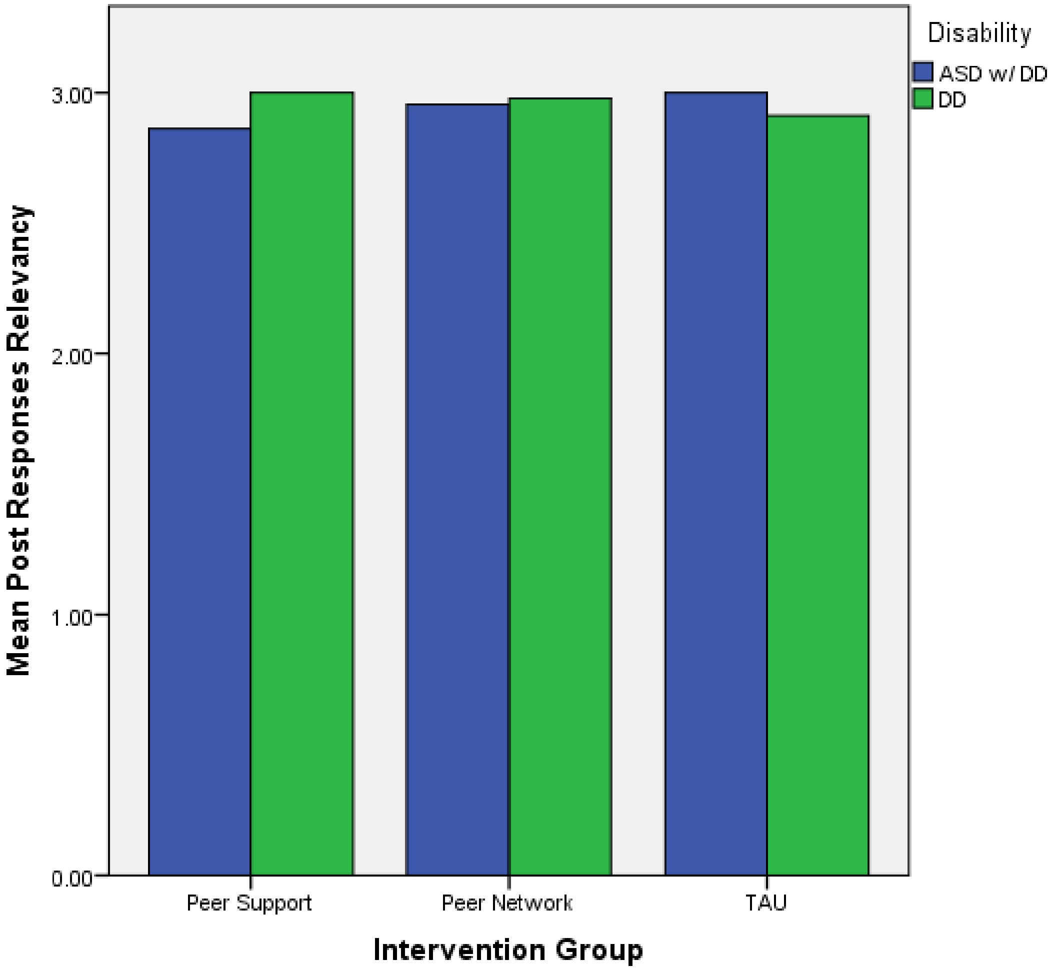

Figure 11. Mean Post Responses Relevance Quality by Treatment Group and Disability

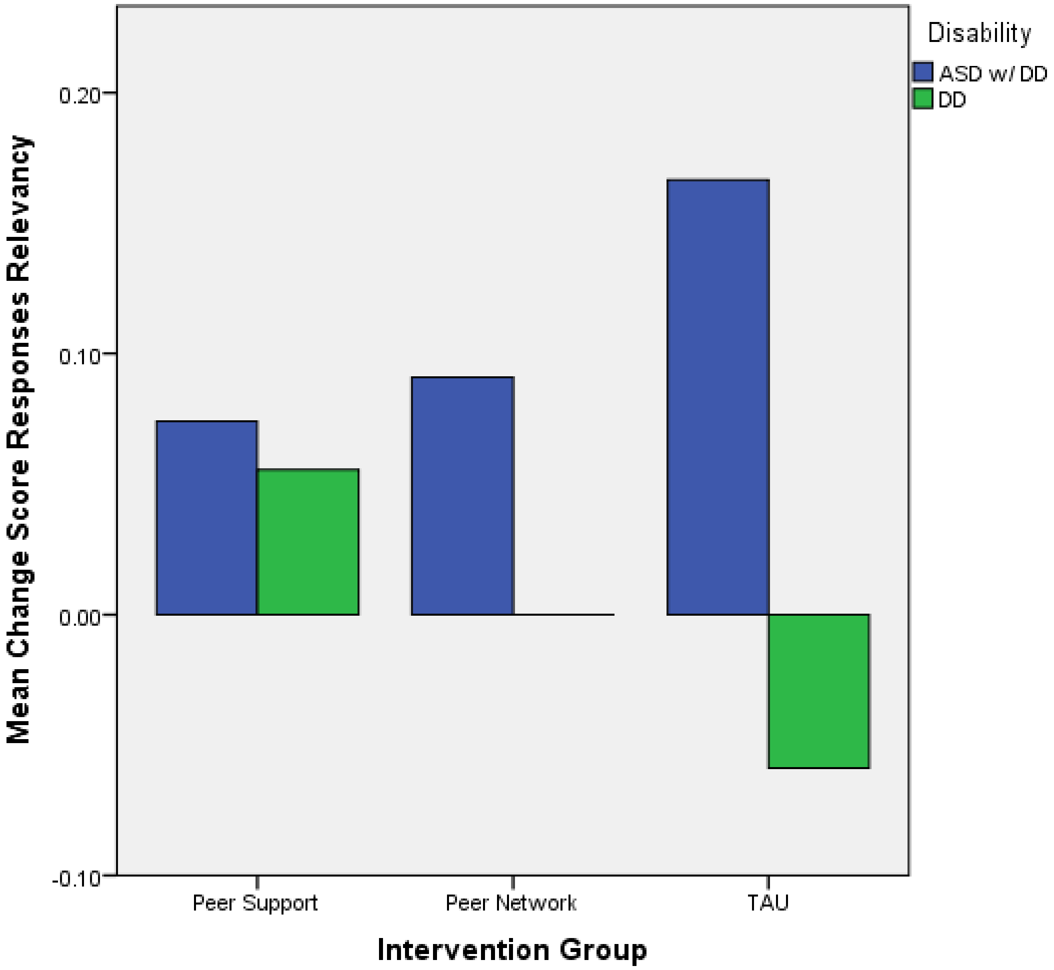

Figure 12. Mean Change Score Responses Relevance Quality by Treatment Group and Disability

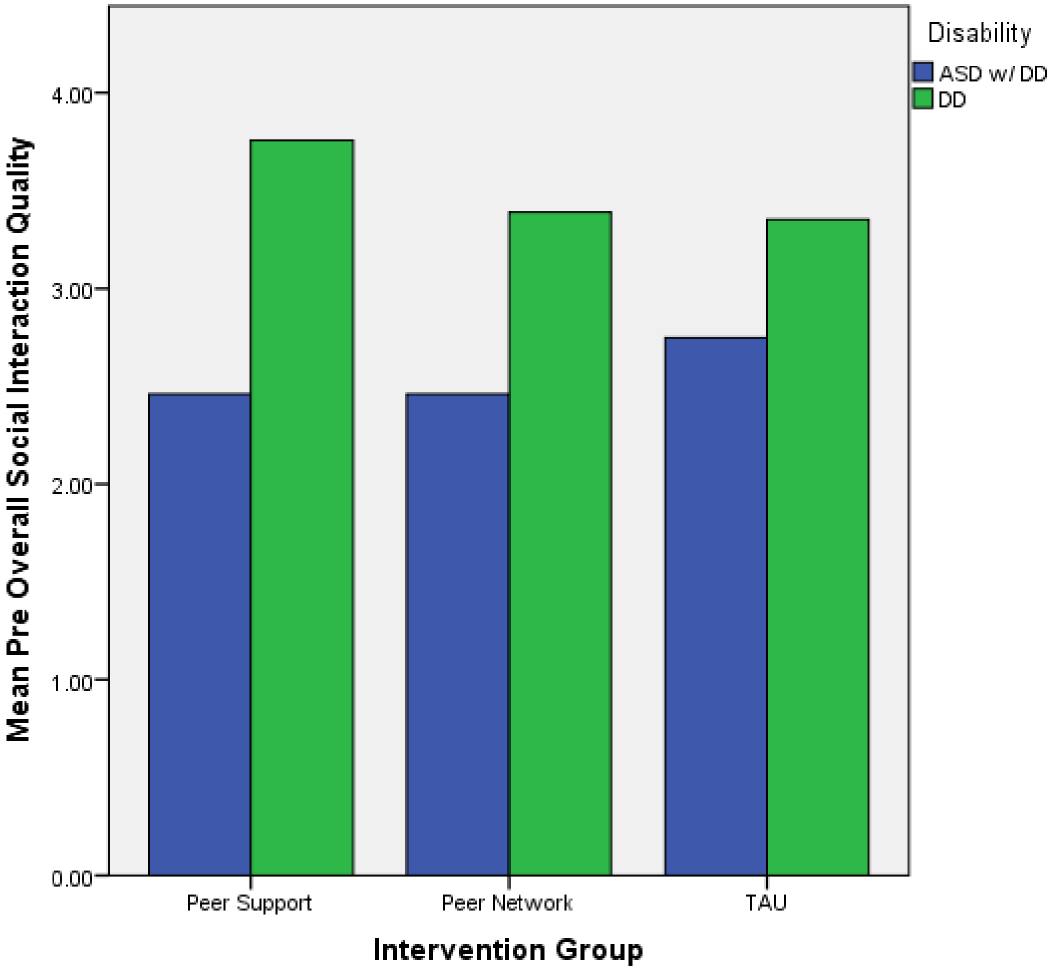

Figure 13. Mean Pre Overall Social Interaction Quality by Treatment Group and Disability

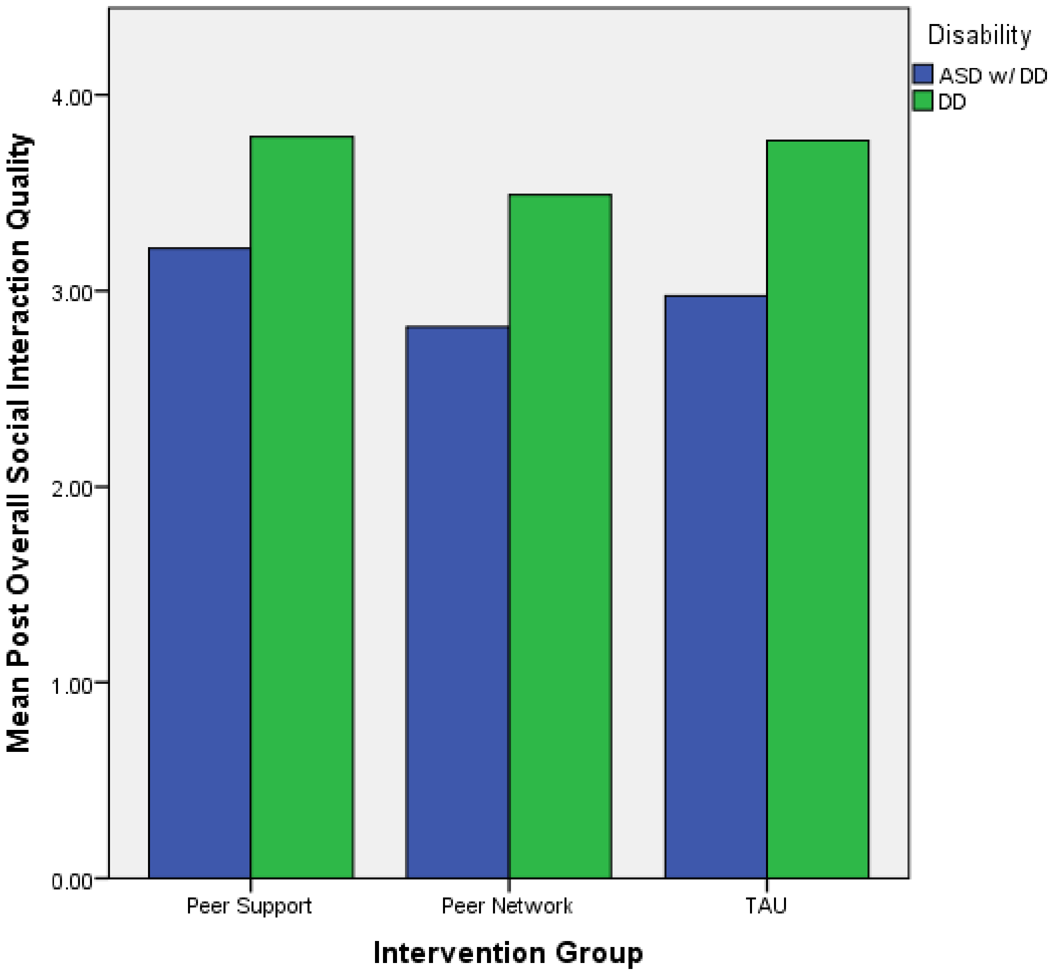

Figure 14. Mean Post Overall Social Interaction Quality by Treatment Group and Disability

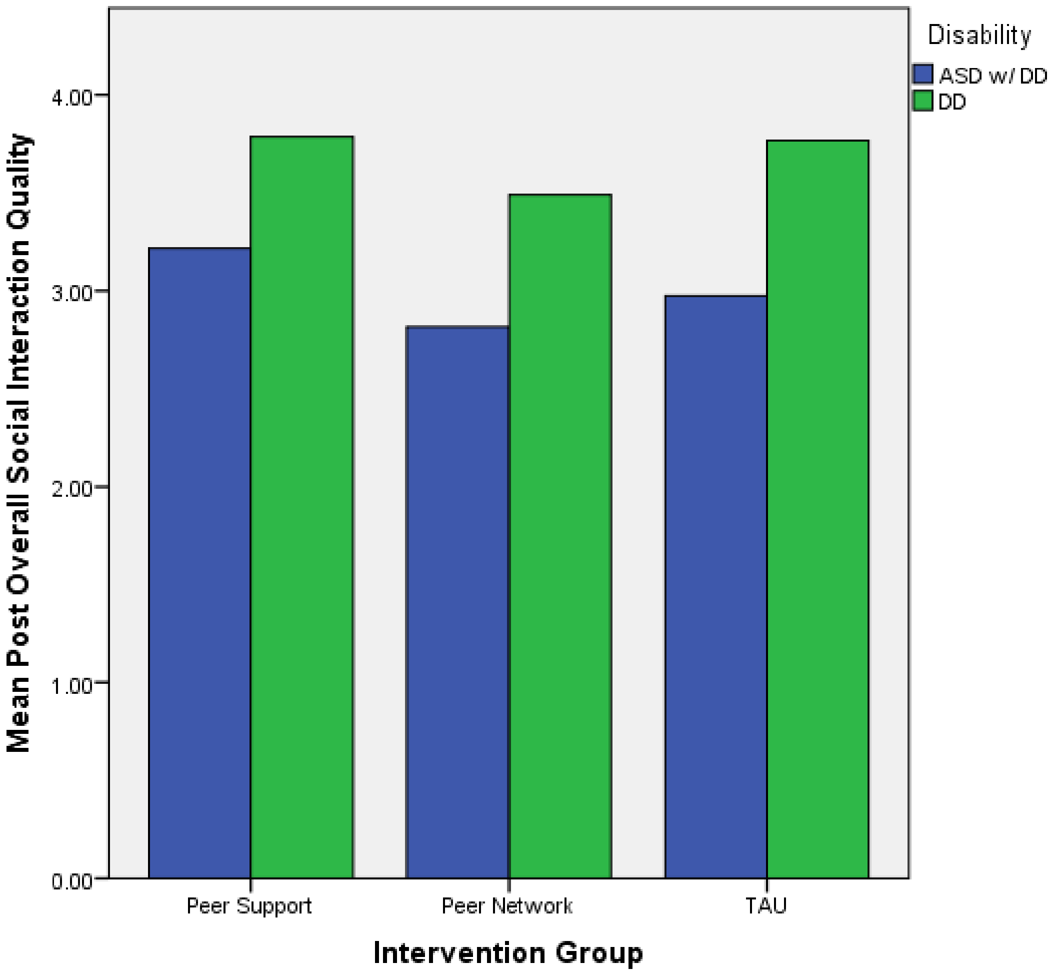

Figure 15. Mean Change Score Overall Social Interaction Quality by Treatment Group and Disability

CHAPTER 5

Discussion

The inclusion of students with disabilities has generated interest among family and school stakeholders. Prior to the initial enactment of the *Education for All Handicapped Children Act of 1975* (Public Law 94-142), meeting the needs of students with disabilities was primary regulated to families and private intuitions. Many school children with severe disabilities did not have access to opportunities for learning, and were therefore, denied an appropriate education. Public Law 94-142, recently known as Individuals with Disabilities Education Act (IDEA, 2004), shifted the primary societal perspective of exclusion of students with disabilities from public institutions to one of inclusion. Public schools were then required to provide children with disabilities a free and appropriate education in the least restrictive environment (LRE; Merrell, Ervin & Gimpel, 2006). IDEA not only ensured that the rights of children with disabilities were protected, but it also provided protections to parents. While IDEA afforded new coordinated rights to children with disabilities and their parents, it did not specify how education services agencies should determine and provide LRE placement. Children with disabilities can be placed and serviced through several school service delivery models varying from inclusionary general education environments to exclusionary special education environments. It was not until recent decades that research rigorously pursued and demonstrated that the inclusion of students with disabilities in general education classrooms results in favorable outcomes. Studies have consistently shown positive outcomes for both students with high incidence disabilities (learning disabilities and other “mild” disabilities) and those with low incidence disabilities (intellectual, multiple, and “severe” disabilities). Now that positive outcomes have been shown, researchers have shifted their efforts to defining the contexts, instructional practices, and curricular modes that result in improved outcomes for these students. While there is a body of well-documented research on inclusion and associated effective practices or interventions for students with high incidence disabilities, there remains less empirical work examining inclusion for students with low incidence (severe) disabilities. Research is clearly needed on the impact of inclusive environments with the use of varied instructional or intervention arrangements for these students.

The use of peer-mediated instruction and intervention is often cited in the literature as one of the most effective strategies for inclusive classroom environments (Carter et al., 2007; Carter et al., 2011). In several studies focused on students with mild disabilities at the elementary and middle school, the use of peer-mediated strategies resulted in improved academic outcomes (Fisher, Shumaker, & Deshler, 1995; Sailor, 2002; Stenhoff & Lignugaris-Kraft, 2007). A paucity of research, focused on students with moderate to severe disabilities, showed that peer-mediated interventions when compared to teacher-led instruction, specifically a traditional paraprofessional model, resulted in increased levels of engagement and academic gains (Carter, Cushing, Clark & Kennedy, 2005, Giangreco, Broer & Edelman 2005). Within this context, less is known about how peer-mediated interventions influence social outcomes for students with severe disabilities.

In summary, while there is ample empirical literature on students with mild disabilities and how they may benefit from specific service delivery models, there is limited empirical evidence to date for students with severe disabilities who may present with a developmental disability or an autism spectrum disorder (ASD) profile. In particular, students with ASD demonstrate marked deficits across several areas of social communication behaviors (APA, 2013), but students who present with a mixed severe developmental disability with ASD profile demonstrate unique social and intellectual deficits, which can further limit their ability to be included and benefit from traditional special education interventions. From this standpoint, it is imperative to examine the potential effectiveness of peer-mediated intervention models for cultivating improved social outcomes (i.e. increased social communication behaviors and social interaction quality) for students with severe developmental disabilities with and without ASD within inclusionary high school environments.

To help address this shortcoming in the literature, the present study used data from a randomized control trial (RCT) to systematically: (1) explore and identify SCB occurrences among high school students with significant developmental disabilities with and without ASD;; (2) compare and contrast the SCB occurrences of both groups in relation to different peer-mediated intervention approaches at pre-treatment and post-treatment; (3) explore and identify the SCB occurrences among typically developing high school students; (4) investigate the quality of social interactions for high school students who present with developmental disabilities with and without ASD before and after the implementation of peer-mediated interventions compared to typically developing high school students who are present in those settings; and (5) explore and describe potential characteristics (e.g., IQ, communication skills, disability severity, etc.) that may influence student outcomes during the implementation of peer-mediated and treatment as usual conditions. For the purpose of the present study, three treatment conditions and three participant groups (i.e. two groups received intervention: ASD with DD and DD; one group was a normative comparison: TD comparison peers) were utilized. Study data was coded with direct observation event and duration recording software. Results examined adolescents with ASD with DD compared to adolescents with DD between different treatment conditions. The complexity of participant group SCBs were analyzed and described.

Research Question 1: How do social communication behaviors (initiations, responses) compare and contrast among (a) high school students with severe developmental disabilities with and without ASD, and (b) high school students with typical development at pre-and post-observation in general education classes by treatment condition? Are there significant differences found in disability groups by treatment condition and across treatment conditions at post-observation?

This study investigated distinct social communication behaviors (SCB) among students with disabilities who were identified as having a severe developmental disability with and without ASD, as defined through IDEA legislation (or concurrently a DSM-IV-TR diagnosis). Typically Developing (TD) comparison peers were also included in this study in order to have a normative comparison of SCB as they were observed to occur within similar settings as the observed SCB of students with severe disabilities. The original P3 project included other types of peers who were identified as “peer partners.” The present study only analyzed data of TD comparison peers. Participant SCB were observed within the context of a peer-mediated intervention or a paraprofessional model (i.e. treatment as usual [TAU]).

For research question one, study analyses were conducted through two avenues: (1) descriptive analysis of SCB for each participant group (DD, ASD with DD, TD comparison peers) between treatment conditions (PS, PN, TAU), and (2) inferential analysis investigating if the observed SCB type was different between disability groups (DD, ASD with DD) and treatment conditions. For each student participant, three full-length class periods were observed toward the beginning of the semester (pre) and three full-length class periods were observed toward the end of the semester (post; i.e., 590 total observations). Each set of three observations was collected over a 2- to 3-week period and lasted an average of 56.8 min of classroom time per observation. Within the context of the present study, mean pre- and post-observation frequency scores were computed, and gain scores were computed between the three pre-observations and three post-observations, as reflected as mean post-observation score – mean pre-observation score = gain score.

This study predicted that adolescent students with disabilities would demonstrate less social communication behaviors (pooled SCB) at pre-treatment when compared to TD comparison peers. In particular, it was hypothesized that DD students would demonstrate higher pre-observation pooled SCB than DD students with ASD regardless of treatment condition. This assertion was supported in that DD students displayed a higher number of SCB within and between treatment conditions at pre-treatment. Nonetheless, it was not foreseen that there would be a higher discrepancy in pre-test scores between disability groups assigned to the TAU condition (vs. PS and PN conditions), which suggests that the disability groups were widely different in their display of any type of SCB at pre-treatment within this condition. The peer support and peer network condition had less pooled SCB divergence at pre-treatment. It was further hypothesized that DD with ASD students would display post-treatment scores that were commensurate with DD students more in the peer-mediated treatment conditions than in the TAU condition. Nonetheless, it was interesting that DD with ASD students were displaying the same mean number of SCB (of any kind) as DD students in the peer network condition but not in the peer support condition. Also, in view of the group post-treatment scores, there remained a wide gap in mean SCB displayed by DD with ASD students and DD students in the TAU condition. Taking the mean pre-and post-treatment scores into consideration, it was hypothesized that DD students would benefit more (i.e. have a higher mean gain score) from the peer network condition as compared to DD with ASD students, as this population of students likely has less difficulty with behavior generalization (Scheuermann &Webber, 2002). In others words, the social relationship connections that they made in the peer network condition are more likely to generalize out of the isolated peer network settings and be maintained in other environments with other non-peer network peers, which as a result one would expect to see greater SCB from them (as they would have made social connections with others and are initiating and reaching out more to peers). Nonetheless, their mean gain score was not significantly better (or higher) than DD with ASD students, suggesting little to no gain in SCB behaviors at post-treatment. In addition, ASD with DD students appeared to grow less from pre-to post-treatment within the TAU condition and peer support condition when compared to DD students, as evidenced by their lower mean group gain score. On the other hand, DD with ASD students appeared to benefit more from the peer support intervention than the peer network and TAU conditions, as evidenced by their higher mean gain score. However, they appeared to have less growth, as seen by their lower mean gain score, from pre-to post-treatment within the peer support and TAU conditions when compared to DD students.

To obtain a better grasp of the types of social communication behaviors exhibited by disability groups between treatment groups, social communication behavior *initiations* were examined. It was hypothesized that DD with ASD students would have less initiations at pre-treatment regardless of treatment condition when compared to DD students. In fact, DD with ASD students had a higher mean frequency of initiations at pre-treatment within the Peer Network condition. This suggests that these students were making social initiations with others prior to getting acquainted with others in a larger social context (i.e., peer network). Consistent with overall (pooled) SCB occurrence findings, there remained a wide discrepancy in mean initiation occurrences by DD with ASD students and DD students with DD students displaying a higher mean initiation occurrences at pre-treatment. Similarly, there was a discrepancy between disability groups within the peer support condition with DD students showing more frequent initiation occurrences than DD with ASD students at pre-treatment.

Interestingly, the discrepancy between disability groups appeared to increase at post-treatment with DD students showing more frequent initiation occurrences. Consistent with overall (pooled) SCB occurrence findings, disability groups tended to display commensurate post-treatment mean initiation occurrences during the peer network condition. Again, this was interesting, because both groups within this condition showed similar ability to initiate.

Of further importance, when examining gain score trends, DD with ASD students appeared to have little initiation occurrence growth in the TAU and peer network conditions as compared to the peer support condition. Overall, findings suggested that mean SCB initiation scores increased from pre-to post-treatment for students with ASD during the peer support condition, but not for the other treatment conditions (TAU, PN). In contrast, it was unexpected that DD students would show growth in the TAU condition, but not in the peer network condition. These findings suggest that students with disabilities who participated in the peer network condition did not perform significantly better (as evidenced by their little gain) at post-treatment within the peer network condition. In general, the peer support condition seemed to influence their level of positive initiation occurrence gain from pre-to post-treatment. Similar to earlier studies conducted in middle and high school classrooms, peer supports increased students social communication behaviors (e.g., Carter et al., 2007; Shukla et al., 1998). Results from this study extend our understanding of peer support interventions and how they might be used to extend social initiations in students with severe developmental disabilities with and without ASD.

As a counterpart to social communication behavior initiations, *responses* as a whole were aggregated and analyzed for trends between treatment conditions for students with disabilities at pre-treatment and post-treatment. Results at pre-treatment, showed that that DD students had higher observed mean pre-treatment response occurrences than DD with ASD students regardless of treatment condition. Findings showed a wider response occurrence gap at TAU between disability groups, with DD students exhibiting a higher mean. Therefore, at pre-treatment, DD students were already showing a higher mean count of observed responses.

Like overall (pooled) SCB occurrence findings, disability groups tended to display commensurate post-treatment mean initiation occurrences during the peer network condition. Again, this was interesting, because both groups within this condition showed similar ability to respond in social interactions (however, predicated on the fact that others are initiating with them). As evidenced by their gain score at post-treatment, there was limited upward movement in their mean pre-to post-treatment response occurrences. In particular, DD with ASD students showed a higher mean gain score in the peer network condition than DD students, but they showed a lower gain score in the TAU condition. In comparison to the peer network and TAU conditions, there was significant growth within the peer support condition as evidenced by differences in their gain scores, for both disability groups.

In comparing pre-and post-treatment trends among task-related initiations, DD with ASD students showed a higher mean task-related initiation score within the peer network condition than in the peer support or TAU condition at pre-treatment, which was unexpected. Similar discrepancies were found for task-related initiations between TAU and peer support conditions between disability groups at pre-treatment. Commensurate mean post-treatment task-related initiations were found for the peer network condition at post-treatment for both disability groups.

Unexpectedly, DD students showed a higher mean of task-related initiations at post-treatment within the TAU condition as compared to other treatment conditions as well as in comparison to DD with ASD students. While there was little upward movement for DD with ASD students from pre-to post-treatment within the peer network condition (as evidenced by the gain score), it remained neutral, such that there was no observed downward trend, unlike the TAU condition. In particular, DD with ASD students showed no growth (as observed by their negative gain score) within the TAU condition, while their DD peers showed positive growth within this condition. In contrast, findings concluded that the peer support condition increased the mean number of task-related initiations for both groups from pre-to post-treatment. Although there was not a wide difference observed between the groups in this specific condition as compared to the TAU condition. These findings lend evidence that the peer support condition was successful at increasing the mean of occurrence task-related initiations for students with disabilities, but seemed to be primarily beneficial for DD students who have ASD, as demonstrated by the opposing mean trends between peer support and TAU conditions.

This study found that the mean pre-treatment task-related response score was larger for DD students (vs. DD with ASD) across all treatment conditions, particularly in the TAU condition. Congruent with study hypotheses, DD students exhibited a higher mean of task-related responses between treatment conditions when compared to DD with ASD students. There was no meaningful difference observed for task-related responses between disability groups within the Peer Network condition. Interestingly, there was a different trend observed in mean post-treatment task-related responses by treatment groups. In particular, DD students exhibited a higher mean of post task-related responses while participating in the peer support condition (vs. other treatment conditions), but a lower post task-related response score in the peer network condition (though not a meaningful difference). Consistent with other SCB reported earlier, DD students scored a higher mean post task-related response score within the TAU condition when compared to DD with ASD students. This is an interesting finding, as it may be possible that the paraprofessional is providing specialized support that is similar to what a peer-mediated intervention might provide for students. Although, this was not measured in the present study. Additionally, DD students are also starting off with more observed task-related responses (as at pre-treatment), which can be a likely contributor to why we are seeing greater task-related responses at post-treatment within the peer support condition. These findings can also be interpreted within the context of ASD deficits. For example, students with ASD may be more likely to have difficulty distinguishing if they need to respond or at times understanding what would be an appropriate response, which in this instance can lead to not responding as they might not know how to follow-up with a task response clarification while engaged in a task. Relatedly, perseveration in interests or conversational topics may hinder engagement. Students with autism may be excited. In addition, ASD students may show lower response rates to redirections from peers or paraprofessionals, which can lead to less observed task-related responses. In view of these finding, DD with ASD students benefited from the peer support-mediated interventions, as their mean task-related response gain score was positive, when compared to the gain score of the TAU condition. However, DD students were observed to have some gain within the TAU, but not DD with ASD students. There are many likely factors as to why we see differences in SCB task-related behaviors among disability groups, but as essential factor might be underlying the underlying social deficits that ASD students present as having. These initial findings suggest that ASD students may need direct instruction on social responding prior to involvement with a treatment as exposure, practice and generalization are key to seeing treatment gains (Kamps et al., 1992; Madden & Slavin, 1983; Noonan & Hemphill, 1984; Stainback, Stainback, Raschle, & Anderson, 1981).

This study also investigated change from pre-to post-treatment for enhancing the occurrence of social-related initiations. In view of the results, DD students had higher mean pre social-related initiations for the TAU condition as compared to other treatment conditions (PS, PN). Moreover, DD students had similar mean pre social-related initiations for the peer-mediated treatment conditions. Nonetheless, DD with ASD students had greater mean pre social-related initiations within the peer network condition as compared to other conditions. Additionally, they were observed to have higher mean pre social-related initiations within the TAU condition compared to the peer support condition.

In further review, mean post social-related initiations were examined. DD students continued to have a higher mean social-related initiation occurrences in the TAU condition (as compared to other SCB behaviors), but their mean post social-related initiation score tended to vary between the peer-mediated treatment conditions, such that they now showed fewer social-related initiations in the peer network condition than in the peer support condition. DD with ASD students were found to have a similar trend as their DD peers, in that they had fewer social-related initiations in the peer network condition as in the peer support network condition. Though, in contrast, they also had fewer social-related initiations in the TAU condition during post-treatment. In view of social-related initiation gain scores from pre-to post-treatment, DD with ASD students were found to have positive growth in their social-related initiations for the peer support condition, but not in the other treatment conditions. This study clearly shows more learning using peer support model for students with ASD features than the traditional lecture and teacher-student discussion format. Literature has found that the use of cooperative learning groups (a type of peer support model) can lead to greater student-to-student interactions, which may reinforce these findings that peer-mediated interventions (with more concentrated small group, 1:1 support; i.e., the Peer Support Condition) can have a greater impact on the occurrences of social-related initiations for DD with ASD students. Relatedly, the use of teacher lecture and teacher-to-student learning formats precludes student-to-student interaction, yet social and interpersonal skills are quite often cited as problem areas for students with disabilities, particularly those with ASD) and for many other children in the public schools (Johnson, et al., 1984). Peer support interventions appeared to be more helpful in encouraging growth in the social-related initiations (i.e. student to student interaction) for students with severe disabilities who presented with ASD features.

Lastly, these findings investigated the change from pre-to post-treatment for enhancing the occurrence of social-related responses. In view of the results, DD students had similar pre social-related responses for the TAU and peer network conditions. Moreover, DD students had lower mean pre social-related responses for the peer support condition. Nonetheless, DD with ASD students had greater mean pre social-related responses within the peer network condition as compared to other conditions.

Finally, mean post social-related responses were examined. DD students continued to have high mean social-related response occurrences in the TAU condition (as compared to other SCB behaviors), but their mean post social-related response score for the peer support condition was slightly higher. In contrast, they demonstrated the lowest mean social-related responses score within the peer network condition at post-treatment. DD with ASD students were found to have similar trends as their DD peers, in that they had more social-related responses in the peer support condition than in any other treatment condition. Moreover, they also had fewer social-related responses in the peer network condition during post-treatment. DD students' were found to have no growth in their mean social-related responses from pre-to post-treatment within the peer network condition. In contrast, DD with ASD students seemed to have some benefit (but lower than the PS and TAU condition peers) from the peer network intervention, as their mean gain score was positive. Additionally, DD students showed more positive growth in the peer support condition (as evidenced by a positive mean gain score) than in the TAU condition. Although, DD students and DD with ASD students also had positive growth within the TAU condition, but less than in the peer support condition. These findings point to the fact that students assigned to a peer support interventions (vs. TAU) had more positive growth in their social-related responses. Findings did not seem to encourage one group's participation in a particular treatment over another group's participation in that same treatment (i.e. DD with ASD students did not have significantly greater gains in the occurrence of social-related responses as a result of participating in the peer support condition or peer network condition than students with DD only). These findings are largely consistent with other research that has used peer support training in social-communicative strategies (e.g., play organizers, mirroring/attending, commenting, choice making, requesting) to increase the initiating and responding by students with developmental disabilities and autism (e.g., Odom, Hoyson, Jamieson, & Strain, 1985; Pierce & Schreibman, 1994).

As expected, findings from the peer comparison data confirmed that TD students had a higher observed mean of task-related initiation occurrences, task-related response occurrences, social-related initiation occurrences, social-related response occurrences, general initiation occurrences, general response occurrences, and overall (pooled) social communication behavior occurrences than DD with ASD students when compared to their observed mean post-treatment scores. Interestingly, there was almost twice the mean score difference if not more across the two group’s various social communication behavior types. Findings seem to suggest that DD with ASD students continued to be lower in their incidence of social communication behaviors regardless of the treatment models. However, outcomes do suggest that with the peer support intervention, DD with ASD students showed a positive upward trend across various SCB outcomes (compared to a specific paraprofessional intervention model).

Dissimilar from their ASD counterparts, DD students showed more movement toward the peer mean within the context of a peer-mediated intervention. More specifically, they showed less deviation in their mean social communication behavior occurrences than their TD peers when observed at post-treatment. In particular, their mean post task-related initiations, post social-related initiations, and post task-related responses were not significantly different than their TD peers within the peer support condition. However, they did differ from their TD peers on their mean occurrences of social-related responses and general responses within the peer network condition.

When compared within the peer network condition, DD students’ social communication behavior outcomes were more divergent than their TD peers, and rather similar to their ASD counterparts. For example, they had significantly lower observed mean task-related initiations, task-related responses, social-related initiations, social-related responses, general initiations, and general responses when examined at post-treatment within the peer network condition. These outcomes indicated that the peer support condition uniquely contributed to increase DD social communication behavior outcomes (as seen in post-treatment scores) than the peer network condition. Due to nature of peer network interventions, students with DD are more likely to benefit from peer network conditions when they have increased peer attempts to participate and contribute; therefore, if these students are not having the opportunity to engage in social interactions outside of the intervention, than less friendships or social contacts are likely (Haring & Breen, 1992). In this instance DD students are not able to engage in a social interaction that requires back-and forth responding. Breaks between classes and lunch periods in typical junior high schools can naturally include a great number of ongoing opportunities for interactions, which can increase the generalization of responding to nondisabled peers (Haring & Breen., 1992). Additionally, considering how adolescents with disabilities have experienced social interaction with others, as in most cases these students have fashioned a set of social skills that they have used time and time again in pursuing peer interactions. If in their history they have been successful with these strategies, they are likely to reciprocate other's bids (Bukowski, Hoza & Boivin, 1993). Considering the history of an adolescent's interpersonal relationships should be taken into account when studying peer interaction behaviors.

In contrast, DD peers within the TAU condition had some post-treatment scores that approached TD normative mean social communication behavior scores. For example, DD students' mean post task-related initiations, general initiations, and social-related initiations were not observed as significantly divergent from TD peers as assessed within the TAU condition. Overall, these peer comparison results allude to the peer support condition as being an intervention that could assist severe DD students to displaying social communication behaviors that approach the normative mean. However, the assumption that engaging in the TAU condition helped DD students approach normalcy should be interpreted with caution as DD students are a heterogeneous group. It would be important to further characterictize the TAU environment that elicited these behaviors. It is may be possible that the TAU condition implicitly included peer support strategies. The present study did not examine contextual features or utilize durational measures of social communication behaviors, which likely influenced outcomes. In order to draw strong conclusions, it would be critical to do a component analyses of these separate variables and ideally replicate the findings. Additionally, research may want to compare the TD students and DD student in the same environment across multiple points in times to further study components of TAU vs. components of peer-mediated intervention.

In summary, results from this investigation suggest that peer support interventions create considerable social opportunities for high school students with severe developmental disabilities. This RCT specifically demonstrated that peer support interventions significantly increased students' social interactions. At post-treatment, students with severe disabilities (undistinguished by disability) demonstrated statically significant (and clinically meaningful) gains in task-related initiations (PS, TAU only), task-related responses (PS only), social-related initiations (PS only), social-related responses (PS, TAU only), pooled initiations (PS only), pooled responses (PS only), and pooled SCB (PS only). Outcomes for peer network students were less encouraging. Students with severe developmental disabilities in the peer network condition performed better than students assigned to TAU in many areas at baseline, but they did not maintain high rates of SCB throughout the treatment. TAU students, who engaged in fewer baseline SCB showed increases from pre-treatment to post-treatment. Despite these contradictory propensities, students in the peer network and TAU conditions ended up at relatively similar levels of SCB at post-intervention. This finding runs in contrast to other studies that have found peer networks to beneficial for either DD students or students with ASD. In particular, using a single-case design, studies have found that peer network systems were effective for students with ASD, particularly in social initiations and quality of interactions (Garrison-Harrell, Kamps, Kravits, 1997).

Research question 2: How do student variables (e.g., intellectual ability, communication skills, disability severity) relate to post-treatment gains in social behaviors seen among the treatment groups when engaged in peer-mediated intervention (Peer Support [PS], Peer Network [PN])?

Knowing that social communication behaviors are differentially influenced by a treatment condition is critical. While Research Question 1 addressed what social communication behaviors look like among different disability groups and described observed and statistical variance among the groups between treatment conditions, it becomes of even greater importance to try to determine what student variables, if any, might influence or even explain the outcome of a participant within a specific treatment condition. In the present study, the three different treatment conditions (PS, PN, TAU) influenced the social communication behavior outcomes for students with severe developmental disabilities. But, it was unable to discern significant interactions between the two disability groups that received the interventions. Further investigating how these treatment conditions may potentially be influenced (confounded or moderated) by student variables between different disability groups might be a better question to answer for improving many social communication behavior outcomes. As indicated in Research Question 1, there are some key differences between disability groups at an observed level, but at a statistical level there was no such significance detected. In this instance, what could have accounted for the finding of non-statistical significance but clinical significance? More specifically, in this respect, how are student variables related or unrelated to producing statistical significance? In particular, how does student’s intellectual ability, communication skills, and disability severity (or age, gender) increase the chances of a greater gain in a social communication behavior outcome for a particular treatment type?

The present study indicated five non-statistical interactions between treatment conditions in producing a social communication behavior outcome. There were no interactions found for the outcome variables of task-related responses, task-related initiations, pooled initiations, pooled responses, and pooled SCB. Therefore, it become of interest to control for potential influences that might influence the SCB outcome but having nothing to do with the treatment. In this case, three key student variables were identified from indirect informant rating scale data collected within the study design. These student variables were student IQ score, disability severity identified through the CAR2-ST measure, and communication skill, as assessed through a mini composite on the SSIS measure. These particular variables were determined as potential factors that might have influenced the treatment outcomes for disability groups.

Unexpectedly it was found that a participant IQ score did not influence the effect of intervention condition and disability on the indicated SCB gain outcomes scores. Next, it was determined that participant SSIS communication skills did not influence the effect of intervention condition and disability on the indicated SCB gain outcomes scores. Nonetheless, in line with research hypotheses, it was determined that participant disability severity influenced the relationship of disability with intervention condition on producing overall social communication behavior initiations. In further examination, the impact of age and gender on disability and intervention condition was not found relevant in enhancing treatment effects. This finding seems to suggest that disability characterization takes precedence over socio-demographic factors. In this instance, it may be that the effect of environmental features is a more important modulating factor than these variables (Bruiniks, Meyers, Sigford & Lakin, 1981). Overall, these findings should be interpreted with caution, as measurement sensitivity may have influenced outcomes. It might be of greater importance to examine individual profiles using ABA procedures as related to specific treatment conditions. For example, does a 15 year old student with ASD who has a high score on the SSIS communication skills factor have better outcomes than a 14 year old DD student who has a low score on the SSIS communication factor? Testing variables together may also increase the validity of the age and gender model.

Research question 3: What social interaction quality differences, as far as affect, reciprocity, content, communication mode, response relevance, and overall quality, were observed between high school students with severe developmental delays with and without ASD, and typically developing high school students at (pre-and) post-observations?

Research question 1 explored and described SCB displayed by students with severe disabilities and their TD peers, while Research Question 3 sought to further characterize those occurrences according to five different quality ratings, which were delineated as reciprocity, affect, content, response appropriateness, and overall social interaction quality. Similar to research question one, SCB quality indicator gain (i.e. change, difference) scores were commuted between a SCB quality indicator obtained for a participant from the observations at pre-treatment and at the observations at post-treatment.

Findings revealed generally uniform mean pre-treatment reciprocity quality scores across conditions for students DD with ASD. Similarly, uniform trends were seen in mean pre-treatment reciprocity quality scores. However, DD students had higher mean reciprocity scores than their ASD counterparts. At post-treatment, uniform trends were seen across treatment conditions for both groups on mean reciprocity quality, though the gap between groups appeared to close. Limited intra-individual change was observed among treatment conditions on quality indications of reciprocity.

One's ability to communicate appropriate content was examined through a social interaction content quality indicator. Similar to the reciprocity indicator, no meaningful differences were apparent in pre content quality scores across or between groups. DD with ASD students appeared to show similar content quality as their DD peers. At post-treatment similar trends were observed in mean content quality scores. Interestingly the peer support condition and TAU condition had no positive impact (as seen by a lack of positive mean gain score) on DD students. There was little meaningful change for DD with ASD students, but they maintained a positive mean gain score.

Affect quality proved to be commensurate among both disability groups between the different treatment conditions at pre-treatment. Interestingly, DD with ASD students had slightly lower mean pre affect quality scores than their DD peers within the peer support and TAU conditions. At post-treatment, there seemed to be a wider discrepancy between groups participating in the TAU condition with DD students higher affect quality than their ASD peers. At post-treatment, DD with ASD students had lower mean affect quality than those participating in the peer-mediated interventions. In contrast, DD participants performed uniformly across treatment conditions at post-treatment. Gain scores for affect quality surprisingly differed. More specifically, DD students showed an opposing trend than DD with ASD students, in that they showed positive change from pre-to post-treatment in the peer network and TAU conditions on the quality indicator of affect. Dissimilarly, DD with ASD students showed positive growth in their mean quality affect scores from pre-to post-treatment within the peer support condition. Study findings did not seem to support the peer support condition for improving affect quality for DD students. But, the peer network and TAU conditions were indicated as being of little benefit for enhancing affect quality among DD with ASD students.

On the quality indicator of response relevance, groups performed homogeneously across pre-treatment conditions and within treatment conditions. Unexpectedly, they appeared at the ceiling for the Likert rating, leaving little room for pre-to post-treatment growth. Like pre-treatment response relevance quality scores, disability groups had unvarying response relevancy quality scores, suggesting little to no change within and between treatment conditions. No major changes were evidenced on their response relevancy quality scores from pre-to post treatment. There was some insignificant movement upward in mean ratings for DD with ASD students between treatment conditions, while DD students had some minor downward movement in the TAU condition. Based on these outcomes, no intervention condition appeared to have meaningful effects on response relevancy quality for students with severe disabilities.

On measures of overall social interaction quality, DD students appeared to have higher mean overall quality scores than their ASD peers at pre-treatment across treatment conditions. Although, mean pre overall quality was consistent between treatment conditions within disability groups. At post-treatment, study outcomes showed similar trends as mean pre-treatment overall quality scores. Groups reminded homogenous, suggesting little treatment impact on creating improved social interaction quality at post-treatment. Gain scores appeared to allude to the peer support condition as being of greater benefit at creating some upward movement in social interaction quality as compared to other treatment conditions (PN, TAU). Unexpectedly, the TAU and peer network condition saw similar change for DD students with ASD from pre-to post-treatment on overall social interaction quality. In contrast, the TAU condition surprisingly appeared to have the most change from pre-to post-observation for DD students. Thus, it can be concluded from these findings that peer support interventions are impactful for DD with ASD students, as they showed the greatest gain in their overall social interaction quality.

As a whole, students with disabilities showed similar trends of different social interaction quality indicators when compared to TD comparison peers. Due the nature of the rating being at the ceiling of the Likert scale, there was little room for growth from pre-to post-treatment. While there was some statistical significance and minor gain score movement for affect and overall social interaction quality, there was an absence of meaningful differences at the level of the disability per intervention condition (i.e. could not find a true difference in mean scores for any treatment condition for DD students with and without ASD). In light of research, Carter et al. (2005) found that the proximity of a Peer Buddy (i.e. peer support) positively influenced the affect displayed by students with severe disabilities, as well as the quality, frequency, and occurrence of their social interaction behaviors. In particular, they noted that both general and special education students' affect was rated as more positive, interactions were judged to be of higher quality, and their interactions occurred more often and with greater frequency when the peer in proximity to a target student with severe disabilities was a Peer Buddy (i.e. designated peer support). Other research involving younger children in inclusive classrooms have shown similar conclusions, such that when paired with a peer support, students with disabilities interact more frequently with their general education classmates (e.g., Garrison-Harrell, Kamps, & Kravits, 1997; Shukla et al., 1999). This research suggests that it may be important to consider contextual features of the environment (i.e. level of integration, proximity) on enhancing the quality of social interactions among students with severe disabilities and their peers. Moroever, educators and paraprofessionals should be encouraged to increase the access of students with severe disabilities to peer supports across the school day if they desire to increase not only their social interaction behaviors, but also develop their social interaction quality (e.g., social reciprocity, content, affect, responses, overall quality) within these interactions.

Implications for Practice

Based on the present study findings, several implications for practice can be recommended. First, peer supports are effective interventions for students with severe developmental disabilities for enhancing specific SCB behaviors. Second, students who present with ASD symptomology have mean behavior increases in their SCB with the used of peer support interventions as compared to professional service delivery and peer network interventions. Third, students with severe disabilities experience changes in their SCB, even students with zero baseline interactions when exposed to peer-mediated interventions. Fourth, students with severe disabilities with higher baseline interactions (i.e. higher pre-observations scores) may experience the greatest SCB benefits. Fifth, practitioners and educators should strive for inclusion of students with severe disabilities and plan to use peer-mediated interventions, particularly the use of peer support strategies, despite a student’s IQ, communication skills, age, and gender. Sixth, student disability severity may be an important factor to consider for improving peer-mediated intervention outcomes for students with severe disabilities. Seventh, it will be key for school professionals to assess the degree of social need to better determine what social supports are needed. In particular, students with ASD symptoms may benefit from peer-mediated interventions being paired with direct instruction approaches; for example, considering direct social skills instruction and modeling within the context of specific peer-mediated treatment service delivery models. Eighth, school practitioners and educators may want to consider using ABA procedures (e.g., functional assessment of social-emotional-behavior needs, environmental needs, curricular needs, etc.) to better determine what specific peer supports are needed for specific students. Overall, this research suggested that once school educators (i.e.

paraprofessionals) undergo initial peer-mediated intervention training, they can implement peer support strategies with a variety of students and see changes in students' SCB.

In summary, it is essential that school practitioners and educators proactively introduce peer-meditated strategies for facilitating peer interaction among students with severe disabilities, such as with the used of verbal directives (e.g., Hughes et al., 2002), cooperative groupings (e.g., Piercy, Wilton, & Townsend, 2002), peer support arrangements (e.g., Shukla et al., 1999), and peer-mediated networks (e.g., Haring & Breen, 1992). Without this active involvement by educators, it is unlikely that students with severe disabilities would have the opportunity to frequent social interaction with their general education peers, as well as to practice their specific SCB, regardless of level of physical integration or location of students (e.g., as in general education classrooms).

Limitations and Future Directions

Several limitations of this study exist that may have impacted the effects seen among treatment and disability groups. First, although it was anticipated that peer network interventions would produce positive gains for students in the classroom environment, it remains unclear if and how they improve specific social communication behaviors. Second, there may have been unmeasured student variables that impacted the treatments gains seen among groups. Additional measures that account for possible changes across different aspects of students' school experiences (e.g., friendships, co-occurring interventions by paraprofessionals) may be better suited to capture benefits of this broad intervention. Furthermore, the nature of the paraprofessional model for differing students may have created some unmeasured effects. In this instance, it might be helpful to measure paraprofessional support on some pre-and post-measure so as to control for variation in TAU practices. This might include measuring (a) the specific number of years or amount of time each paraprofessional spent in general education classes, (b) the exact nature of the supports provided by the paraprofessionals, or (c) the surrounding school culture. Moreover, due to the limited sample size (i.e. unevenness) in some variable cells, some statistical power may have been lost, which led to a lack of statistical significance. Lastly, additional standardized measurement of various social interaction quality indicators as completed by different informants might have been more sensitive to measuring these qualities and detecting change within them from pre-to post-treatment.

Peer support and peer network interventions share several core components (e.g., using peers as intervention agents to promote social and communication outcomes for students with disabilities). However, inherent differences in their goals and implementation suggest the use of unique methods to evaluate their effects. While peer support interventions are implemented in classrooms and target learning skills, peer network interventions take place outside of academic classrooms and focus on fostering broad friendships and increasing social contacts outside of the classroom. In light of this, the dependent variables in the current study were confined to the classroom setting, and no data from the environment in which peer network interventions were carried out (e.g., peer network meetings, social activities) were examined.

The present study sought to provide more evidence for the utilization peer-mediated intervention in increasing social outcomes for student with severe developmental disabilities with and without ASD. As many studies with students with ASD have focused on applying applied behavior analysis (ABA) strategies (e., descriptive assessment, structural analysis, and functional assessment and intervention) to remediate social and behavior deficits, this study considered a way of “marrying” the ideas of descriptive analysis with peer-mediated intervention. Based on the present study findings it is thought that peer-mediated interventions don’t have to be implemented contrary to a paraprofessional model (i.e. TAU) or ABA model. As seen from treatment findings, students with particular characteristics (such as DD) can benefit from a TAU model that is supplemented with PS strategies delivered by TD peers within inclusive classroom settings. In this way, paraprofessionals and educators alike can facilitate involving specific supports and strategies that can aid in the use of this treatment model (peer supports) and incorporate other aspects of the peer network intervention approach as well (such as planned social contacts outside the classroom on a regular basis). Curricular decisions, such as determining which interventions to use, for secondary students with severe intellectual disabilities should not be viewed as a one-or-the-other situation. Rather, the educator should view a students’ needs as ranging from functional curriculum (i.e., doing a functional assessment of their curricular needs) to an academic or social curriculum (i.e. what they need to learn) as two ends of a spectrum (Bouck et al., 2015). Secondary students with severe intellectual disability can benefit from receiving peer-mediated approaches used to concurrently support their educational outcomes and provide opportunity for the paraprofessional to assist with other students in the classroom as well. Peer support and peer network interventions have several core components that are alike (e.g., using peers as intervention agents to promote social and communication outcomes for students with disabilities). But, there are inherent differences in their goals. Based on the limited effects found for students who participated in the peer network condition, it is recommended that further research aim to understand what interventions and inclusionary strategies (such as specific peer network intervention components) may advance *social communication behaviors,* particularly for those with DD that includes ASD. Likewise, it would also be imperative to understand what interventions and inclusionary strategies (such as specific peer support strategies) may advance social communication behaviors within education classroom settings among students with disabilities, particularly those with DD.

Conclusions

Increasing meaningful social interactions for students with developmental disabilities with and without ASD and their general educational peers has been documented to be desirable, possible, and useful. The findings from this study provided further descriptive and inferential evidence that adolescent students with disabilities can benefit from peer support and peer network conditions over paraprofessional models. The study indicated overwhelmingly that peer support interventions are key to enhancing social communication behaviors for students who present with severe developmental disabilities that include ASD. These findings have implications that will ultimately benefit and enhance future use of these interventions in schools, which can create opportunities for shared learning experiences as well as for others to be formally trained to facilitate social interactions between students with and without disabilities.

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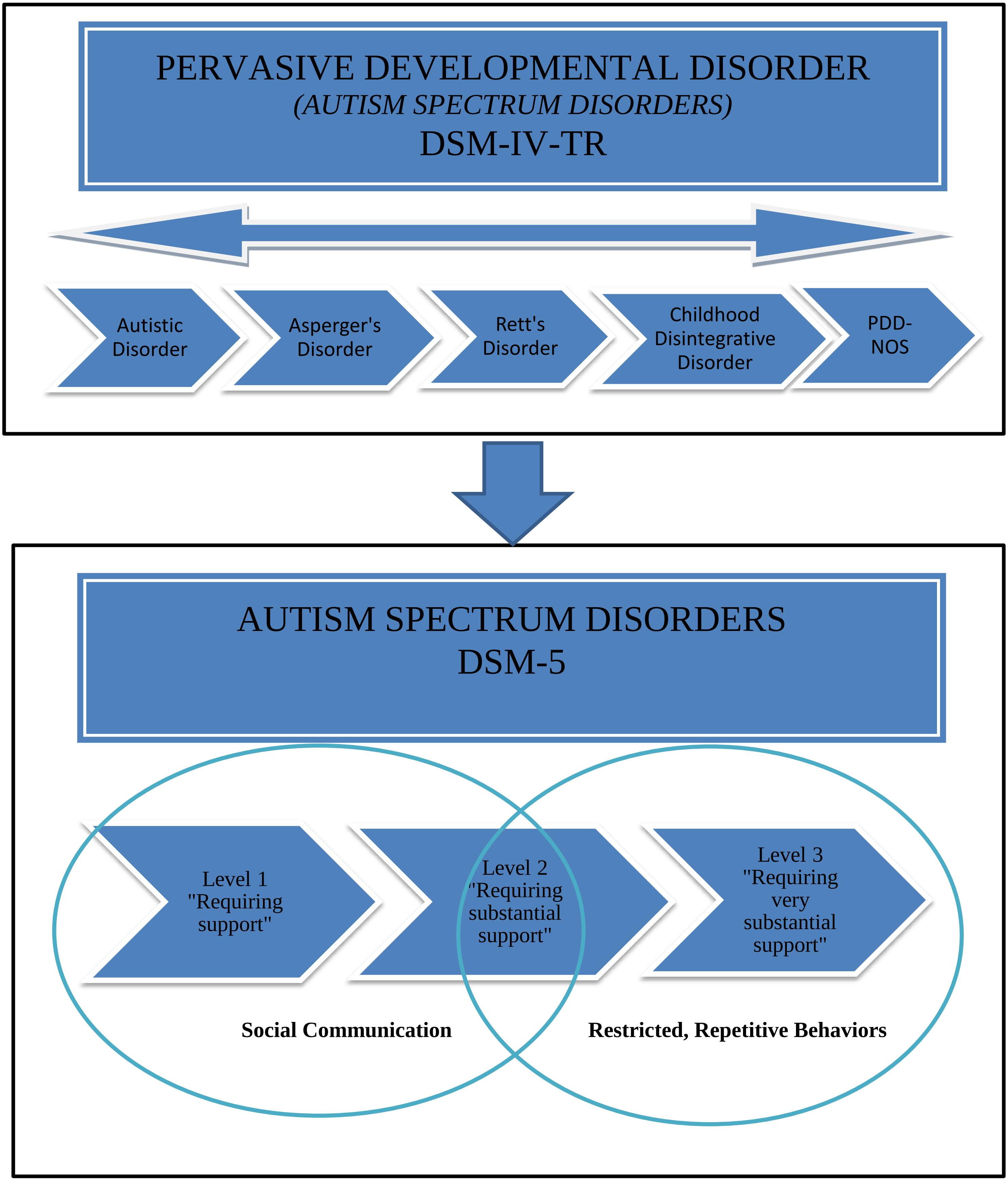
APPENDIX A

DIAGNOSTIC EVOLUTION OF ASD


PERVASIVE DEVELOPMENTAL DISORDER
(AUTISM SPECTRUM DISORDERS)
DSM-IV-TR
Autistic Disorder
Asperger's Disorder
Rett's Disorder
Childhood Disintegrative Disorder
PDD-NOS
AUTISM SPECTRUM DISORDERS
DSM-5
Level 1 "Requiring support"
Level 2 "Requiring substantial support"
Level 3 "Requiring very substantial support"
Social Communication
Restricted, Repetitive Behaviors

APPENDIX B

ASD INDICATIORS

Social Interaction

- Socially unaware
- Has poor eye contact
- Little to no imitation
- Not interested in others
- Lack of social-emotional reciprocity (e.g., no back-and-forth interaction)
- Prefers solitary play

Communication

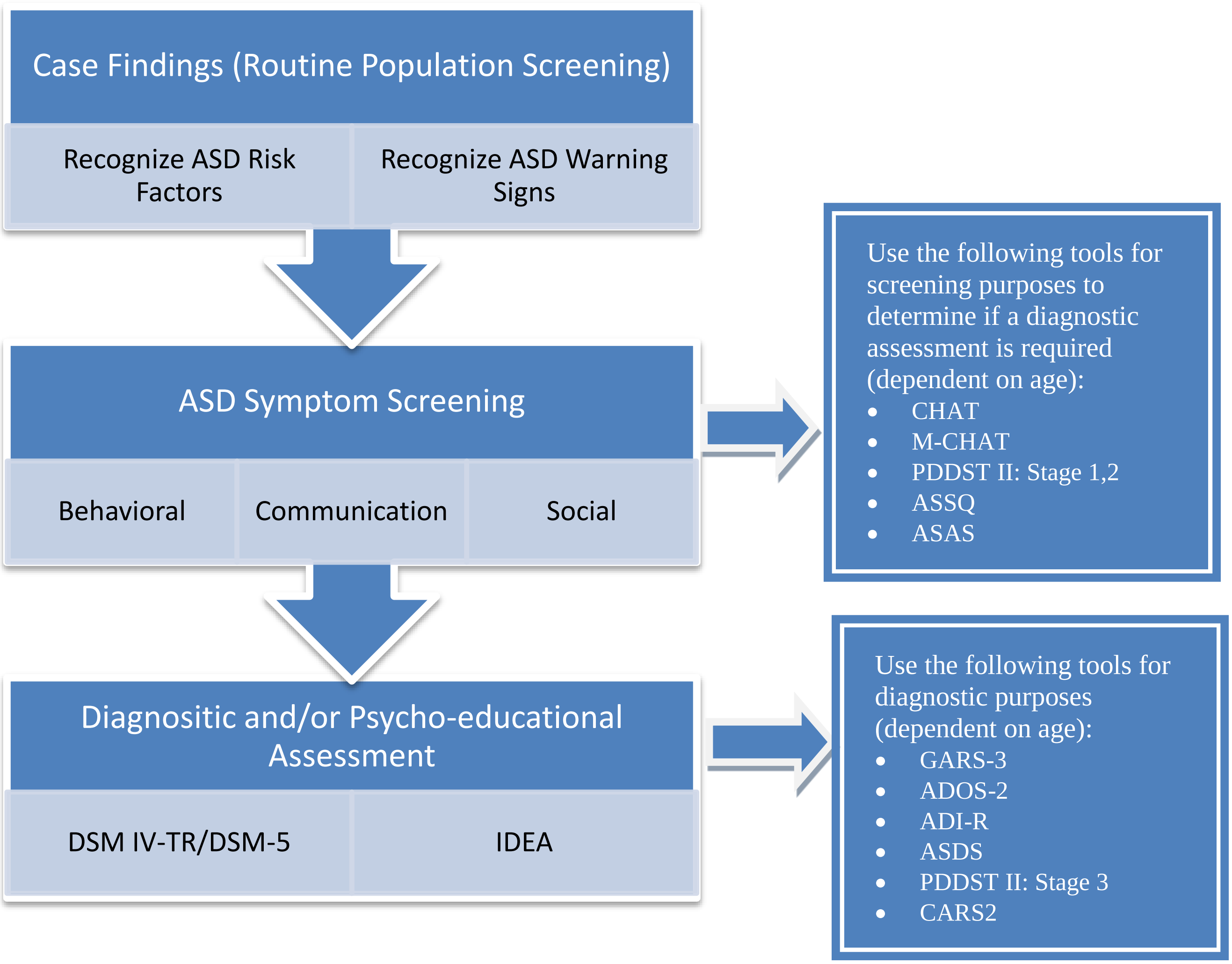
- Does not respond to his/her name
- Does not point or wave bye-bye
- Cannot communicate wants and needs as easily
- Appears to be deaf sometimes (i.e., selective hearing)
- Lack of nonverbal communicative gestures (e.g., pointing)
- Doesn't show things to others
- Uses rote, repetitive, or echolalic speech

Restricted Repertoire of Behaviors, Activities, Interests

- Throws tantrums
- Appears indifferent to toys
- Does the same things over and over
- Has unusual attachments to objects
- Has odd body movements/engages in repeitive stereotypical movements
- Narrow range of interests (attends to limited things)
- Little to no imagination (pretend play non-existent)

APPENDIX C

ASD ASSESSMENT



Use the following tools for screening purposes to determine if a diagnostic assessment is required (dependent on age):

- CHAT
- M-CHAT
- PDDST II: Stage 1,2
- ASSQ
- ASAS

Use the following tools for diagnostic purposes (dependent on age):

- GARS-3
- ADOS-2
- ADI-R
- ASDS
- PDDST II: Stage 3
- CARS2

APPENDIX D

PEER-MEDIATED (PS AND PN) INTERVENTION FIDELITY COMPONENTS

Peer Supports Fidelity of Implementation Checklist/Check-In Notes
Student: _________________ School: ________________________
Intervention Facilitator: ______________________ Coach: _______________________
Date: ____________________
Peer Supports Present: ____

Circle Y (yes) or N (no) based on whether or not these behaviors occurred during the observation.

1. Y N Are peer supports in close proximity to the focus student during class?
Y N Do the students sit next to each other?
N/A Y N Do the students remain in close proximity during out-of-seat class activities?
N/A Y N During group activities, do the students join the same group?
Other? ____
When does proximity occur during class (circle all that apply):
Beginning Middle End

2. Y N Are peer supports interacting with the focus student in class?
Y N Do they greet the focus student (e.g. "Hi" or "see you later")?
Y N Do students engage in conversation?
Y N Do peer supports include the focus student in interactions with other peers?
Other? ____
When do interactions occur during class (circle all that apply):
Beginning Middle End

3. Y N Are peer supports assist the focus student academically?
Y N Do the peer supports help the focus student participate in class activities?
Y N Do peer supports repeat or rephrase instructions for the focus student?
Y N Are peer supports appropriately prompting the focus student?
Y N Do peer supports provide appropriate feedback to the focus student?
Y N Do students work together on classroom activities?
Y N Do students share work materials?
Other? ____
When do support behaviors occur during class (circle all that apply):
Beginning Middle End

4. Y N Are facilitators supporting peer supports and the target student?
Y N Does the facilitator provide reminders/feedback to peer supports before, during or after class?
Y N Does the facilitator facilitate interactions during class when appropriate?
Y N Does the facilitator monitor students during class?
Y N Does the facilitator provide praise and feedback to students during or outside of class?
Other? ____
Notes from observation:
____
____
____

Facilitator Check-In Notes

Student: ________________ School: _______________________
Intervention Facilitator: ______________________ Coach: ______________________
Date: ___________________

Topics Discussed

Any changes/variations made to intervention:

Feedback/follow up coaching:

Additional notes/comments:

Peer Network Fidelity of Implementation Checklist/Check-In Notes

Student: ________________ School: _______________________

Intervention Facilitator: _____________________ Coach: ______________________

Date: ___________________

Peer Network Members: ____

Total number of students at meeting: _________

Circle Y (yes) or N (no) based on whether or not these behaviors occurred during the observation.

1\. Y N Are peer partners and the focus student interacting during the meeting?

Y N Do students greet each other?
Y N Does the focus student initiate interactions with peer partners?
Y N Do peer partners initiate interactions with the focus student?
Y N Do students engage in a game or activity together?
Y N Do students engage in conversation together?
Other? ____

When do interactions occur during the meeting (circle all that apply):

Beginning Middle End

2\. Y N Are peer partners and the focus student reporting that interactions occurred during the week (outside of the meeting)?

Y N Does the focus student ever initiate interactions?
Y N Do peer partners initiate interactions?
Y N Are these interactions reciprocal?
Y N Are interactions occurring at least once per day?
Y N Are interactions occurring between more than one peer partner and the focus student?
Other? ____

How many students report interactions during the week? ______

How many total interactions are reported? ______

When were interactions reported as occurring (circle all that apply):

Before school Between classes Lunch After school Weekend

3\. Y N Are facilitators supporting peer partners and the target student?

Y N Does the facilitator provide structure and facilitate the meetings as needed?
Y N Does the facilitator check with peer partners weekly about interactions with the focus student?
Y N Does the facilitator monitor interactions during the meeting?
Y N Does the facilitator provide praise and feedback to students during or outside of the meeting?
Other? ____

Notes from observation:

____
____
____
____

Facilitator Check-In Notes

Student: ________________ School: _______________________
Intervention Facilitator: _____________________ Coach: ______________________
Date: ___________________

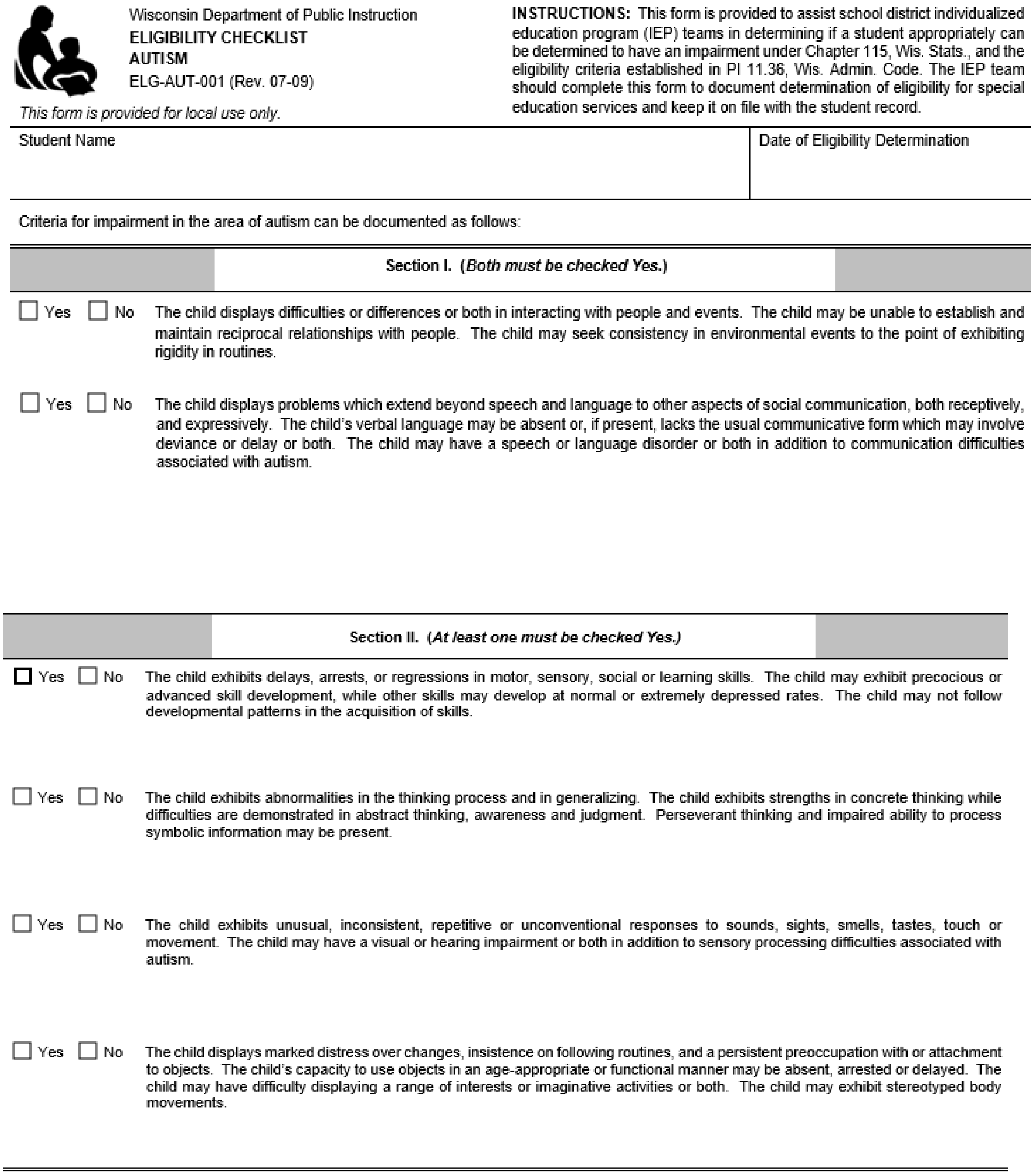
Topics Discussed

Any changes/variations made to intervention:

Feedback/follow up coaching:

Additional notes/comments:

APPENDIX E
WISCONSIN IDEA ELIGIBILITY CHECKLIST



Wisconsin Department of Public Instruction
ELIGIBILITY CHECKLIST
AUTISM
ELG-AUT-001 (Rev. 07-09)

This form is provided for local use only.

INSTRUCTIONS: This form is provided to assist school district individualized education program (IEP) teams in determining if a student appropriately can be determined to have an impairment under Chapter 115, Wis. Stats., and the eligibility criteria established in PI 11.36, Wis. Admin. Code. The IEP team should complete this form to document determination of eligibility for special education services and keep it on file with the student record.

Student Name	Date of Eligibility Determination

Criteria for impairment in the area of autism can be documented as follows:

Section I. (*Both must be checked Yes.*)

☐ Yes ☐ No The child displays difficulties or differences or both in interacting with people and events. The child may be unable to establish and maintain reciprocal relationships with people. The child may seek consistency in environmental events to the point of exhibiting rigidity in routines.

☐ Yes ☐ No The child displays problems which extend beyond speech and language to other aspects of social communication, both receptively, and expressively. The child's verbal language may be absent or, if present, lacks the usual communicative form which may involve deviance or delay or both. The child may have a speech or language disorder or both in addition to communication difficulties associated with autism.

Section II. (*At least one must be checked Yes.*)

☐ Yes ☐ No The child exhibits delays, arrests, or regressions in motor, sensory, social or learning skills. The child may exhibit precocious or advanced skill development, while other skills may develop at normal or extremely depressed rates. The child may not follow developmental patterns in the acquisition of skills.

☐ Yes ☐ No The child exhibits abnormalities in the thinking process and in generalizing. The child exhibits strengths in concrete thinking while difficulties are demonstrated in abstract thinking, awareness and judgment. Perseverant thinking and impaired ability to process symbolic information may be present.

☐ Yes ☐ No The child exhibits unusual, inconsistent, repetitive or unconventional responses to sounds, sights, smells, tastes, touch or movement. The child may have a visual or hearing impairment or both in addition to sensory processing difficulties associated with autism.

☐ Yes ☐ No The child displays marked distress over changes, insistence on following routines, and a persistent preoccupation with or attachment to objects. The child's capacity to use objects in an age-appropriate or functional manner may be absent, arrested or delayed. The child may have difficulty displaying a range of interests or imaginative activities or both. The child may exhibit stereotyped body movements.

APPENDIX F

TENNESSEE IDEA ELIGIBILITY CHECKLIST

Tennessee Department of Education Autism Eligibility Checklist

Autism

Assessment Documentation

School System__________________ School________________________ Grade______
Student__________________________ Date of Birth____/_____/________ Age____

1. Definition		
Student's characteristics evident before age three (3) include		
○ difficulty relating to others or interacting in a socially appropriate manner	☐ Yes	☐ No
○ absence, disorder, or delay in verbal and/or nonverbal communication	☐ Yes	☐ No
○ insistence on sameness as evidenced by restricted play patterns, repetitive body movements, persistent or unusual preoccupations, and/or resistance to change	☐ Yes	☐ No
○ unusual or inconsistent responses to sensory stimuli	☐ Yes	☐ No
Student's characteristics evident after age three (3) include		
○ significant affects in verbal and nonverbal communication and social interaction ○ engagement in repetitive activities and stereotyped movements ○ resistance to environmental change or change in daily routines ○ unusual responses to sensory experience		
▪ student meets criteria or has been diagnosed with an Autism Spectrum Disorder, including Autism, PDD-NOS, Asperger's Syndrome, PDD, Rett's, or Childhood Disintegrative Disorder	☐ Yes	☐ No
2. Evaluation Procedures		
▪ parental interview (including developmental history	☐ Yes	☐ No
▪ behavioral observations in 2 or more settings	☐ Yes	☐ No
▪ physical and neurological information from a licensed physician, pediatrician, or neurologist:	☐ Yes	☐ No
○ Report provides general health history evaluating the possibility of other impacting health conditions	☐ Yes	☐ No
○ Name of physician: _______________________ Date of report_________________		
• evaluation of speech/language/communication skills	☐ Yes	☐ No
• evaluation of cognitive/developmental skills	☐ Yes	☐ No
▪ evaluation adaptive behavior and social skills	☐ Yes	☐ No
▪ documentation (observation and/or assessment) of how Autism Spectrum Disorder adversely impacts the child's educational performance	☐ Yes	☐ No

___________________________________ _____/_____/________
Signature of Speech/Language Therapist Date

___________________________________ _____/_____/________
Signature of Assessment Team Member Date

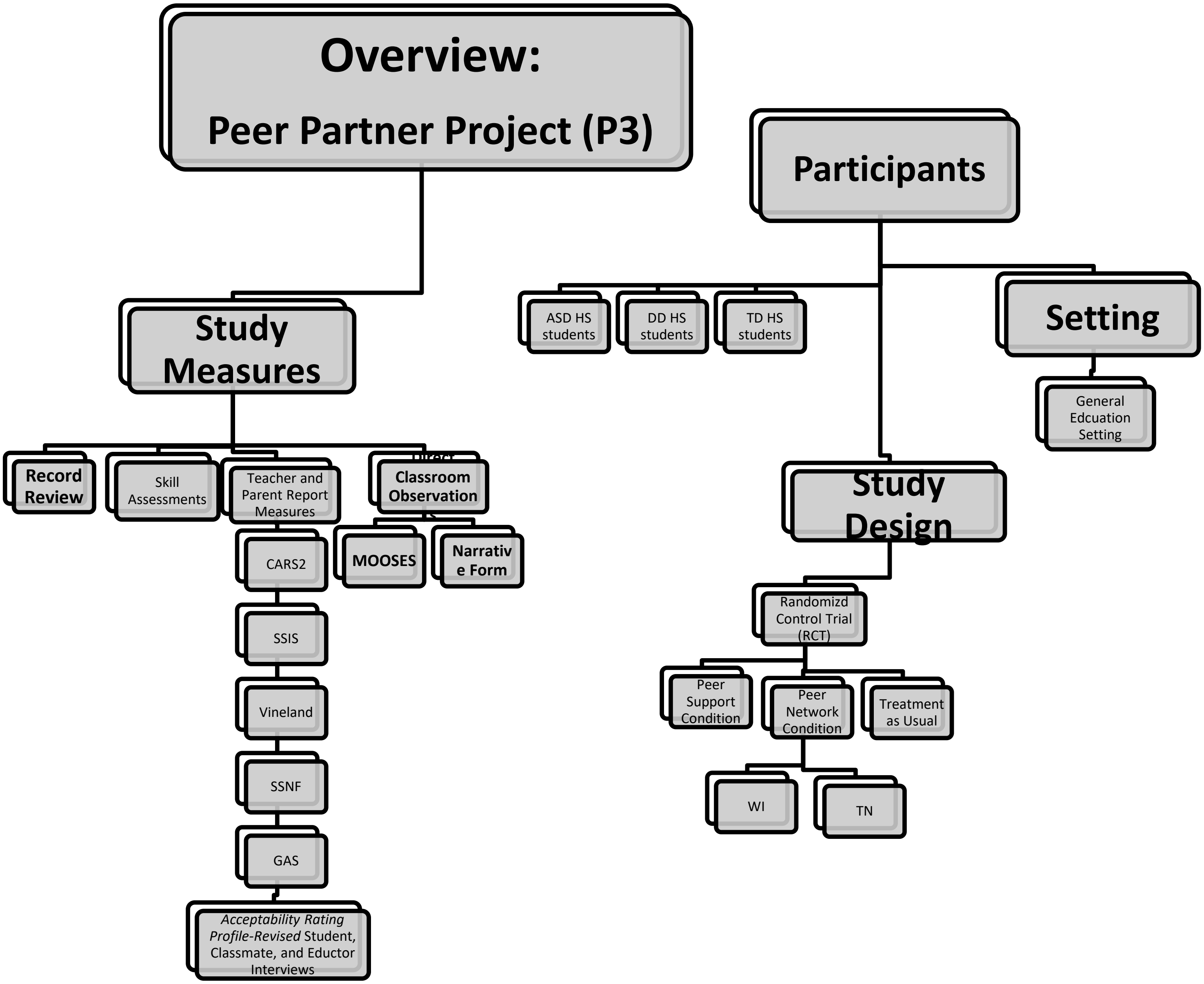
___________________________________ _____/_____/________
Signature of Assessment Team Member Date

___________________________________ _____/_____/________
Signature of Assessment Team Member Date

___________________________________ _____/_____/________
Signature of Assessment Team Member Date

APPENDIX G

STUDY METHODOLOGY


Overview:
Peer Partner Project (P3)
Study Measures
Record Review
Skill Assessments
Teacher and Parent Report Measures
CARS2
SSIS
Vineland
SSNF
GAS
Acceptability Rating Profile-Revised Student, Classmate, and Eductor Interviews
Direct Classroom Observation
MOOSES
Narrative Form
Participants
ASD HS students
DD HS students
TD HS students
Setting
General Edcuation Setting
Study Design
Randomizd Control Trial (RCT)
Peer Support Condition
Peer Network Condition
Treatment as Usual
WI
TN

APPENDIX H

P3 OBSERVATIONAL CODING MANUAL

Overview of Observational Codes

A. Lily (real-time measure)

Level 1: Focus Student and Peer Behaviors		
Focus Student and Peer Behaviors	▪ SWD Initiation- Task ▪ SWD Response- Task ▪ SWD Initiation- Social ▪ SWD Response- Social ▪ Peer Initiation- Task ▪ Peer Response- Task ▪ Peer Initiation- Social ▪ Peer Response- Social ▪ Peer Support Initiation- Task ▪ Peer Support Response-Task ▪ Peer Support Initiation- Social ▪ Peer Support Response- Social	Frequency
Level 2: Instructional Format		
Instructional Format/Peer Group Size (mutually exclusive)	▪ Large Group ▪ Small Group ▪ Independent work ▪ 1:1 Peer ▪ 1:1 Adult ▪ No Instruction ▪ Gone	Duration
Level 3: Proximity		
Proximity (*not* mutually exclusive)	▪ To peer supports (for post-intervention) ▪ To peers without disabilities ▪ To direct support personnel (special education assistant or teacher)	Duration
Level 4: Academic Engagement		
Academic Engagement (mutually exclusive)	▪ Engaged in consistent instructional activities ▪ Engaged in inconsistent instructional activities ▪ Not engaged	Duration

B. Information Sheet (narrative measure)

- Conversation topics addressed at any point with peers (from a checklist)
- Communication modes used at any point with peers (from a checklist)
- Support behaviors received from peers at any point (from a checklist)
- Adult facilitation strategies used at any point (from a checklist)
- Number of different peers with whom any interaction occurred **involving the focus student** during entire class (Note: If a peer initiates to the focus student but the focus student does not respond, this does not count as a peer interacted with on the form. However, if the focus student initiates to a peer but the peer does not respond, this does

count as a peer interacted with as the focus student was involved). If completing a peer comparison observation, record BOTH the number of peers contacted in the first half and the number of peers contacted in the second half of the observation. If completing an observation in a peer supports classroom, record BOTH the number of peer supports and other peers.

- Observer ratings of quality along various dimensions
- Numbers of students, general educators, special educators, and other adults in the class at the beginning and by the end of the class

Observational Codes

Lily

Level 1: Focus Student and Peer Interaction Behaviors

Initiations and responses are defined as verbal or nonverbal (e.g., gestures, signs) communicative behaviors directed toward a classmate. Each conversational turn is counted separately without regard to length of utterance.

Each communicative behavior is coded according to its topic (i.e., task- or social-related), source (i.e., student with disabilities, peer without disabilities, or peer support without disabilities), and function (i.e., initiation or response).

Initiations and responses are to be coded as ***task-related*** *if they address activities, materials, or expectations related to the current class (e.g., comments or questions concerning class assignments, group projects, course content; discussing an upcoming test in this class).*

Initiations and responses unrelated to the current class are to be coded as ***social-related*** *(e.g., social amenities and comments or questions concerning peers, popular culture, other school events, other classes, and out-of-school activities). In other words, everything else except conversations about the class in which they are in is social related.*

Behaviors such as reading aloud to oneself, echolalic behavior, and conversations with teachers, paraprofessionals, or other adults are not to be coded as initiations or responses. Facilitated communication (when an adult guides the hand of the student with disability to type or write) is also **NOT** coded as interactive behaviors as it does not involve communication from the student with disability.

Contributions to interactions are to be recorded separately for (a) participants with significant disabilities, (b) classmates without disabilities with whom the participants were interacting (i.e., “peers” on Lily), and (c) classmates without disabilities who have agreed to serve as “peer supports” (i.e., “Support” on Lily)

Communicative behaviors are considered initiations if they are preceded by at least 5 seconds without an interaction or if they reflect a change in topic (e.g., task- to social-related or vice versa). All other communicative behaviors are coded as responses.This level of detail will provide information on initiation, direction, continuation, and reciprocity of peer interactions that the focus student has in the classroom.

How do you code interactions between the focus student and other peers with disabilities?

Only code social exchanges that occur among the focus student and peers without significant disabilities. If there are other students with significant disabilities in the class, DO NOT code any interactions occurring between the focus student and peers with significant/obvious disabilities (e.g., students who have a physical disability or receive support from a paraprofessional). In addition, do not record proximity to peers with significant disabilities. Use the same rules when collecting peer comparison data; do NOT code interactions occurring between the comparison peer and peers with significant disabilities (including the focus student) and do not code proximity to a peer with significant/obvious disabilities and to the focus student. [If you anecdotally note lots of interactions with other students with significant disabilities, just note this in narrative form on the written observation sheet.]

How do you code interactions involving both an adult and a peer?

Code any interactions that are **clearly directed** to a *specific* peer or group of peers. If an adult (teacher or paraprofessional) is present, but the focus student's initiation or response is clearly directed to both the adult **AND** a peer, code the interactive behavior as a peer interaction. If both a teacher and peers are present and the focus student makes a general comment not directly toward a specific peer, do **NOT** count it. In other words, in a group setting, the default is not to count a comment unless there is compelling reason to think the focus student intended to elicit a response from a peer. This is discerned by considering the content of the comment, the persons whom the focus student is looking at, and/or the context of the activity.

Student or Peer/Peer Support Initiations

Initiations are any initial or new interactive behavior demonstrated by the focus student to specific peer(s)/peer support(s), or by a specific peer/peer support toward the focus student ***with clear communication intent to evoke a response***.

Initiations from the focus student or peers toward each other may occur with or without prompts from adults. If two students initiate toward each other at the same time (e.g., say hi simultaneously), the default is to code the focus student as the initiator.

Code a new initiation if 5 seconds elapses between two interactive behaviors, when there is an introduction of a new topic (from academic to social, or vice versa), or the focus student joins an ongoing conversation. Therefore, a new initiation may be a statement that is produced after 5 seconds of a previous response, a new statement that occurs 5 seconds after the first initiation, a change of topic (from task to social or vice versa), or when the SWD joins an ongoing conversation among peers that was not already being coded.
Note: When determining whether 5 seconds have elapsed, always begin counting at the END of the last person's speech whether or not that person's speech was coded.

<u>**How do you code initiations involving a group of students?**</u>

If a focus student initiates to a group of peers, code it as an initiation from the focus student toward peers. To avoid overestimating the number of different peers who interact with the focus student, when the focus student initiates toward a group of peers, only count the number of peer(s) who respond to the initiation as ***Different Peers Interacted*** unless the focus student's initiation is overtly directed to every peer in the group.

If a peer initiates toward a group of students including the focus student, code as an initiation if the peer's interactive behaviors clearly directed toward or includes the focus student (i.e., the initiation is intended to elicit responses from the focus student along with other students).
*Rule of thumb: If you are not sure if an initiation is produced toward the focus student or peers, put yourself in the situation of the person in question and see if you would feel that the initiation is directed toward you. However, an initiation may not always be recognized by the intended respondent.

<u>Examples:</u>

- A peer says to the focus student, "Hey, let's go!"
- A peer asks a group of students, including the focus student, "Are any of you coming to the dance tonight?"
- A classmate passes a worksheet to the focus student and <u>*also*</u> says, "Here you go." (The phrase "here you go" is what is being coded as an initiation.)
- The focus student turns his head to look and smile at a peer, which results a high-five from the peer.
- A focus student gives/shows a peer his artwork (with or without speech).
- The focus student asks a teacher *and* a peer, "Hey, what do you guys think about my painting?"
- The focus student waves to a peer, who is looking down and does not respond.
- The focus student raises his hand to initiate a "high five" with a peer.
- The focus student makes a comment toward a group of classmates.
- The focus student walks up to a peer and shows her something in a book by pointing and looking up at the peer.
- A peer passes a sheet to the focus student (not an initiation) and the focus student says, "Thanks!" (an initiation).
- A peer support tells the focus student to open her book (i.e., an initiation) and the focus student follows the command without saying anything (not a response). After 5 seconds, the peer support tells the student to find the right page (i.e., another initiation).
- The focus student passes a peer a note or a calculator with "hello" (or some other words) typed on it (an initiation), the peer looks at the note and smiles back (an response)

Nonexamples:

- The focus student is talking aloud toward the entire class but the initiation is not clearly directed toward any specific peers.
- During a small-group discussion, the focus student is making a comment toward a teacher. A peer laughs at the comment (not an initiation, as the comment is not clearly directed toward the focus student) and the focus student turns to the peer and says, "What's so funny?" (initiation)
- The focus student is walking by a teacher and a group of peers while making a comment not directed toward a specific person, "Oh, I forgot to bring back the permission slip for the field trip."
- A peer is talking to the teacher and the focus student is looking or smiling at the peer.
- While distributing worksheets to the entire class, a classmate walks by the focus student and leaves a worksheet in front of the focus student.
- The paraprofessional says to the focus student, "Say hi." The focus student looks at the peer support for couple seconds and turns his head away.
- A peer who sits next to the focus student makes a comment to herself, "I wish I had remembered to bring the permission slip back today."
- A peer passes a worksheet to the focus student's hands without looking.
- A paraprofessional is guiding the focus student's hands over a keyboard (i.e. facilitated communication).

Student or Peer/Peer Support Response

A **response** is any facial expression, vocalization, gesture, or augmentative behavior demonstrated by the focus student or any peer(s) without significant disabilities that ***overtly*** follows and adds to an initiation or response from peers or the focus student. The response can be related or unrelated (you will record this on the information sheet) to the topic or question and is produced within 5 seconds of the completion of the last initiation or response. The response **must have communicative intent.** Responses from the focus student or peers toward each other may occur with or without prompts from adults.

How do you differentiate between acknowledging behaviors and responses?

Do not code behaviors that are just acknowledgments. Acknowledging behaviors are defined as gestural or verbal behaviors that do not add any new information to the ongoing conversation and simply demonstrate attention to the conversation. **If you could replace the comment or gesture with a head nod or "I hear you" and have the same meaning, this is an acknowledging behavior and should not be coded. If the comment adds to the conversation or presents the speaker's personal position on a matter, this does count as a response and should be coded.** For example, if the person's comments endorse, agree with, or disagree with the other speaker's comments, these are responses.

During normal conversation, the ‘listener’ often says ‘yeah’, ‘uh-huh’, ‘right’ or uses other similar verbal statements or head nods just to show he or she is listening. If this occurs and the statement just shows that the listener is following the stream of conversation, these are acknowledgments and are NOT coded. However, these same statements can sometimes be framed in such a way that they **are** adding to the conversation. For instance, if a student says “Math is stupid!” and the focus student responds, “That’s true!”, the phrase “that’s true” would count as a response because it is showing the focus student’s personal position on the matter. Likewise, sometimes these comments and nods can be answers to questions. In this case, they are also coded. For example, if a student asked the focus student, “Did you bring your book today” and the focus student said “yeah” or nodded, these would count as responses because they are adding to the conversation. Finally, sometimes these comments are asked in a way that is asking a question and these would be coded as responses. For instance, if a student said, “I figured out what I’m writing for my paper” and the focus student responded, “Yeah??” in a way that seemed designed to elicit more information, this yeah would count as a response.

If, in the moment, you can’t decide whether a comment or gesture was an acknowledging behavior (which wouldn’t be coded) or a response (which would be coded), default to NOT coding. It must be clear that an occurrence is truly a response in order to code it.

What do you do if a comment is interjected while the other person is still talking?

If a second person interjects while the first person is still talking, code a response from the person who interjected but **do not** code the original speaker again **if** the original speaker just continues their speech as if the second person hadn’t said anything. **Do** code another response from the original speaker if they had stopped talking and restart talking or if their comment somehow reflects or changes because of the interjector’s comment.

How do you code behavioral responses?

Do not code any behavioral responses as communicative responses. Only code social responses with clear communicative intent **back** to the initiator as responses. For example, code an initiation if a peer support asks the focus student to use both hands to shape a clay pot. If the focus student simply follows this command by placing her hands on the pot without saying anything back to the peer support, do **NOT** code this as a response (it is considered a behavioral response not a social response). However, if the focus student says, “ok” or “no way” or asks for help, **code** it as a social response.

How do you deal with group situations?

During group discussions involving multiple peers, after coding the first initiation (either from the focus student or from a peer), code any subsequent interaction behaviors (either initiations or responses) between the focus student and any other peers (e.g., different peers join the conversation later) as responses as long as the interaction behavior occurs within 5 seconds of the completion of the previous interaction/response and the topic is consistent. One exception is when the focus student explicitly invites a new peer (who has not been previously involved) to join the conversation; in this case, code as an initiation from the focus student. **If at any time, the topic changes, a new initiation should be coded.**

In group settings, code as peer (or peer support) responses all statements that are explicitly directed toward the focus student. If a peer in the group responds to another peer's comment, do not code this. As always, if you put yourself in the shoes of the focus student and would feel the need to respond, this is a good indication that the previous speech may have been a response.

Examples of group situations:
Tom is the focus student; Kathy is a peer support; Gina is a general education peer

Example 1:
Tom "Hey, guys. How are you?" (SWD Social Initiation)
Kathy "I'm great!" (PS Social Response)
Gina "I'm doing okay. How are you?" (Peer Social Response)
Tom "I'm doing good." (SWD Social Response)

Example 2:
Tom "Hey, guys. How are you?" (SWD Social Initiation)
Kathy "I'm great! I just got a new video game." (PS Social Response)
Gina "You got a new video game? Which one?" (Do not code as it is not directed toward Tom)
Kathy "World of Warcraft" (Do not code as it is not directed toward Tom)
Tom "Oh cool! I want that video game!" (SWD Social Response)

Helpful hint: If two people start talking at the same time, default to coding the student with disability.

<u>Examples of Responses:</u>

- A peer asks the student, "What type of music do you like to listen to?" The focus student turns on her communication device and activates a message, "Lady Gaga."
- The focus student asks a peer support, "Can I borrow your pencil?" The peer support passes a pencil and says "Here."
- A peer makes a comment toward the focus student and another classmate, "Don't you guys think that's pretty cool?" The focus student nods and responds with vocalization, "Hmm."

- A peer network member waves and says hi to the focus student, the focus student turns his head and smiles at the peer (facial expression that explicitly addresses an initiation will be coded as a response if it is the primary means of communication for the student).
- A peer asks the student, "What do you like to do on the weekend?" The focus student responds, "It is snowing outside."

<u>Non-examples:</u>

- The focus student calls a peer, "Hey!" The peer turned his head and looked back to the student but did not say anything (a behavioral response).
- During a group discussion involving the focus student and three peers, the focus student turns to a fourth peer who is not involved in the conversation and asks, "Did you see that movie?" (initiation from the focus student)
- A peer asks the student, "What type of music do you like to listen?" The focus student looks away (no response).
- A peer laughs at the focus student's comments while the focus student is still talking.
- A peer support asks the focus student to go get a book (initiation from peer support) and the student gets the book without saying anything (no response).
- In response to a peer's question, a paraprofessional guides the focus student's hands over a keyboard to type a response (i.e. facilitated communication; facilitated communication is never coded).

Instructional Format (duration)

Instructional groupings for the focus student should be coded as one of the following mutually exclusive and exhaustive categories. This variable should reflect the instructions received by ***<u>the focus student</u>*** (which may or may not align with the rest of the class). At the beginning of each observation, code the instructional format for the focus student and code any subsequent changes in this variable only *<u>after 5 seconds</u>* have elapsed after going from one state to another (if one instruction changes to another but changes back within 5 seconds, do NOT change the code).

*Rule of thumb: The code remains the same unless there is a *compelling reason to change*. Thus, if it seems that the instructional format will go back to the original code quickly, do not change the code, even if the change is more than 5 seconds.

Large Group

The focus student, along with 7 or more students (i.e., 8 or more total students in the large group), is receiving ongoing instruction primarily from a teacher or paraprofessional (or a co-teaching arrangement). If a paraprofessional is supporting the student with disabilities to participate in large group activities, code as large group (not 1:1 adult).

Examples: The teacher is lecturing about specific topics, giving instructions on how to complete a class project, going over previous assignments, or leading a class discussion in which all or most students are expected to participate or attend; students are asked to get out materials/supplies related to ongoing large group instruction.

Nonexamples: School-wide announcements (no instruction); see other instructional grouping categories

Small Group

The focus student is working cooperatively with 2 to 6 other classmates on a class project, task, or assignment (i.e., between 3 and 7 total students in the small group). The small group may be directly taught or facilitated by a teacher, paraprofessional, or peer.

Examples: The focus student is working in a small group to observe plants using worksheets, search books or the internet to complete a report or solve problems.

Nonexamples: see other instructional grouping categories

Independent Work

The focus student is **primarily** working independently on tasks assigned by the teacher or the paraprofessional, ***without*** the ongoing assistance of peers or paraprofessional. Occasional, brief help from a peer or an adult is okay and should still be coded as Independent Work. Ongoing or regular help from a peer would be considered 1:1 peer. While students are working on their individual assignments, the teacher may move around, check students' individual progresses, and provide intermittent instructions or feedback to individual students and/or the entire class.

Examples: The focus student is copying answers from the board or working on his or her worksheet independently.

Nonexamples: See other instructional grouping categories

1:1 Peer

The focus student is **primarily** working with only 1 other peer. At this time, the focus student may or may not receive support from a paraprofessional. 1:1 peer tutoring or peer support arrangements should be coded as 1:1 Peer.

Examples: The focus student is working on his or her project with support from a peer support. The focus student is paired with a peer to participate in a class activity. Students are paired together to tutor each other on an assignment or a lab project

Nonexamples: See other instructional grouping categories.

1:1 Adult

The focus student is **primarily** working with an adult (paraprofessional or general educator) on his or her own.

Examples: The focus student is receiving instructions from a paraprofessional during the class's individual work time.

Nonexamples: See other instructional grouping categories

No Instruction

The focus student has not been assigned any tasks or assignments, has completed assigned activities and is given "free time," or is undergoing a long-period transitioning from one context/activity to another context (e.g., changing from large- group instruction in one classroom to small-group instruction in a different classroom, leaving the classroom, etc.). In essence, the student is not expected to be doing any specific class-related work during this time. **During this condition, academic engagement should be coded as not engaged.**

*Rule of thumb: The code remains the same unless there is a *compelling reason to change*. If you are not sure if there is a change in the instructional format, the default is to keep the format unchanged. Thus, do not code no instruction if the focus student is going through a brief transition.

Examples: The teacher is taking attendance, or the focus student is sitting at desk at the beginning of class or listening to general announcements from broadcasting or from the classroom teacher (e.g., about school events), waiting for the teacher to arrive in the room or to begin class, or finished with work and lacks another assignment to move on to.

Nonexamples: See other instructional grouping categories.

Gone

The focus student has not yet arrived in the classroom or has left the classroom. The student should be coded as unengaged during this time.

Examples: The focus student has not arrived in the room when the bell rings, leaves to go to the restroom, or leaves the class early to go to his locker.

Nonexamples: See other instructional categories

Sources: adapted from Carter et al. (2005); Logan, Bakeman, & Keefe (1997); Wallace, Anderson, Bartholomay, & Hupp (2002)

Academic Engagement (duration)

The following academic engagement measures will be coded for the focus student with disabilities. These measures are mutually exclusive and exhaustive. Code any changes in this variable *only after 5 seconds* have elapsed after going from one state to another.

*Rule of thumb: The code remains the same unless there is a **compelling reason to change** (i.e., the focus student's attention is clearly shifted from engaged to unengaged or from unengaged to engaged). Thus, if the student seems unengaged for more than 5 seconds but you have reason to believe that the student will be engaged again quickly, do not change the code (e.g., the student seems to be taking a small break and leans back in his/her chair for 15 seconds).

Active engagement (attending) is defined as: looking at materials (e.g., textbook, worksheet, overheads) related to ongoing instructional activities, looking at the teacher, writing related to the assigned activity, following teacher instructions/directions, raising hand, or asking questions of the teacher about instructional activities. Explicit teacher instructions (i.e., is the student doing what the teacher asked him/her or the class in general to do?) or observations of other classmates (i.e., is the student engaging in the same general behaviors as his/her classmates?) are sometimes helpful guides in determining what behaviors are expected at a given time if the focus student is receiving the same instructions as the rest of the class.

Sources: adapted from Callahan & Rademacher (1999); Firman, Beare, & Lloyd (2002); Umbreit, Lane, & Dejud (2004).

Engaged with Consistent Instructional Activities

The focus student is actively engaged in (i.e., attending to) instructional activities *and/or* tasks assigned by the teacher or the paraprofessional that are consistent or aligned with the ***content*** provided to the remainder/majority of the class (i.e., identical or appropriately modified from the class curriculum with respect to difficulty, modality, response format, length, and/or materials).

Examples: The focus student is working with a peer or paraprofessional on an assignment using adapted materials, adapted worksheets that are similar to class content, or books on a lower reading level related to course content, following large-group instructions in a slower pace, or listening to the same lecture as the rest of the class.

Nonexamples: See Engaged with Inconsistent, Unengaged.

Engaged with Inconsistent Instructional Activities

Code if the focus student is actively engaged in (i.e., attending to) instructional activities *and/or* materials assigned by the teacher/paraprofessional that are **not** consistent or aligned with the ***content*** provided to the remainder/majority of the class (i.e., not identical or appropriately modified from the class curriculum with respect to difficulty, modality, response format, length, and/or materials).

Examples: Students coloring, completing other activities unrelated to the class theme/unit for the day, working on assignments from other classes—*all if assigned by a teacher.*

Nonexamples: See Engaged with Consistent, Unengaged.

Unengaged in Instructional Activities

Code if the focus student is overly ***not actively engaged*** (i.e., attending to) in any instructional activities and/or tasks **or** if the focus student is actively engaged in activities and/or materials that are ***not assigned by a teacher or paraprofessional.*** That is, the student does not actually appear to be 'learning' anything.

Examples: Moving around the classroom during instructional activities, looking around the room or staring "off into space", not paying attention to a teacher lecture (i.e., not looking at the teacher, writing, or writing), disrupting others, talking to peers when he/she is not supposed to, working on assignments for other classes (if not assigned by teacher), listening to class announcements and sleeping. Also includes the student not being provided any instructional materials or waiting for an assignment/activity to begin.

Nonexamples: See above engaged examples.

Source: adapted from Carter, Cushing, Clark, & Kennedy (2005)

Proximity (duration)

Code any of the following personnel who is in a body orientation, distance, and position that allows easy access for interaction with the focus student (i.e., about 3 feet or reachable length to touch that person). Code changes in this variable only after 5 seconds have elapsed after going from one state to another. Again, as a rule of thumb, only change proximity codes if there is a compelling reason to change the code. For example, if an SEA walks away to get something but looks to be coming back, don't change the code.

Proximity of Peers/Peer Supports

A peer *without* significant disabilities (e.g., peer support during pre-intervention, other classmates) is in a position that allows him or her to interact with the focus student easily (e.g., facing toward each other or sitting next to each other and facing the same direction). Proximity will be coded if the focus student and a peer do not have to drastically reposition themselves in order to work or interact with one another.

> Examples: A peer is sitting directly next to or across table from the focus student. A peer is standing right behind the focus student in a line.
>
> Nonexamples: A peer and focus student are sitting back to back at different tables, or the peer support is walking around the room and happens to be walking by the focus student. While providing instructions to the focus student, the paraprofessional stands next to the focus student and block the access for the focus student and peers to talk to each other.

Proximity of SEA or Special Educator

The support person (e.g., a paraprofessional, special educator, speech language pathologist) is positioned within a distance that allows him or her to interact with or provide instructions to the focus student.

> Examples: A paraprofessional is sitting directly next to the focus student and helping him or her to complete a worksheet. A special educator is standing behind the focus student during a large group lecture.
>
> Nonexamples: The general educator is standing right next to the focus student. A paraprofessional from a different class stops by and says hi to the focus student.

Source(s): adapted from Carter, Cushing, Clark, & Kennedy (2005); Hughes, Carter, Hughes, Bradford, & Copeland (2002); Hughes et al. (1995, 1996); Mautz, Storey, & Certo, 2001)

Information Sheet

Number of Adults and Peers in the Classroom

This captures the number of peers and adults presented in the classroom in the beginning and at the end of the class.

Different Peers Interacted

This variable documents the number of different peers who had interactions with the focus student (through initiations or responses) during the observation session. Each new peer who interacts with the focus student is counted. If the focus student initiates toward multiple peers, only count the peers who respond to the initiation as peers interacted unless the initiation is overtly directed toward every peer in the group.

Communication Modes Used During Peer Interactions

Check all of the following behaviors that the focus student used toward peers during interactions that appear to have communicative intent.

- **None:** The focus student did not make any contributions to any interactions that occurred in the class (i.e., the focus student did not initiate or respond to any peer during the entire observation session).

- **Speech:** Single words, short phrases, whole sentences, and word approximations that are understood by the listeners that serve communication purposes (if the observer cannot distinguish between a word approximation and vocalization, code as speech)

  Example: the focus student produces a word approximation "Sure" in respond to a classmate's question, "Can I borrow your eraser?"
  Nonexamples: See other communication mode categories.

- **Vocalizations:** non-speech sounds with communication intents in which the words are not intelligible to the listener. "Not intelligible and not consistent to a specific referent to the listener" (Blackstone, 1991; Pasco et al., 2008).

  Example: The focus student uses voice to gain peer's attention.
  Nonexamples: See other communication mode categories (e.g., word approximations)

- **Facial expressions/affect/eye gaze:** generic or specific facial and visual behaviors that clearly serve communication purposes.

Examples: A peer asks the focus student, “Do you like swimming?” The focus student answers with a smile, “Yes, I go swimming at the YMCA with my sister and I like it.” *Nonexamples*: the focus student looks at the special education teacher who sits next to him and is giving instruction about completing a worksheet.

- **Signs:** “specific gestures that are taken or adapted from formal sign language vocabularies” that serve communication purposes (Blackstone & Berg, 2003).

  Examples: the focus student touches a peer’s shoulder and uses a sign to ask for help. *Nonexamples:* see other communication mode categories.

- **Gestures:** body movements that clearly serve communication purposes, usually involved the use of the head or hands (e.g., headshakes, waving, high five, fist bump, pointing). If the focus student points to a picture to interact with a peer, code as an aided system. “Holding, touching, or taking an object does not count as a gesture unless the child is directing the gesture toward a partner” (Wetherby & Prizant, 2003).

  Examples: The focus student waves while saying bye to a peer support. The focus student nods in response to a peer’s question.
  Nonexamples: The focus student turns pages in response to a peer’s instruction.

- **Aided systems —external communication devices (non-electronic or electronic):** Any non-electronic displays of symbols/pictures/words/photos or any battery-operated electronic devices or computers that serve communication purposes. Non-electronic systems may be communication broads or books. Electronic devices usually have electronic or pre-recorded voice output, may be simple (limited storages of messages or inserted printed pictures) or complex (computerized programs that use digital pictures). Specify the type of aided system that the focus student uses during peer interactions.

  Examples: A peer asks, “What’s your weekend plan?” The focus student points to a picture on her communication board, “Shopping.” The focus student activates a message from his device while facing the peer, “Want to hear a joke?”
  Nonexamples: see other communication mode categories.

Sources: adapted from Beukelman & Mirenda (2005); Blackstone (1991); Blackstone & Berg (2003); Kaiser & Grim (2006); Pasco et al. (2008); and Wetherby & Prizant (2003).

Quality of Peer Interaction

By the end of each observation, rate the quality of peer interactions. This measure will reflect the overall interaction experiences the students had across all of the peer interactions during the entire class period. Rate the reciprocity of interactions, the content of conversation, and students' affect in relation to other classmates' interactions. If no interactions with peer occurred during the observation, check the "no interactions" box.

- **Reciprocity**
  High: Overall, interactions were reciprocal and balanced (both the focus student and peers equally initiated and responded).
  Medium: Peers initiated more than the focus student. The focus student occasionally initiated and often responded to peers' initiations.
  Low: Peers were the primary initiators. The focus student rarely initiated and infrequently responded to peers' initiations.
- **Content**
  Appropriate: The overall content of the student's peer interactions was similar to the interactions of other students in the class and was appropriate to the class context and the student's age (e.g., the focus student was talking about school events during free time).
  Neutral: The content of the student's peer interactions was a mix of appropriate and inappropriate topics and conversations.
  Inappropriate: The content of student's peer interactions was mostly dramatically different from the interactions other students had in the class, or was neither age-appropriate nor class context-related.
- **Affect**
  Positive: Both the focus student and peers enjoyed the interaction exchanges as indicated by their positive affect (smiles and attentive body language) **most of the time**.
  Neutral: Most of the interaction exchanges between the focus student or peers were accompanied with neither positive nor negative affect.
  Negative: **Most of the time,** either the focus student or peers showed negative affect during interaction exchanges (e.g., angry, verbal/physical aggression, displeased).
- **Responses**
  Mostly related: Most responses produced by the focus student and peers toward each other are related to the topic or questions that were asked.
  Somewhat related: Most responses produced by the focus student and peers toward each other are related to the topic or questions that were asked with the exception of some incidences in which the focus student produced unrelated responses.
  Not related: Noticeable amount of responses produced by the focus student and peers toward each other are **NOT** related to the topic or questions that were asked.

- **Overall quality based on reciprocity, content, affect, and relevance.**
  5: High quality: The peer interactions that the focus student has are almost identical or very similar to what other peers have in the classroom.
  4: Medium-high quality
  3: Medium quality
  2: Medium-low quality
  1: Low quality: The peer interactions that the focus student have are significantly deviant from what other peers have in the classroom.

Sources: adapted from Bauminger (2007); Carter et al. (2005), Fryxell & Kennedy (1995); Hughes, Copeland et al., (2002); and Hunt et al. (1996).

Peers' and Support Person's Support Behaviors

Check off each of the support behaviors produced by peers (i.e., peer supports and other peers) and the support person observed during the session. This can be done in an ongoing fashion (i.e., check them off as they occur) or at the end of the class. Record any additional support behaviors you observed that did not fit into one of the existing categories.

Conversation Topics Addressed During Peer Interactions

Check off the type of conversation addressed during initiations or responses from the focus student to peers or from peers to the focus student throughout the entire session. This can be done in an ongoing fashion (i.e., check them off as they occur). Record any other topics you observed that did not fit into one of the existing categories.

Topic	Definitions and/or examples
Task-related	Academic-related conversations in the class in which the observation is taking place (e.g., borrowing materials or checking answers). See school events (academic) for conversations associated with other classes.
Peers	Conversations about other similar-age students (e.g., friends, other kids at school).
Greetings and social amenities	Behaviors performed to fulfill conventional social rules in a given situation (e.g., saying, "Hi, goodbye, excuse me, or thanks!").
Food	Substance that can be consumed to provide energy, nutrition, and hydration (e.g., talking about lunch choices or restaurant menus).
Jokes	Behaviors that are intended and/or resulted in laughter (e.g., acting silly or making funny faces).
School events (academic)	School activities that are academic-oriented or <u>other classes</u> that the student has or will take (e.g., taking about midterm exams, quizzes,

	assignments for other classes, or academic field trips).
School and after-school events (social)	School-sponsored activities that are social in nature (e.g., extracurriculars, school dance, musical, or swimming camps).
Outside-school events	Personal, family, or community activities that are not sponsored by the school (e.g., birthday party, family trips, or community parade)
TV, movies, bands, and celebrities	Conversations associated with TV shows, movies, music, or/and famous people (e.g., TV stars, movie reviews, or new CD releases).
Money and work/employment	Conversations associated with money or hourly jobs (e.g., salary, babysitting, or summer jobs).
Indiscernible	Conversations that cannot be heard or the topics cannot be discerned.
Others	Topics discussed that do not fit in the above categories (e.g., weather or heath). Please specify with examples.

Other Notes

Record the class activities or instructional topics, any negative interactive behaviors, challenging behaviors, and any other relevant information that may influence the data.

APPENDIX I

P3 NARRATIVE OBSERVATION FORM

Observation Information Sheet

Date: ___________ Class: ________________Student code: __________________________

Primary/IOA: _____/______
Persons in Classroom (start/end)
General educators: ___/___ Students: ___/___ Special educators: ___/___ Other adults: ___/___

Tally of different peers interacted: (PS) :_________(Other Peer): ________________Total: (PS) :_____(Other P)____

Communication modes used by the focus student during peer interactions:
☐ None ☐ Non-speech vocalizations ☐ Facial expressions ☐ Gestures ☐ Signs ☐ Speech ☐ Aided systems (specify:__________)

Quality of Interaction ☐ No Interactions
Reciprocity ☐ High ☐ Medium ☐ Low
Content ☐ Appropriate ☐ Neutral ☐ Inappropriate ☐ N/A
Affect ☐ Positive ☐ Neutral ☐ Negative
Responses ☐ Mostly Related ☐ Somewhat related ☐ Not related ☐ N/A
Overall ☐ 5/High ☐ 4/Medium-high ☐ 3/Medium ☐ 2/Medium-low ☐ 1/Low

Support Behaviors Demonstrated by *SEA and Peers*

SEA	Peer	Academic-related supports
☐	☐	Motivate/encourage the student
☐	☐	Redirect when the student is off-task
☐	☐	Assist with completing class assignments
☐	☐	Assist in taking notes or share notes (with peers)
☐	☐	Sharing class materials other than notes (with peers)
☐	☐	Prompt the student to answer a academic question
☐	☐	Help the student participate in a group activity
☐	☐	Paraphrase lectures or discussions (review class content)
☐	☐	Modify/adapt assignments during the class period
☐	☐	Read aloud a book section or assignment
☐	☐	Write down answers given orally or with a aided device
☐	☐	Help the student keep organized
☐	☐	Other______________________________
SEA	**Peer**	**Social-related supports**
☐	☐	Prompt the student to interact with other classmates
☐	☐	Encourage other classmates to interact with the student

Conversation Topics Addressed during Peer Interaction

☐ Task-related
☐ Peers
☐ Greetings and Social Amenities
☐ Food
☐ Jokes
☐ School events (academic)
☐ School and after-school events (social)
☐ Outside-school events
☐ Television, movies, bands, and celebrities
☐ Money
☐ Work and employment
☐ Indiscernible
☐ Others:______________________
☐ Others:______________________

Class Activities or Topics:

☐	☐	Explicitly teach the student specific social skills	Negative interactions: Challenging behaviors:
☐	☐	Prompt the student to use aided communication devices	
☐	☐	Praise social/communication attempts/behaviors	
☐	☐	Provide emotional support or give advice	
☐	☐	Other ______________________________	
SEA	Peer	Other supports	
☐	☐	Help the student self-manage own behaviors	
☐	☐	Explain class rules	
☐	☐	Explain class schedule	
☐	☐	Other _______________________________	

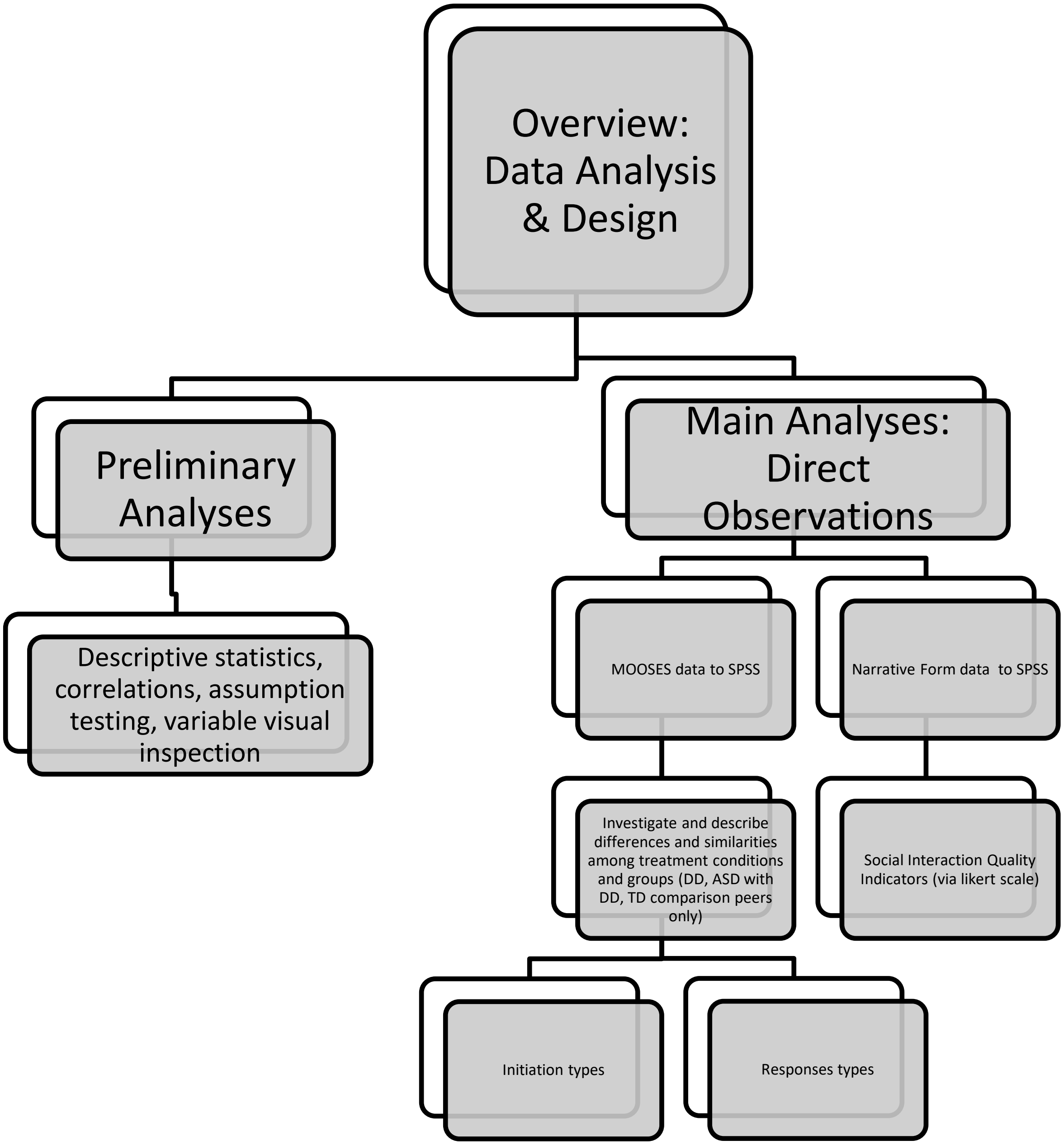
Notes for data entry:

Peer Comparison 1- Gender: M F Race/ethnicity __________________________

Peer Comparison 2- Gender: M F Race/ethnicity __________________________

APPENDIX J

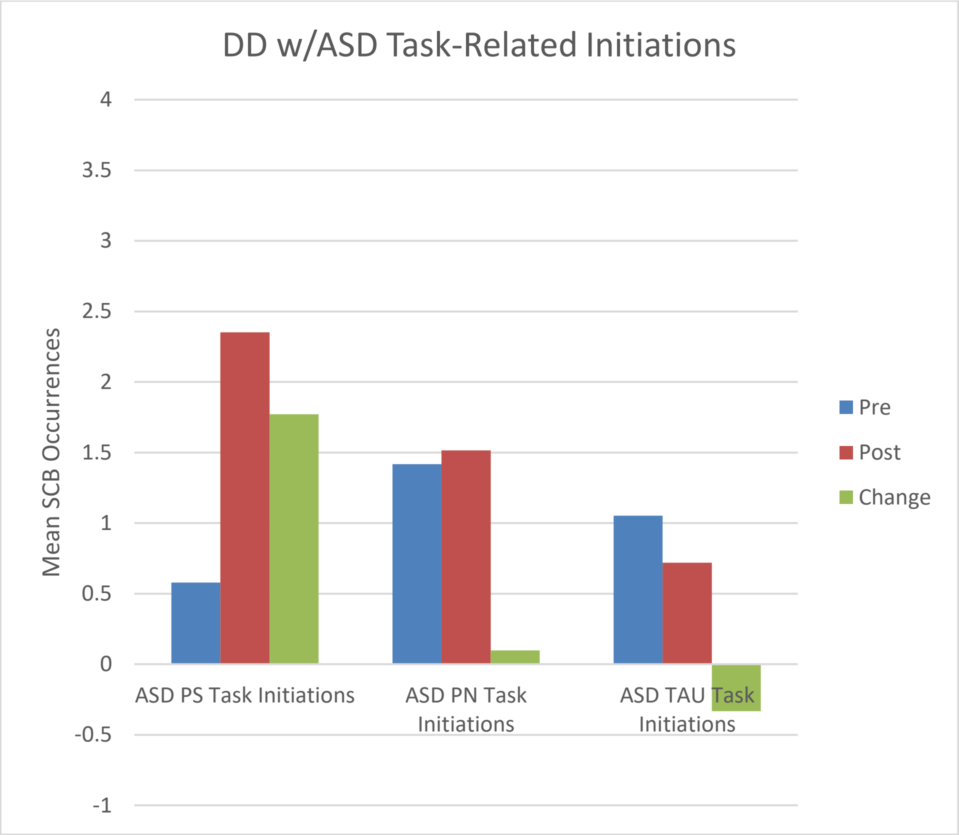
PRESENT STUDY DATA ANALYSIS FRAMEWORK

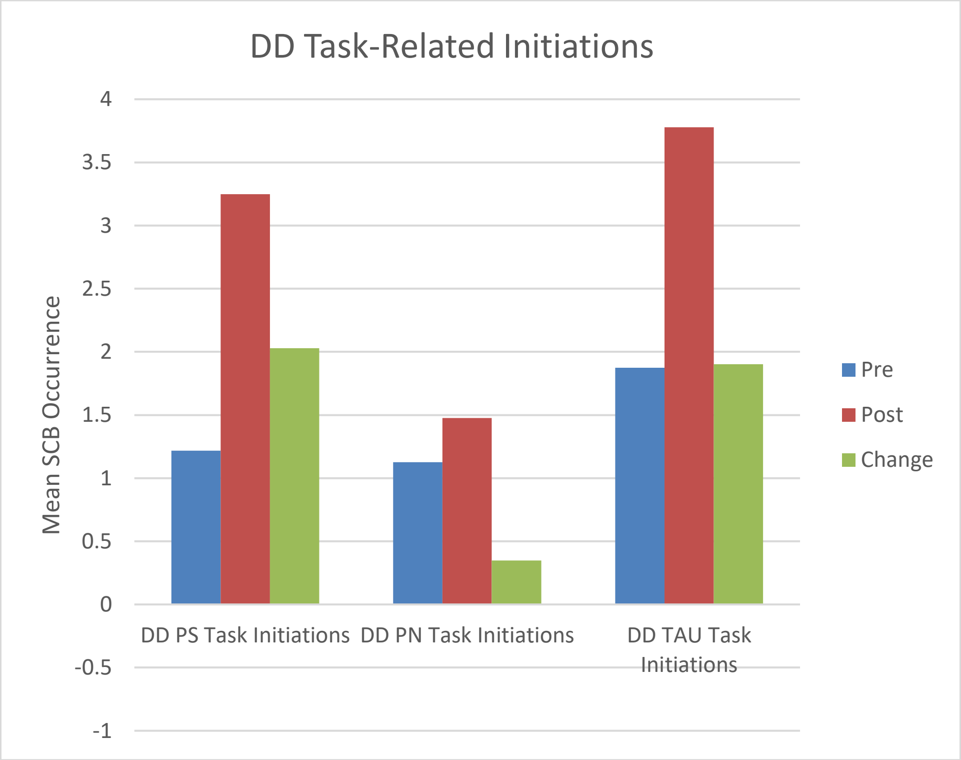

Overview: Data Analysis & Design
Preliminary Analyses
Main Analyses: Direct Observations
Descriptive statistics, correlations, assumption testing, variable visual inspection
MOOSES data to SPSS
Narrative Form data to SPSS
Investigate and describe differences and similarities among treatment conditions and groups (DD, ASD with DD, TD comparison peers only)
Social Interaction Quality Indicators (via likert scale)
Initiation types
Responses types

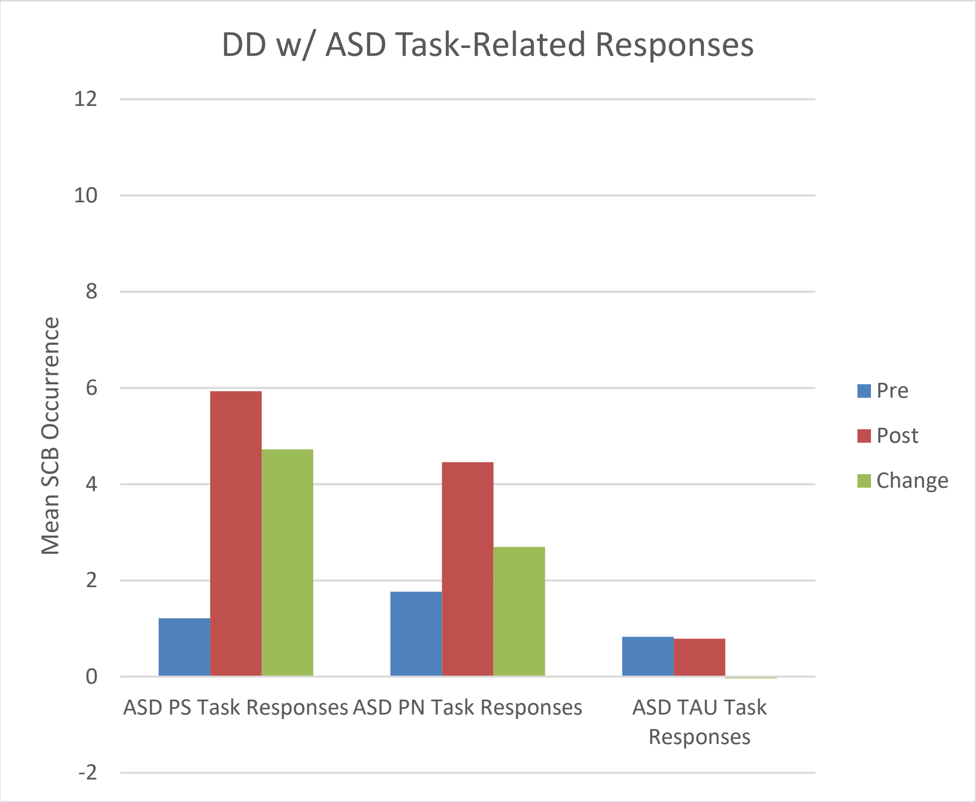
APPENDIX K

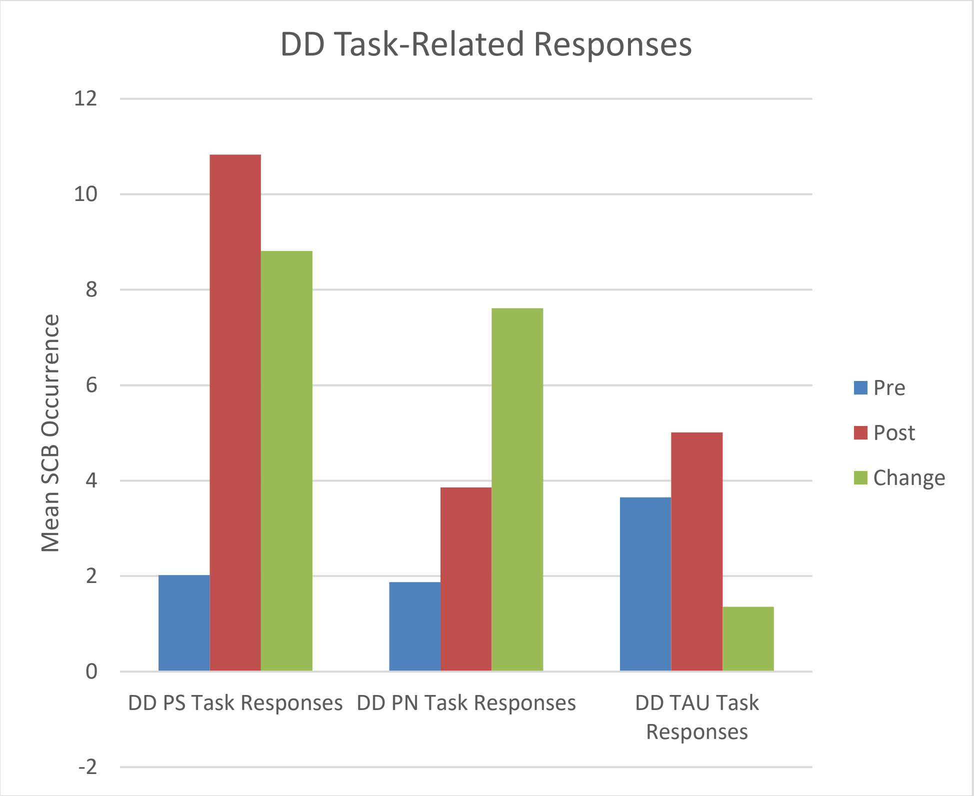
ADDITIONAL GRAPHICAL RESULTS FOR RESEARCH QUESTION 1

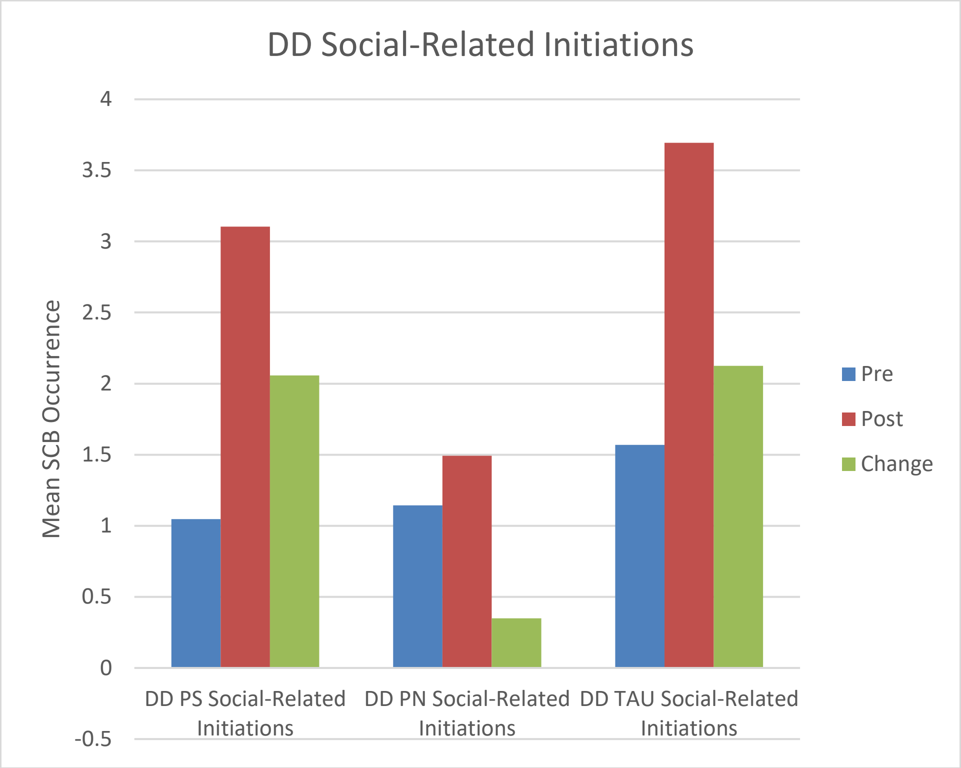
Research Question 1: Additional Graphical Results

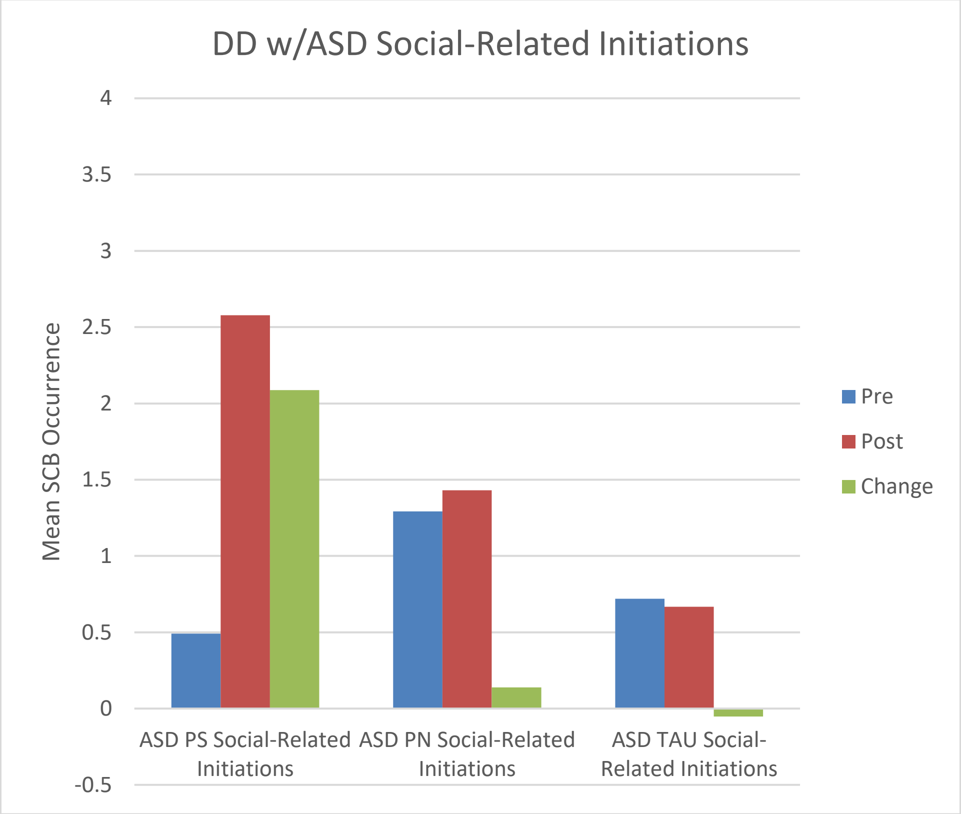


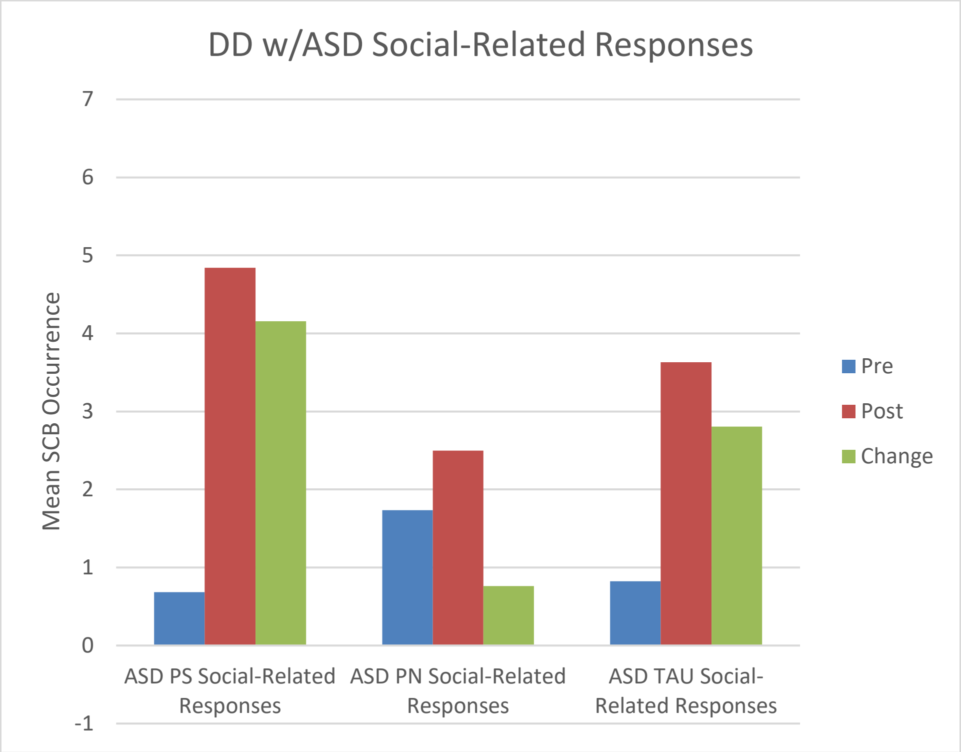


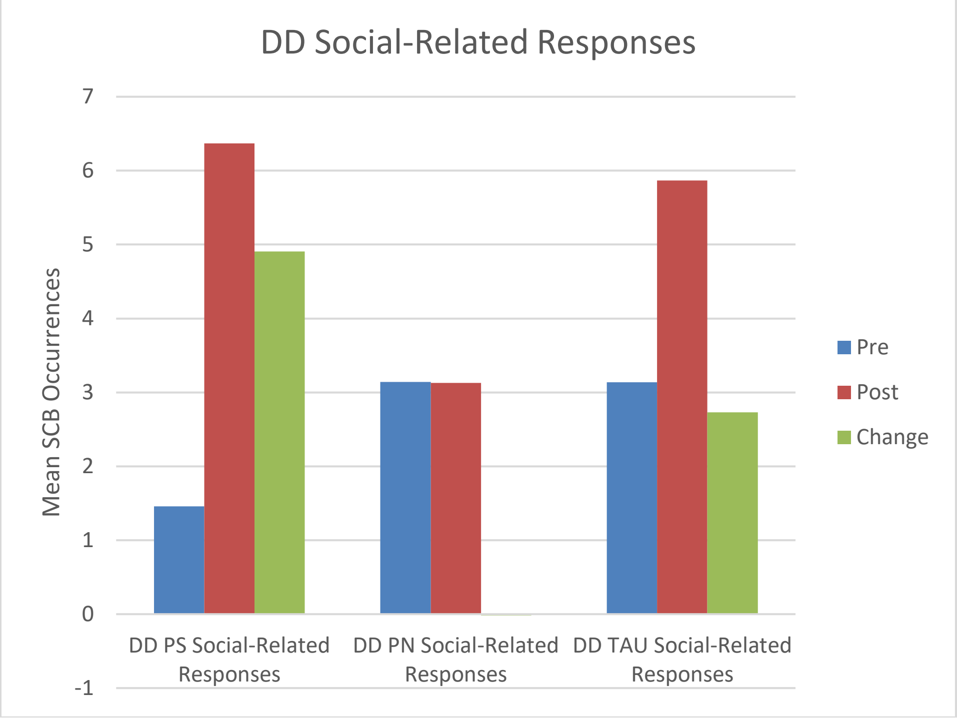

DD w/ ASD Task-Related Responses
Mean SCB Occurrence
12
10
8
6
4
2
0
-2
ASD PS Task Responses
ASD PN Task Responses
ASD TAU Task Responses
Pre
Post
Change

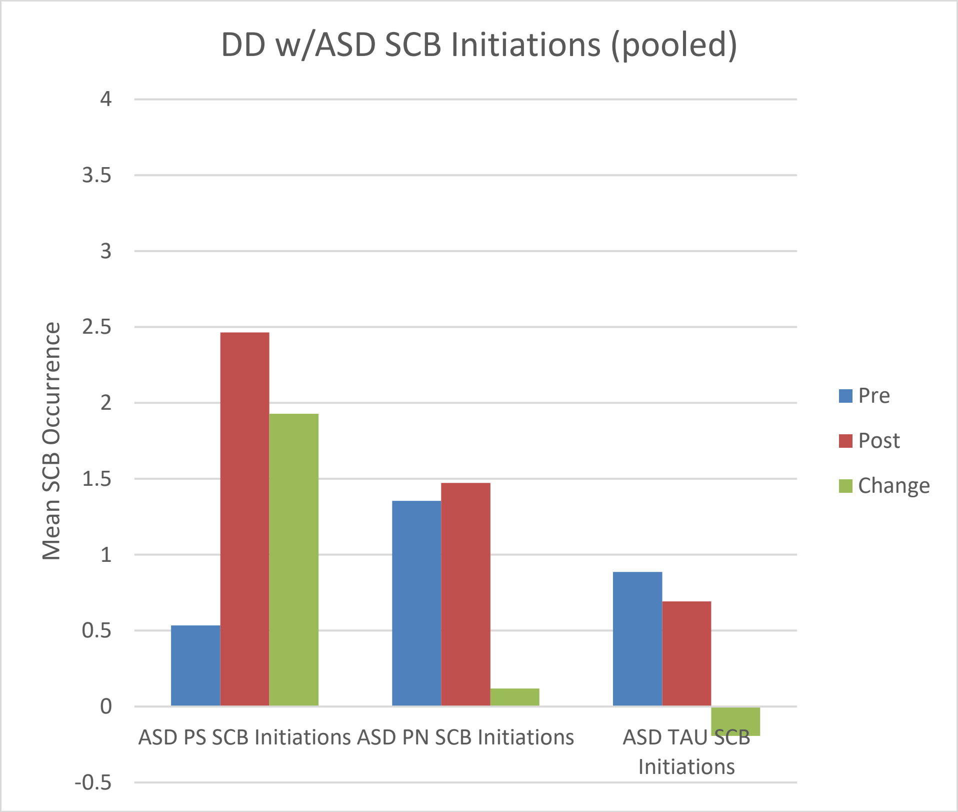

DD Task-Related Responses
Mean SCB Occurrence
12
10
8
6
4
2
0
-2
DD PS Task Responses
DD PN Task Responses
DD TAU Task Responses
Pre
Post
Change

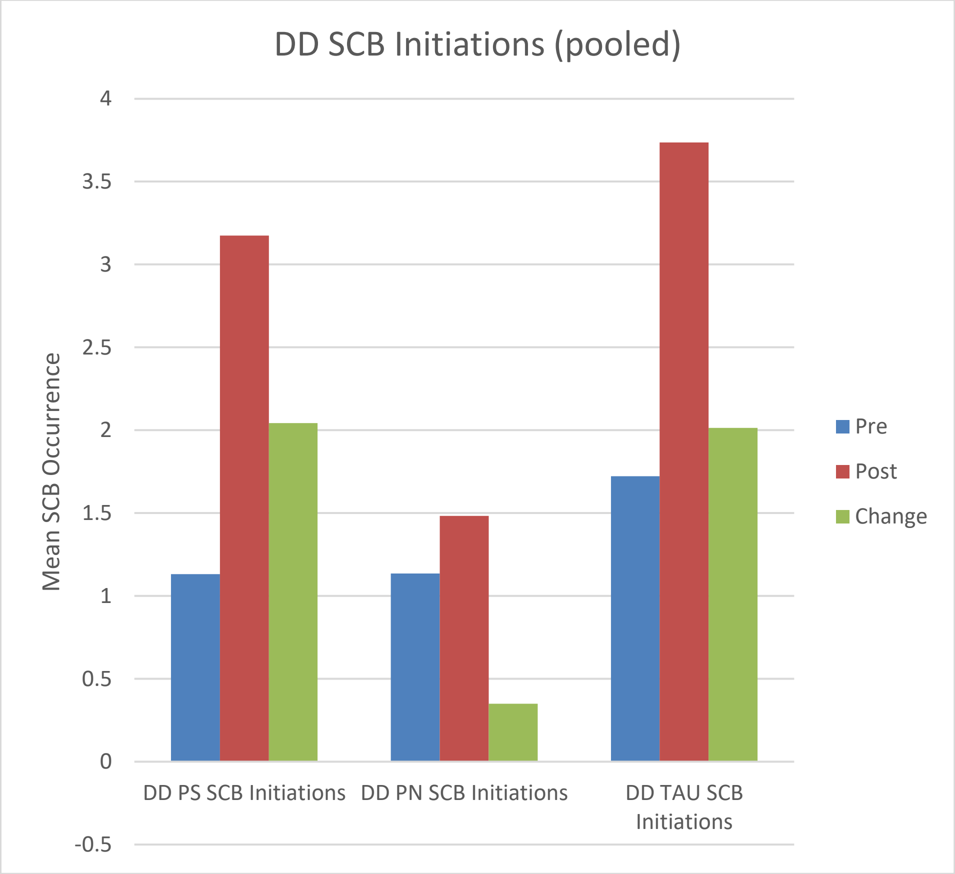

DD Social-Related Initiations
Mean SCB Occurrence
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
DD PS Social-Related Initiations
DD PN Social-Related Initiations
DD TAU Social-Related Initiations
Pre
Post
Change

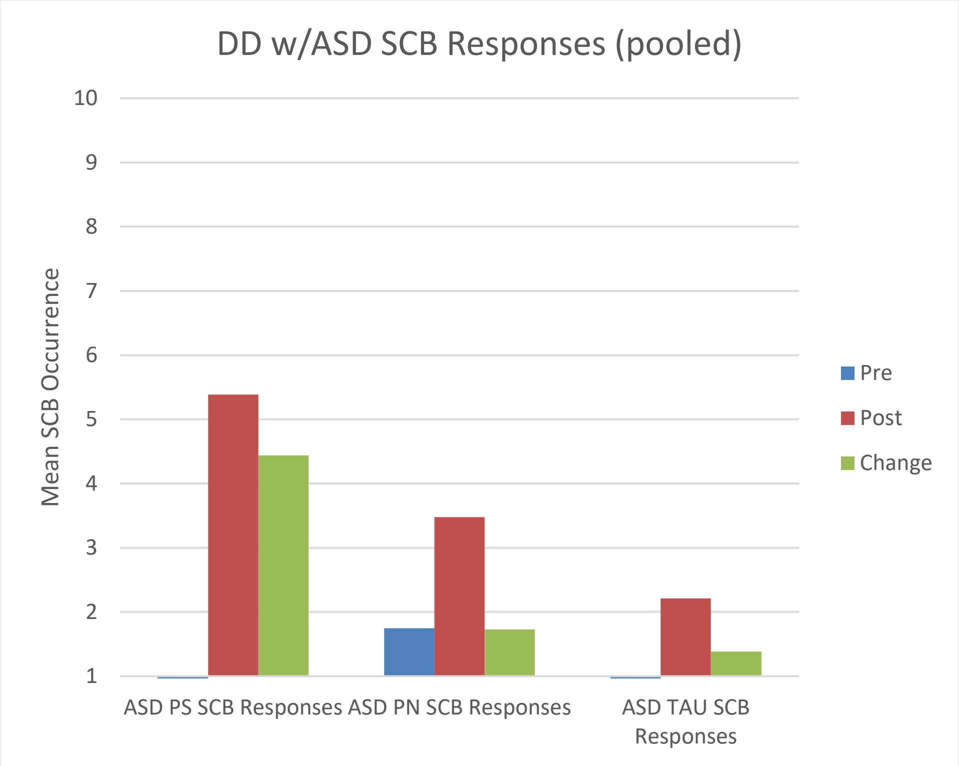

DD w/ASD Social-Related Initiations
Mean SCB Occurrence
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
ASD PS Social-Related Initiations
ASD PN Social-Related Initiations
ASD TAU Social-Related Initiations
Pre
Post
Change

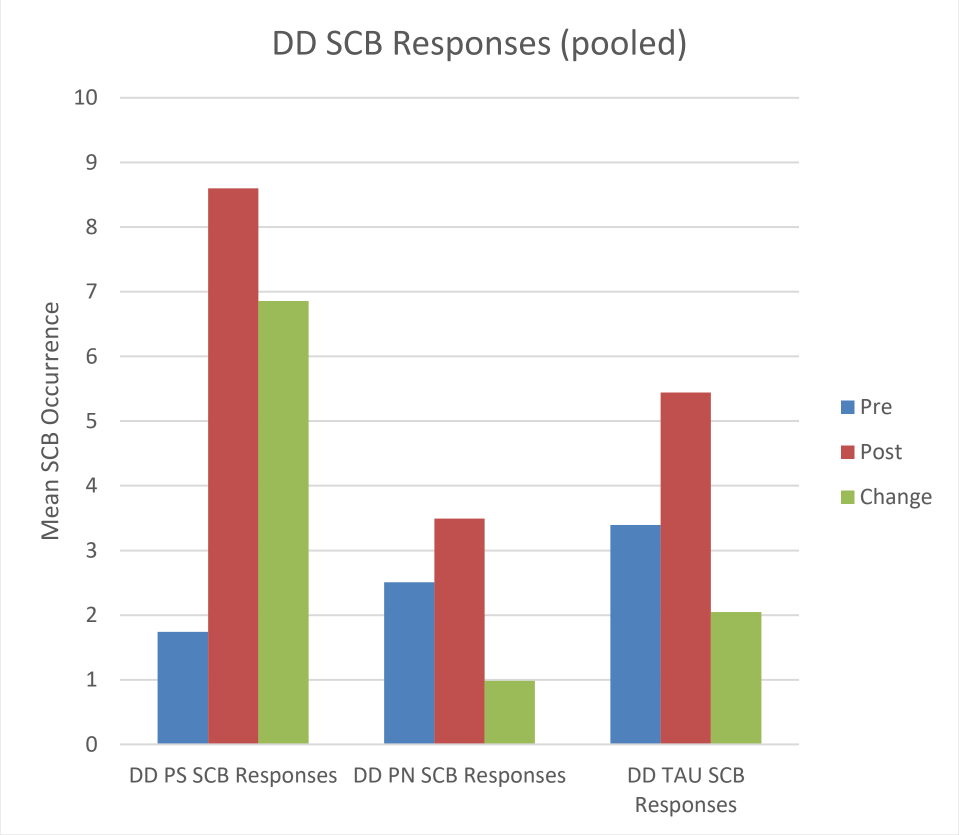

DD w/ASD Social-Related Responses


DD Social-Related Responses

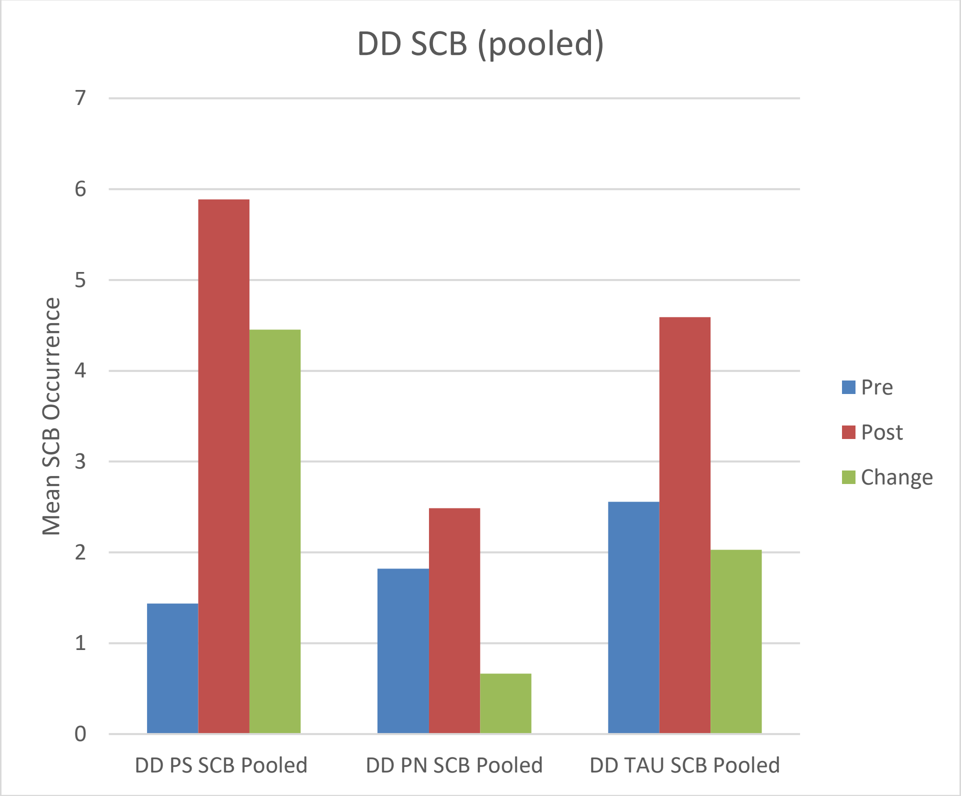

DD w/ASD SCB Initiations (pooled)
Mean SCB Occurrence
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
ASD PS SCB Initiations
ASD PN SCB Initiations
ASD TAU SCB Initiations
Pre
Post
Change

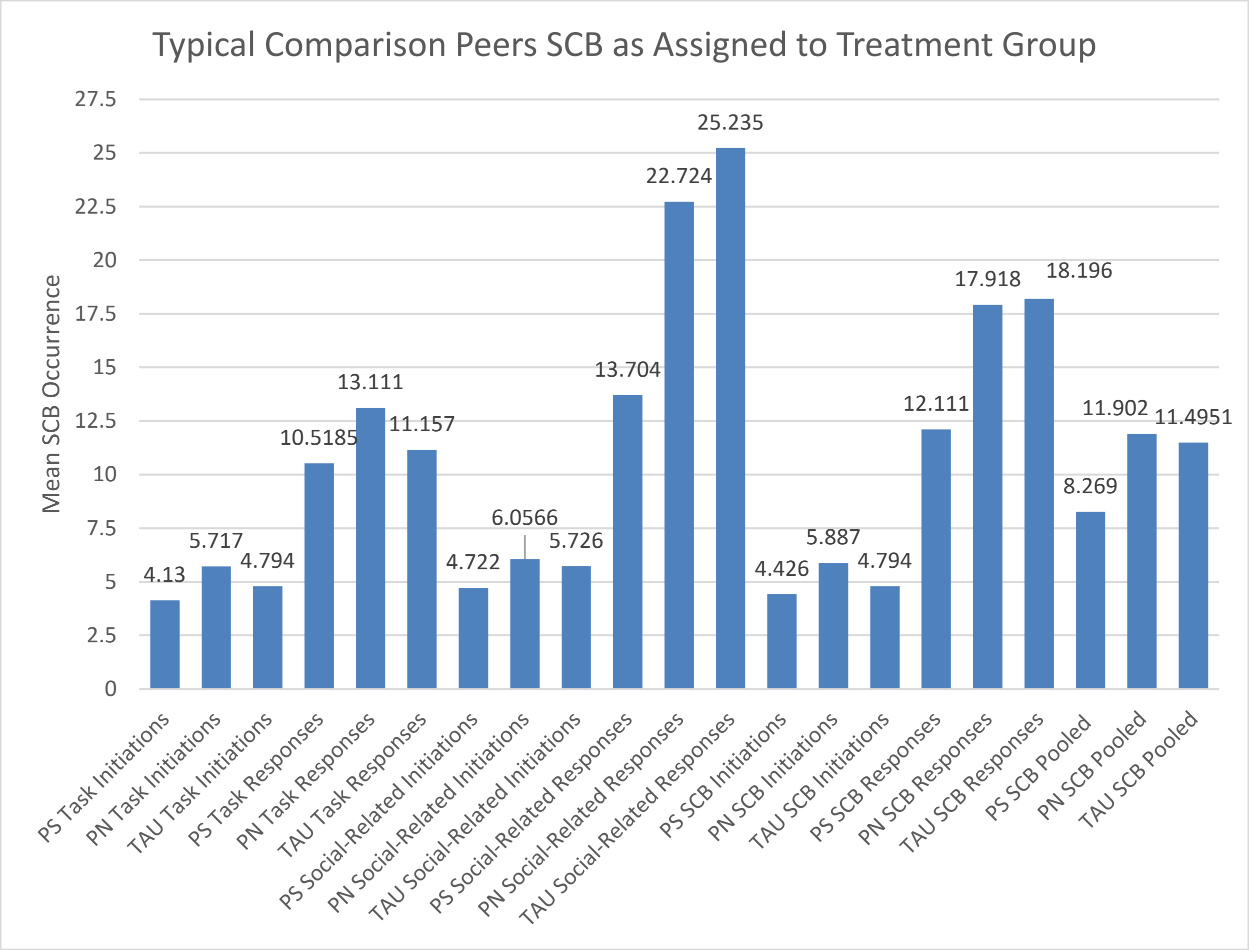

DD SCB Initiations (pooled)
Mean SCB Occurrence
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
DD PS SCB Initiations
DD PN SCB Initiations
DD TAU SCB Initiations
Pre
Post
Change


DD w/ASD SCB Responses (pooled)
Mean SCB Occurrence
10
9
8
7
6
5
4
3
2
1
ASD PS SCB Responses
ASD PN SCB Responses
ASD TAU SCB Responses
Pre
Post
Change


DD SCB Responses (pooled)
Mean SCB Occurrence
10
9
8
7
6
5
4
3
2
1
0
DD PS SCB Responses
DD PN SCB Responses
DD TAU SCB Responses
Pre
Post
Change


DD w/ASD SCB (pooled)
Mean SCB Occurrence
7
6
5
4
3
2
1
0
ASD PS SCB Pooled
ASD PN SCB Pooled
ASD TAU SCB Pooled
Pre
Post
Change


DD SCB (pooled)
Mean SCB Occurrence
7
6
5
4
3
2
1
0
DD PS SCB Pooled
DD PN SCB Pooled
DD TAU SCB Pooled
Pre
Post
Change

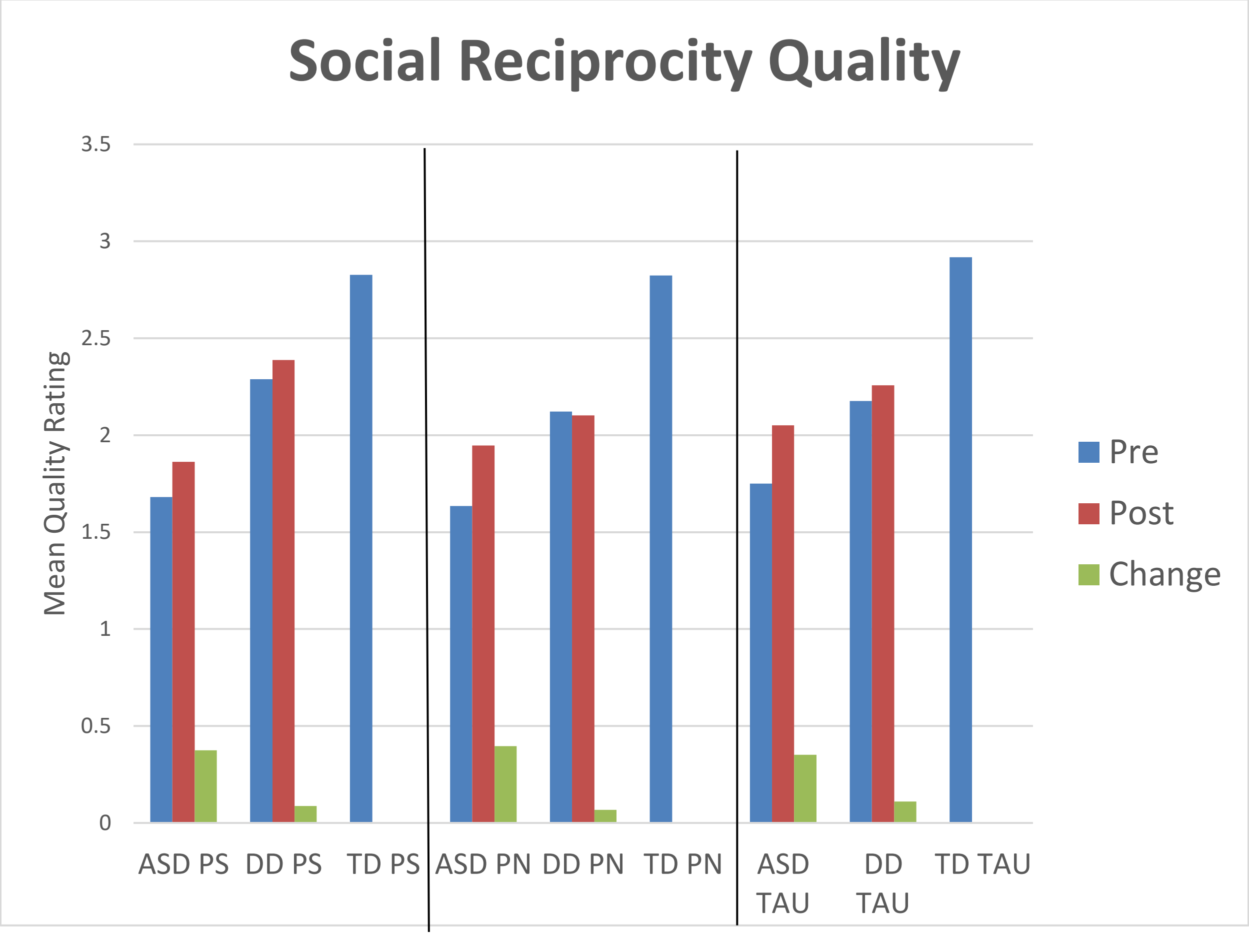


Note. SCB = Social Communication Behaviors, PS = Peer Support Treatment Condition, PN = Peer Network Treatment Condition, TAU = "Treatment as Usual" Treatment Condition.

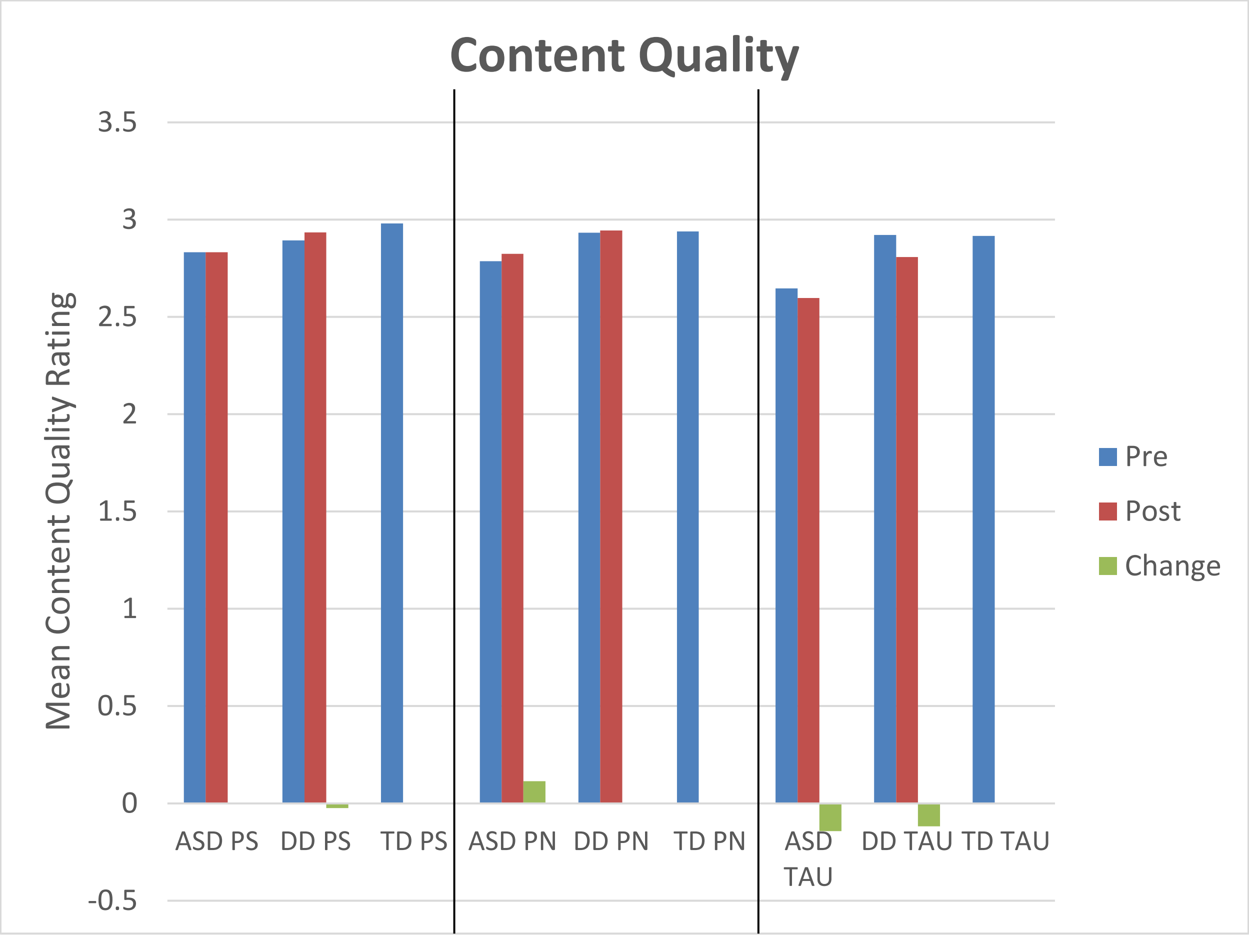
APPENDIX L

ADDITIONAL GRAPHICAL RESULTS FOR RESEARCH QUESTION 3

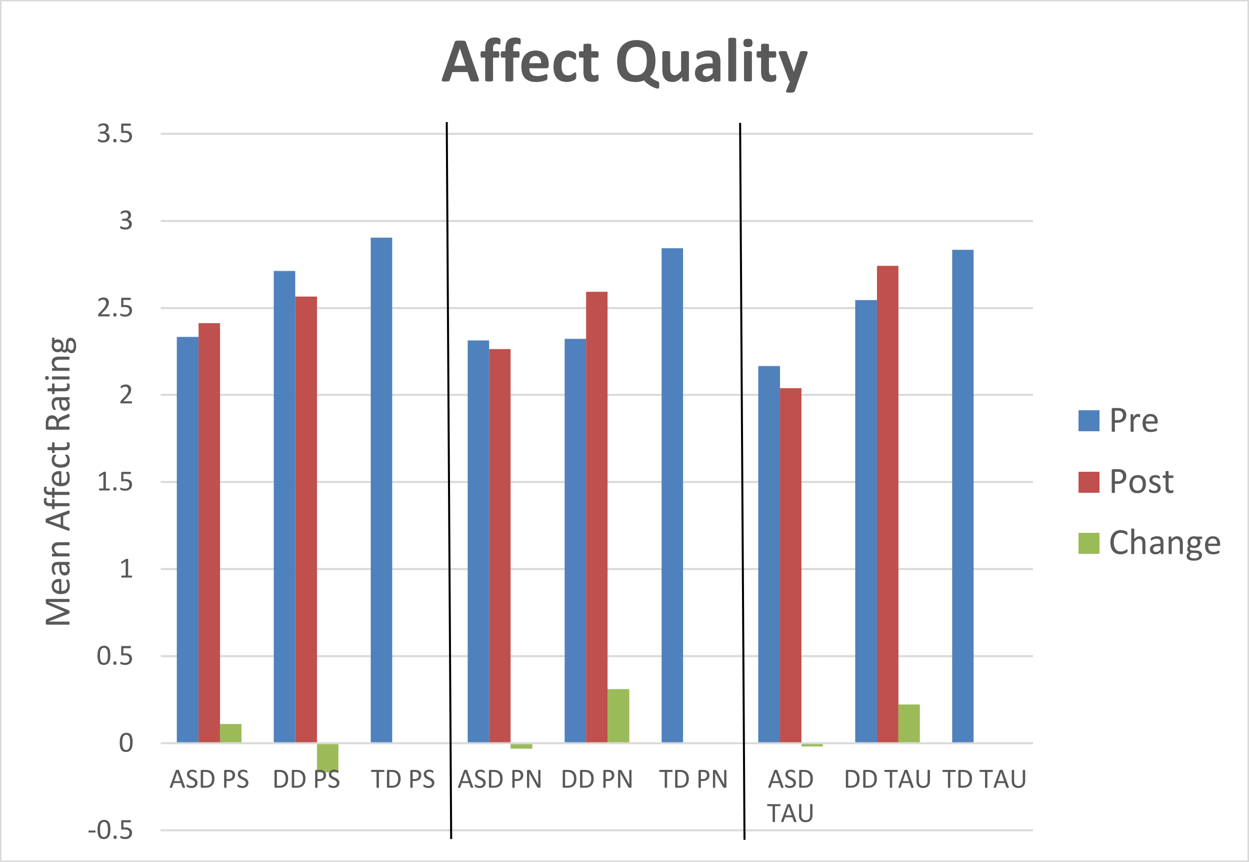
Research Question 3: Additional Graphical Results



Note. Likert Anchors: Social reciprocity was rated by observers on a scale of 1 ("Low" Social Reciprocity) to 3 ("High" Social Reciprocity). PS = Peer Support Treatment Condition, PN = Peer Network Treatment Condition, TAU = "Treatment as Usual" Treatment Condition.

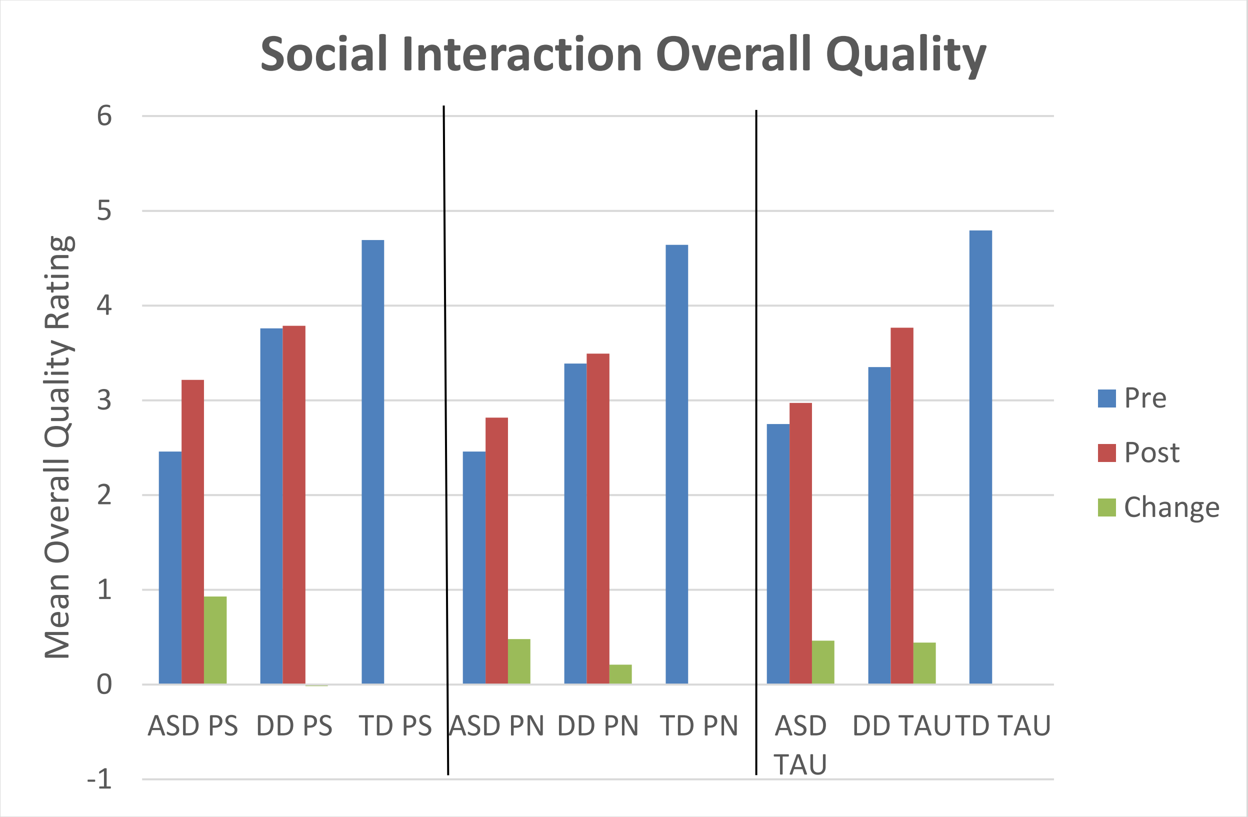


Note. Likert Anchors: Social interaction content quality was rated by observers on a Likert scale of 1 to 3, with the following ratings: 1 = "Appropriate," 2 = "Neutral," 3 = "Inappropriate." PS = Peer Support Treatment Condition, PN = Peer Network Treatment Condition, TAU = "Treatment as Usual" Treatment Condition.



Note. Likert Anchors: Social interaction affect quality was rated by observers on a Likert scale of 1 to 3, with the following categories: 1 = "Negative," 2 = "Neutral," 3 = "Positive." PS = Peer Support Treatment Condition, PN = Peer Network Treatment Condition, TAU = "Treatment as Usual" Treatment Condition.

Note. Likert Anchors: Social interaction responses quality was rated by observers on a Likert scale of 1 to 3, with the following categories: 1 = “Not Related,” 2 = “Somewhat Related,” 3 = “Mostly Related.” PS = Peer Support Treatment Condition, PN = Peer Network Treatment Condition, TAU = “Treatment as Usual” Treatment Condition.



Note. Likert Anchors: Overall social interaction quality was rated by observers on a Likert scale of 1 to 5, with the following categories: 1 = “Low Quality,” 2 = “Medium-Low Quality,” 3 = “Medium Quality,” 4 = “Medium-High Quality,” and 5 = “High Quality.” PS = Peer Support Treatment Condition, PN = Peer Network Treatment Condition, TAU = “Treatment as Usual” Treatment Condition.