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TEACHING SOCIAL SKILLS TO INDIVIDUALS WITH COMORBID
DOWN SYNDROME AND AUTISM SPECTRUM DISORDER:
A SINGLE-SUBJECT DESIGN STUDY

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Education
at the University of Kentucky

By
Matthew A. Cody Davis

Lexington, Kentucky

Director: Jonathan Campbell, Ph.D, Professor, College of Education,
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Lexington, Kentucky

2017

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ABSTRACT OF DISSERTATION

TEACHING SOCIAL SKILLS TO INDIVIDUALS WITH COMORBID DOWN SYNDROME AND AUTISM SPECTRUM DISORDER: A SINGLE-SUBJECT DESIGN STUDY

Social skills are important for building and maintaining relationships, effective communication, and providing appropriate responses within social contexts. Deficits in social skills are often exhibited in individuals with comorbid Down syndrome (DS) and autism spectrum disorder (ASD). Peer-delivered interventions and other behavioral techniques for teaching specific social skills show effectiveness; however, the paucity of intervention research including individuals with DS-ASD has resulted in little guidance for how best to teach social skills and ensure generalization and maintenance. In the present study, a multiple probe study across behaviors, replicated across participants, assessed the effectiveness of peer-delivered simultaneous prompting in teaching social skills to four adults with DS-ASD. The overarching purposes of this project were (a) to explore whether peer-mediators with DS-only can use simultaneous prompting reliably for teaching social skills, and (b) to examine the influence of simultaneous prompting to teach social skills to adults with dual-diagnoses of DS and ASD. Study findings add to the DS-ASD literature base on intervention design and implementation as well as the literature base for intervention delivery by peers with identified developmental and intellectual disabilities.

KEYWORDS: social skills; peer-delivered intervention; single-subject design; autism spectrum disorder; Down syndrome

Matthew A. Cody Davis

Student's Signature

February 16, 2017

Date

TEACHING SOCIAL SKILLS TO INDIVIDUALS WITH COMORBID
DOWN SYNDROME AND AUTISM SPECTRUM DISORDER:
A SINGLE-SUBJECT DESIGN STUDY

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CHAPTER 1

INTRODUCTION

Despite the scholarly and societal focus on Down syndrome (DS) and autism spectrum disorder (ASD), the consideration of comorbid DS and ASD (DS-ASD) has a relatively limited research basis. By definition, however, individuals with DS-ASD present with deficits in social communicative skills and restrictive and repetitive behaviors. Like individuals with ASD-only, social deficits experienced by individuals with DS-ASD likely lead to life-long deficits when appropriate, evidence-based interventions are not provided (White, Koenig, & Scahill, 2010). Unfortunately for evidence-based DS-ASD intervention, the majority of the DS-ASD literature has been based on case study reports, prevalence studies, and diagnostic considerations. The dearth of peer-reviewed research is particularly notable for studying the effectiveness of educational and social-emotional interventions for individuals with DS-ASD. Despite positive findings for DS-ASD intervention research that has been conducted, a paucity of research and several methodological concerns leave few empirical findings that practitioners can incorporate into intervention planning. Furthermore, there are no studies with individuals with DS-ASD that have focused specifically on improving social skills through direct social skills training or instruction. In many ways individuals with comorbid DS and ASD have the same social impairments as individuals with ASD-only; however, a unique phenotype emerges that should be considered when providing interventions to individuals with DS-ASD. Therefore, the purpose of this study is to add to the intervention literature for individuals with DS-ASD by exploring whether an intervention based on evidence-based methods (i.e., peer delivered interventions and

simultaneous prompting) for instruction in teaching skills to individuals with ASD or intellectual disability (ID) is effective.

Terms

Social skills. For all individuals, *social skills* are comprised of a variety of verbal (e.g., volume, clarity of voice, and tone) and non-verbal (e.g., eye contact, proximity, and facial expressions) qualities of responses “that influence the perception and response of other people during social interactions” (Spence, 2003, p. 84). Some researchers include challenging behaviors (e.g., disruptive or isolative) under the term ‘social skills’ due to such conduct interfering with positive social behaviors (Walton & Ingersoll, 2012). For the purpose of this study, challenging behaviors are not included in the definition of social skills. Competent social functioning requires foundational social skills, which allow for more complex social behaviors, including understanding emotions, initiating and maintaining interactions, self-management, and understanding the social cues of individuals and groups (Stone, Ruble, Coonrod, Hepburn, & Pennington, 2003). *Social skills instruction, or training*, is a common term used for a category of interventions under which a number of different techniques, targeted social behaviors, and approaches are incorporated. For the purposes of this project, the National Association of School Psychologists’ (NASP; 2002) definition is adopted in which social skills interventions are those that teach targeted skills using behavioral and social learning approaches along with a set structure, language, or sequence that assists in learning the behavior. The Institute of Education Sciences’ (2013) definition also fits within this definition by defining social skills training as teaching related skills with an assortment of age-appropriate, behaviorally oriented practices. Social skills training can be implemented in several

different ways and include several elements, such as modeling, coaching, and role-playing with feedback (Mesibov, 1984). Other key features of social skills training can include direct, systematic instruction, involving caregivers, training staff, assessing progress, and providing individualized intervention.

Down syndrome. Individuals with *Down syndrome* have an additional chromosome 21 in all of their cells (i.e., trisomy 21, or nondisjunction), an additional chromosome 21 in some of their cells (i.e., mosaicism), or a piece of chromosome 21 attaches to a different chromosome (i.e., translocation). A fourth type of DS occurs when an “internal duplication of some critical genes” occurs on one chromosome 21 (Lovering & Percy, 2007, p. 150). Approximately 95% of all individuals with DS have the trisomy 21 type (Lovering & Percy, 2007). The error in cell division that results in an individual having DS impacts multiple domains of development including cognitive delays (i.e., Intelligence Quotients, or IQs, typically between 30 and 70), significant delays in adaptive skill development, and significant delays in language skill development (particularly expressive language skills; Chapman & Hesketh, 2000). Several physical characteristics are also associated with the syndrome, such as brachycephaly (short, broad head), broad hands, fifth-finger clinodactyly (i.e., the little finger curving inward), hypotonia, and short stature (Lovering & Percy, 2007). The Centers for Disease Control and Prevention (CDC) indicate 1 in every 691 infants is born with DS (Parker et al., 2010). Individuals with DS develop along the same developmental trajectory as typically developing individuals, however, with significantly more delays as mentioned (Chapman & Hesketh, 2000). Furthermore, individuals with DS have difficulties retaining skills and information learned, deficits in verbal working memory, and seemingly less motivation

when presented with a challenging task (Fidler & Nadel, 2007). Down syndrome accounts for approximately 5-6 percent of *intellectual disability* (ID) cases and exists as one of the most common genetic causes of ID (Heward, 2013; Patterson & Costa, 2005). Individuals with DS are often characterized, in part, by relative strengths in social understanding.

Intellectual disability. *Intellectual disability* refers to “some restriction or lack of ability” as it relates to human intellect (Brown, 2007, p. 3). The American Psychiatric Association (APA)’s *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5; APA, 2013) defines ID as including deficits in both intellectual and adaptive functioning with onset during the developmental period. ID is diagnosed using clinical assessment and individualized, standardized intelligence testing of areas such as problem solving, planning, and abstract thinking (APA, 2013). Adaptive functioning deficits across conceptual, social, and practical domains limit functioning in one or more activities of daily living and across multiple settings (APA, 2013).

Autism spectrum disorder. Individuals with *autism spectrum disorder* are heterogeneous as a group in terms of cognitive functioning and language development, but all are defined in part by significant difficulties with social communication and interaction as well as restricted, repetitive patterns of behavior and interests (APA, 2013). Autistic disorder, Asperger’s disorder, childhood disintegrative disorder, and pervasive developmental disorder not otherwise specified are a set of neurodevelopmental disorders from the (DSM-IV-TR) that the DSM-5 replaced with the category of ASD (APA, 2000; APA, 2013). Common characteristics for individuals with ASD include difficulties with imitation, joint attention, stereotypies, changing routine, perception, symbolic play, and

the presence of sensory problems (Heward, 2013). Research on ASD identified neurobiological and environmental causes, however, 85 percent to over 90 percent of the ASD population has a diagnosis of idiopathic autism (Geschwind & Levitt, 2007; Muhle, Trentacoste, & Rapin, 2004; National Human Genome Research Institute, 2012). Known genetic causes of ASD include Fragile X, Prader-Willi, and Williams syndromes (Bailey et al., 1995; Rutter, 1999).

Due, in part, to the high percentage of idiopathic ASD cases, several ASD-specific theories exist. Since Kanner's (1943) original differentiation from "childhood schizophrenia," the theoretical understanding and knowledge of ASD has progressed. Researchers and developers of ASD interventions can now be guided by several different theories. Deficits related to *theory of mind* relate to individuals with ASD having difficulties with the perception of others' beliefs and prediction of others' behaviors (Baron-Cohen, Leslie, & Frith, 1985; Boucher, 2012; Tager-Flusberg, 1992). Theorists who posit the role of *weak central coherence* in ASD suggest difficulties processing diverse pieces of information to construct overall meaning in context (Frith & Happe, 1994; Happe & Frith, 2006; Hill & Frith, 2003). Some theorists suggest a connection between ASD and deficits associated with executive dysfunction (Hill, 2004; Corbett, Constantine, Hendren, Rocke, & Ozonoff, 2009). *Enhanced perceptual functioning theory* suggests overly active regions of the brain causing more locally focused visual and auditory perceptions in individuals with ASD (Mottron, Dawson, Soulieres, Huberty, & Burack, 2006). *Extreme male brain theory* suggests that individuals with ASD exhibit extreme male sex differences, such as greater spatial abilities and less empathizing (Baron-Cohen, 2002). Other ASD-specific theories reflect diminished social motivation

(Chevallier, Kohls, Troiani, Brodtkin, & Schultz, 2012) as well as several neurobiological theories (e.g., the amygdala theory; Baron-Cohen et al., 2000; Di Martino et al., 2009; Mundy, 2003). Down syndrome can be diagnosed using one of several medical tests; however, at this time, interview and behavioral observations are required to diagnose ASD. Individuals with ASD vary in terms of cognitive functioning and language development, but all show significant difficulties within the social domain.

Review of the Literature

The first published work mentioning what is currently referred to as an autism spectrum disorder in Down syndrome (DS-ASD) was a case study description in 1976 (Ghaziuddin, 1997). Three years later a researcher described a boy with DS who exhibited autistic-like behaviors (Wakabayashi, 1979). The perceived rare comorbidity of ASD with DS is likely responsible for a thin research underpinning (Bregman & Volkmar, 1988). Initially, researchers contributed to the DS-ASD knowledge base via prevalence studies (e.g., Ghaziuddin, Tsai, & Ghaziuddin, 1992) and clinical case studies (e.g., Bregman & Volkmar, 1988; Howlin, Wing, & Gould, 1995) while a DS-ASD dual diagnosis was reported to be uncommon occurring in only approximately 1 percent of the DS population (Gath & Gumley, 1986; Moss & Howell, 2009). More recent studies suggest a much higher ASD comorbidity rate, such as 15.6 percent (Lowenthal et al., 2007) to 37.7 percent in the DS population (Warner, Moss, Smith, & Howlin, 2014). If accurate, a 37.7 percent occurrence of ASD in DS suggests approximately 1 in 260 individuals with DS also have ASD. In the last several years, a synthesis of prevalence study findings shows similar estimates of ASD in the DS population. Three of the most rigorous prevalence studies used (a) larger sample sizes, (b) expert opinion, (c)

psychometrically sound ASD-specific screeners (e.g., Social Communication Questionnaire; SCQ), and (d) gold standard instruments (e.g., the Autism Diagnostic Observation Schedule [ADOS]; DiGuseppi et al., 2010; Hickey & Patterson, 2006; Moss, Richards, Nelson, & Oliver, 2012). Across the three studies researchers consistently found an estimated prevalence of autism in DS at 6-8 percent and autism spectrum disorders in DS at 14-20 percent. Conversely, no studies are available reporting a prevalence of DS in groups with ASD. Several researchers do suggest, however, that approximately 10 percent of children with autism have a comorbid genetic or chromosomal condition (e.g., DS, fragile X syndrome, or tuberous sclerosis; CDC, 2015; Rutter & Thapar, 2014). More recently published DS-ASD prevalence rate studies suggest that DS-ASD is not as rare as once believed; therefore, the importance of learning more about individuals with DS-ASD and DS-ASD treatment is crucial considering the distinctive presentation of the disorder and the potential impact on prognosis.

In the following sections of Chapter 1, the rationale for developing and evaluating DS-ASD interventions is presented by first describing the behavioral presentation of individuals with DS-ASD. Next, a synthesis of current research will describe the treatment approach for individuals with DS-ASD. The paradigms used to study personal characteristics associated with treatment approach, and how treatment should be approached based on the unique needs and behavioral phenotype of individuals with DS-ASD will be presented. Subsequently, a discussion regarding social skills instruction and related theories of change is the focus. Finally, a description of the multiple probe

technique for the proposed research, a statement regarding the problem of interest, and a thorough description of the purpose of this study is provided.

Behavioral Presentation in DS-ASD

Along with the limited research guidance provided for intervention development for individuals with DS-ASD, the impact of the diagnosis of ASD on the behavioral presentation of individuals with DS (and vice versa) provides a rationale for the need to develop and evaluate interventions for individuals with DS-ASD. Research findings from ASD-specific diagnostic instruments used in the DS population have helped to demonstrate the impact of the unique DS-ASD behavioral phenotype. As DS and ASD have already been briefly described, the following research is primarily focused on how ASD manifests in individuals with DS. First, individuals with DS-ASD are more likely to have severe ID (Carter, 2007; Dressler, Perelli, Bozza, & Bargagna, 2011; Hepburn & MacLean, 2009; Ji, Capone, & Kaufmann, 2011) and lower adaptive skills (Hepburn & MacLean, 2009; Magyar et al., 2012) than both ASD-only and DS-only groups. The findings resulted in some researchers positing that autistic-like behaviors are manifestations of low cognitive functioning. However, by using standardized autism diagnostic tools (e.g., the ADOS) and after controlling for non-verbal abilities common among individuals with DS-ASD, evidence of a distinct group of individuals with DS meeting criteria for ASD has been established (Warner et al., 2014). The following research findings are organized by how individuals with DS-ASD differ from those with DS-only followed by how individuals with DS-ASD differ from those with ASD-only.

The impact of ASD on DS behavioral presentation. Results from several different standardized instruments indicate that, compared to individuals with DS-only,

individuals with comorbid DS-ASD had different types of, and significantly more, stereotyped behaviors (Carter et al., 2007; Ghosh, Shah, Dhir, & Merchant, 2008; Moss et al., 2012), unusual sensory interests (Hepburn & MacLean, 2009), over-activity or hyperactivity (Capone, Grados, Kaufmann, Bernad-Ripoll, & Jewell, 2005; Moss et al., 2012; Warner et al., 2014), self-injurious behaviors (Ji et al., 2011; Moss et al., 2012), lethargy (Capone et al., 2005), behavioral disturbances (Ji et al., 2011; Warner et al., 2014), self-absorbed behaviors (Hepburn & MacLean, 2009), repetitive use of language (Hepburn & MacLean, 2009; Moss et al., 2012), and language impairment (Molloy et al., 2009; Warner et al., 2014). Moss and colleagues (2012) found that participants with DS-ASD and ASD-only more commonly exhibited hand stereotypies, repetitive phrases, and echolalia while exhibiting fewer positive vocalizations than individuals with DS-only. In addition, DS-ASD and ASD-only group findings indicated significantly more impairments on measures of communication, restricted and repetitive behavior, and reciprocal social interaction than a DS-only comparison group (Moss et al., 2012).

Further, in a study of overt behavior problems in children with DS-ASD, DS-only, or developmental delay (i.e., individuals with a developmental quotient below 75 without a diagnosis of DS or ASD; Hepburn & MacLean, 2009), individuals with DS-ASD showed fewer social relating skills than children with DS-only, which is consistent with findings that individuals with DS-ASD isolate themselves from others more than individuals with DS-only (Carter et al., 2007). Carter and colleagues (2007) also found social isolation in comorbid DS and ASD was associated with more emotional symptoms (i.e., higher levels of anxiety), conduct problems, poorer general communication, and a lesser likelihood to use verbal communication than children with DS-only. In terms of

adaptive skills, researchers have also found that individuals with DS-ASD have a similar adaptive profile to the DS-only population, though below average scores obtained by individuals with DS-ASD in play and coping skills matched the ASD-only adaptive profile (Dressler et al., 2011). In addition, Magyar and colleagues (2012) also identified a significantly higher percentage of males with DS-ASD when compared to the percentage in the DS-only group.

Finally, there appear to be differences in timing of developmental regression, which may impact progression of DS-ASD versus ASD. For example, in a study with 24 participants with DS-ASD, 12 experienced a similar pattern of regression as participants with ASD-only; however, both initial age of language skills acquisition ($M = 40.6$ months) as well as language regression ($M = 61.8$ months) for the DS-ASD group occurred significantly later as compared to ASD-only controls ($M = 14.9$ months and $M = 19.7$ months, respectively; Castillo et al., 2008).

The impact of DS on ASD behavioral presentation. Research findings related to how individuals with DS-ASD differ from those with ASD-only is more limited. Findings indicate that although individuals with DS-ASD isolate themselves more than those with DS-only, individuals with ASD-only tend to isolate themselves more than those with DS-ASD (Carter et al., 2007; Moss et al., 2012). Specific to communication skills, the influence of DS in ASD might be related to less impairment in non-verbal communication (e.g., gesture use, imitation or imitative social play), but more impairment in pronoun reversal (e.g., referring to self in the third person), use of neologisms (e.g., creating a new word for something), and social chat compared to the ASD group (Warner et al., 2014). Furthermore, and conflicting with previous findings,

individuals with DS-ASD are potentially less likely to show impairments in reciprocal social interactions suggesting DS could be a social “buffer” against some of the impairments (e.g., social reciprocity and non-verbal communication skills deficits) common in ASD (Warner et al., 2014, p. 438). Using the Childhood Autism Rating Scale (Schopler, Reichler, & Renner, 1988), researchers found a profile for DS-ASD with higher overall scores in comparison to both the ASD and DS-only groups; however, the DS-ASD scores were more similar to DS scores in relating and imitation domains (Dressler et al., 2011). In comparison to individuals with ASD-only, a DS-ASD group also showed more compulsions and ritualistic behaviors (Carter et al., 2007), less impulsivity than those with ASD-only (though more impulsivity than those with DS-only; Moss et al., 2012), and children with ASD-only were significantly less interested in surroundings as compared to DS-ASD and DS-only groups (Moss et al., 2012).

DS-ASD behavioral presentation summary. Overall, it appears that the impact of ASD on DS, and vice versa, presents some interesting considerations for behavioral presentation and intervention. It appears that DS may act as a social “buffer” for some ASD symptoms (e.g., deficits in social reciprocity, non-verbal communication, interest in surroundings, and imitation). Likewise, behaviors more often associated with individuals with ASD (e.g., deficits in social relation skills, impairments in play and coping skills, higher levels of anxiety, more frequent and odd stereotyped behaviors, and higher rates of hyperactivity) are clearly impacting individuals with the dual diagnosis. Unfortunately, individuals with DS-ASD are also most likely to have severe cognitive deficits and to exhibit self-injurious or other disruptive behaviors. A summary table for the behavioral presentation for individuals with DS-ASD is provided (Appendix A).

DS-ASD Intervention Strategies

Understanding the behavioral presentation of individuals with DS and those with ASD independently, as well as understanding the findings of the growing research describing the unique behavioral phenotype of individuals with DS-ASD, is important for answering what needs to be different about an intervention for an individual with DS-ASD versus DS versus ASD. Based on research findings suggesting a unique behavioral presentation and special needs for individuals with DS-ASD (e.g., Carter et al., 2007; Magyar et al., 2012; Warner et al., 2014), specific intervention development for this population as well as examination of adaptations to evidence-based ASD or DS interventions already identified is needed. The need for specific intervention development is further established considering that, across ASD and other neurodevelopmental disorder groups, research has indicated that intensive early intervention yields the best long-term outcomes (Reichow, 2012). In addition to intelligence level and the presence of meaningful speech by age five, research shows that the age of diagnosis, age beginning treatment, and intensity of treatment predict intervention outcomes for individuals with ASD (Granpeesheh, Dixon, Tarbox, Kaplan, & Wilke, 2009; Perry et al., 2011). Currently, no studies have established an evidenced-based, early intervention practice for individuals with DS-ASD specifically. Early intervention strategies are most certainly important for the prognosis of DS-ASD individuals as well; however, the mean age of diagnosis of ASD for individuals with DS ($M = 14.4$ years) is approximately 7 years later than for individuals who have ASD alone ($M = 6.9$ years; Rasmussen, Borjesson, Wentz, & Gillberg, 2001). Therefore, the DS-ASD population has an absence of both sound diagnostic and treatment approaches.

Whether this delay in diagnosis is a result of diagnostic overshadowing (i.e., parents and pediatricians attributing autistic-like behaviors to the DS diagnosis) or due to differing patterns of regression (Castillo et al., 2008; Wakabayashi, 1978), the reality is that many individuals with DS-ASD may not begin receiving interventions with an ASD-specific orientation or focus until adolescence or adulthood. Thus, at this time, there is an acute need to establish evidence-based interventions addressing the needs of children, adolescents, and adults with DS-ASD.

Our knowledge of the causes, symptoms, and typical characteristics of DS and ASD as well as differing theories, behavioral presentations, and needs result in differences in how interventions are designed for these populations. For example, some researchers have found that individuals with DS benefit from strategies involving social consequences during instruction (Fidler & Nadel, 2007). In addition, using strategies that other populations with ID benefit from, such as applied behavior analysis (ABA) strategies, visual supports, and systematic instruction, are often recommended for effective teaching of a variety of social, academic, and behavioral skills (Collins, 2012; Feeley, Jones, Blackburn, & Bauer, 2011; Fidler & Nidel, 2007; Swain, Lane, & Gast, 2014). Individuals with ASD also benefit from these strategies, although several other models and techniques are often incorporated into ASD-specific interventions (e.g., social skills instruction) incorporating theoretical understandings of core ASD symptoms (Myers & Johnson, 2007; Peters-Scheffer, Didden, Korzilius, & Sturmey, 2010). Despite some overlap in intervention strategies, individuals with DS and individuals with ASD are often seen as two relatively distinct groups with different prognoses, expected behaviors, and approaches to interventions. In fact, participants with DS are often used

as a comparison or control group in ASD interventions suggesting innate differences between the two populations (e.g., Charman, Campbell, & Edwards, 1998; Reed, Staytom, Stott, & Truzoli, 2011; Ruble & Robson, 2007; Yirmiya & Shulman, 1996). The most reported, and potentially stereotyped (see Wishart, 2007), difference in individuals with DS as compared to those with ASD is the common presence of strong social skills (Fidler & Nadel, 2007; Smith & Wilson, 1973). Therefore, the impact of having both DS and ASD should prompt many researchers and practitioners to consider how the comorbidity changes both behavioral presentation and the effectiveness of interventions for such individuals (Moss & Howlin, 2009). Nevertheless, the theoretical foundations, behavioral presentations, and evidence-based interventions for individuals with DS and those with ASD separately are well grounded; however, the investigation of individuals with DS-ASD is less developed. As discussed, there is noticeable progress in describing the unique behavioral phenotype of a typical individual with DS-ASD; however, effective interventions for individuals with DS-ASD are not yet established.

DS-ASD intervention research. Many practitioners rely on early intensive behavioral interventions, applied behavior analysis techniques (e.g., discrete trial training), and visual supports (e.g., picture schedules) among other evidenced-based interventions for ASD. Additionally, practitioners working with individuals with DS and other intellectual disabilities rely on setting academic and functional goals, interventions teaching self-determination, utilizing systematic instruction techniques (e.g., systematic feedback, task analyses, and opportunities to respond), and incorporating generalization and maintenance techniques, such as community based instruction (Heward, 2013). Although research establishes the effectiveness of many DS intervention techniques listed

for individuals with ASD (Collins, 2012), ASD-specific interventions for use with individuals with genetic syndromes are not yet well established (Moss & Howlin, 2009).

Due to the lack of DS-ASD intervention research, it is difficult to determine at this time how researchers are conceptualizing how interventions for individuals with comorbid ASD and DS differ from interventions developed for persons with ASD alone. Based on the intervention research exclusively involving participants dually diagnosed with DS and ASD (Capone, Goyal, Grados, Smith, & Kammann, 2008; Kroeger & Nelson, 2006; Newman, Summerhill, Mosley, & Tooth, 2003), interventionists are currently adapting evidence-based practices for ASD and for individuals with moderate to severe ID. Results of these studies suggest that modified evidence-based interventions for ASD could be effective for individuals with DS-ASD. The limited number of studies using varying intervention strategies and approaches (i.e., pharmacological, ecological, and systematic instruction) makes it difficult to synthesize and accurately establish how ASD interventions are being adapted for individuals with DS-ASD. However, from these studies, some differences in intervention delivery and monitoring do emerge that are potentially important for developing an intervention for individuals with DS-ASD.

Treating challenging behaviors for individuals with DS-ASD has been the most common focus of intervention research (Capone et al., 2008; Newman et al., 2003). Capone and colleagues (2008) conducted the first examination of risperidone in reducing problem behaviors in children with DS-ASD. In this study, specific DS-ASD behaviors of concern included higher levels of social withdrawal and stereotypy than typical in ASD as well as significant concerns related to hyperactivity, irritability, and apathy. Researchers found that compared with previous research participants with ASD alone,

participants with DS-ASD had more severe ID. Specific to the DS-ASD population, researchers suggest an examination of combining risperidone with other medications commonly taken by individuals with DS (e.g., mood stabilizers) as well as close monitoring of potential side effects common in the DS population that might occur in individuals with DS-ASD (e.g., weight gain and sleep apnea; Capone et al., 2008).

Newman and colleagues (2003) examined the effectiveness of an intervention for reducing challenging behaviors and increasing positive behaviors using a systemic, ecological approach focusing on educating staff members about ASD. The intervention included staff education about autism, multidisciplinary discussion of the individual, and a multidisciplinary formulated care plan largely focused on strategies typically used for ASD treatment (i.e., visual schedules, picture self-modeling, and providing choices based on the individual's preferences). The unique difference in intervention development in this study was the importance in establishing a "culture of autism" for individuals with DS-ASD, especially adults, who are often seen as having exclusively DS (Newman et al., 2003). The ASD interventions used were not adapted in this study to meet the needs of the individuals with DS-ASD, and poor procedural fidelity and caregiver knowledge of autism were noted by the researchers to explain the ineffectiveness of the intervention in some settings.

Kroeger and Nelson (2006) examined an intervention focusing on communication-related objectives using discrete trial training, errorless and natural environmental teaching, and incidental teaching procedures while withholding reinforcement. The rationale for an intervention to improve the communicative language of individuals with DS-ASD was to address language deficits inherent in DS in order to

provide opportunities to address inherent socialization difficulties in ASD. Results indicate that the implemented language program built on a foundation of ABA and systematic instruction techniques could potentially be effective for improving the communication skills of children with DS-ASD. It is likely that individuals with DS-ASD will have severe ID; thus, possibly even more so than in ASD interventions, study conclusions would support that practitioners should rely on the use of evidence-based direct, systematic instruction for moderate and severe disabilities for the improvement of language, academic, and social skills.

The growing, yet still limited, research base on the DS-ASD population and effective interventions require a reliance on certain paradigms to study the personal characteristics associated with treatment approach. As has been established by the APA (2006) in *Evidence-Based Practices in Psychology* (EBPP), researchers and practitioners rely on the best available research evidence, their own clinical expertise, and the consideration of patient characteristics, culture, and preferences to guide treatment decision making. The approach to treatment research and approaches for the DS-ASD population, though not stated explicitly in the research, has followed the EBPP model. The use of the best available research evidence is reflected in the use of evidence-based standardized measures (e.g., the SCQ, the ADOS, and the Aberrant Behavior Checklist), methodologies (e.g., single-subject research), and supported treatment models and practices (e.g., the ecological model, ABA, and pharmacology). Clinical expertise is evident in researcher interpretations and uses of appropriate interventions, data collection procedures, and diagnostic references (e.g., the *DSM-IV-TR*; APA, 2000). Most important in working with the DS-ASD population, researchers have to be aware of the

personal characteristics of their participants considering the unique behavioral phenotype and development, the need to modify treatments due to the lack of evidence-based interventions for the DS-ASD population, and the extent to which comorbidity of DS and ASD moderates the impact of the treatment.

Social Skills Instruction

Individuals with ASD often participate in social skills programming as part of their overall treatment package. In addition, social skills instruction may be particularly important for a number of different populations with social skill impairments, including individuals with conduct problems, learning disabilities, mood disorders, anxiety disorders, attention deficit/hyperactivity disorder, ID, or schizophrenia (Rutherford, Quinn, & Mathur, 2004). As discussed, the scholarly, peer-reviewed intervention research available regarding individuals with DS and comorbid ASD has commonly utilized typical ASD-specific interventions, but has not, to date, directly focused on how social skills instruction has been implemented with individuals with DS-ASD.

Targeted social skills and DS-ASD. The DS-ASD literature includes several social skills used as dependent variables (Capone et al., 2008; Kroeger & Nelson, 2006; Newman et al., 2003). Specifically, social withdrawal (Capone et al., 2008), non-verbal communication (e.g., gesturing to request basic needs), and the initiation of social interactions (Newman et al., 2003) are dependent variables of interest addressed using pharmacological and system-wide strategies and interventions. One DS-ASD-specific intervention study implemented a language program to improve the verbal social communicative language (e.g., initiating requests spontaneously and when prompted) skills of a 9-year-old male dually diagnosed with DS and autism (Kroeger & Nelson,

2006); however, this study would likely be considered a collateral skills intervention as the strategies aimed at increasing verbal language production as opposed to specific social behaviors (McConnell, 2002).

Clinical recommendations for social skills instruction for DS-ASD. Social skills intervention research for individuals with DS-ASD has not yet been published in empirical journals. Communicating how social skills instruction could be offered to individuals with DS-ASD is accomplished by reviewing recommendations from organizations and practitioners with interests in supporting individuals with DS-ASD and their families. In addition, how social skills interventions are offered for arguably comparable populations (i.e., individuals with ASD and comorbid ID) will be discussed.

For individuals with ASD, researchers and practitioners have used varied social skills programs utilizing teacher-mediated or direct, systematic instruction and applied behavior analysis, naturalistic techniques, parent education, staff training, peer training, social skills groups, visual supports, and video modeling (Reichow & Volkmar, 2010). Empirical support for peer-mediated approaches to teaching social skills is also available (Wang, Cui, & Parrila, 2011). According to researchers and practitioners, social skills training should not be considered a single curriculum, but rather a collection of practices including several possible elements administered individually or in a multi-modal approach (Spence, 2003). Common practices might include modeling, coaching, role-playing with feedback, reinforcement, or teaching problem solving strategies (Mesibov, 1984; Spence, 2003). Social skills training can also be delivered in a group or one-on-one setting.

There are no social skills interventions for individuals with DS-ASD that currently meet standards for evidence-based practice. Several researchers, physicians, and organizations supporting individuals with DS-ASD and their families have used the best available research in intervention development with similar populations to offer recommendations for DS-ASD intervention. For example, though there is emerging evidence for a unique DS-ASD behavioral phenotype (e.g., Hepburn & MacLean, 2009; Moss et al., 2012), individuals with ASD and comorbid ID may share many of the same social skill deficits as those with DS-ASD and other disabilities (Walton & Ingersoll, 2012). The earliest studies of social deficits in DS-ASD were in the form of case studies. Reilly (2009) reviewed case studies (e.g., Bregman & Volkmar, 1988; Ghaziuddin et al., 1992; Ghaziuddin, 1997; Howlin et al., 1995; Kent, Perry, & Evans, 1998) documenting social deficits in 13 males and 2 females ranging in age from 7 to 35 years old. These findings included consistent reports of general developmental regression, severe cognitive impairments, low verbal abilities, poor imaginative play, and significant deficits in social skills (e.g., poor nonverbal skills, avoidance of eye contact, difficulties with joint attention, and difficulties maintaining peer relationships; Reilly, 2009).

Although limited rigorous research findings are available to inform social skill interventions for individuals with DS-ASD, professional recommendations exist. For example, Swiezy (1999) recommends that interventionists have a good understanding of children with DS-ASD (e.g., common behavior problems in DS-ASD are likely a form of communication), create opportunities to practice and teach skills, set environmental controls (e.g., setting appropriate goals, appropriate reinforcement, allow choices, and securing attention), use multiple prompts (e.g., verbal, gestural, and physical prompting),

ensure predictable structure and routine, use systematic instruction, and use appropriate behavioral management strategies (e.g., giving positive attention and planned ignoring). The National Down Syndrome Society (2012) identifies ASD as an associated condition in DS in addition to citing the importance of early, intensive and behavioral intervention services as well as the use of specific teaching strategies, including visual communication strategies and discrete trial training (Capone, 1999). Sue Buckley (2005) from the Down Syndrome Educational Trust in Portsmouth, United Kingdom, recommends the use of visual timetables, providing opportunities to practice skills, and “behavioral oriented strategies with developmental and educational approaches” (p. 119). Dr. John Hartweger (2014) shared DS-ASD resources with the Down Syndrome Association of Greater St. Louis recommending that autism should be treated as the primary diagnosis in individuals with DS-ASD with social skills being a focus for intervention and strategies including preparation for transitions, use of visual and auditory cues, and providing opportunities with peers.

In addition, several researchers and practitioners emphasize the importance of family involvement for improving DS-ASD intervention effectiveness and outcomes (e.g., Capone, 1999; Buckley, 2005; New Zealand Down Syndrome Association [NZDSA], 2004). As collateral skills interventions, the NZDSA (2004) recommends intense speech and language therapy with a focus on multiple types of communication (e.g., picture exchange systems or signing) as opposed to exclusively speech development. Researchers (Capone, 1999; Lashno, 1999) and at least one organization (NZDSA, 2004) also suggest there might be benefits to incorporating sensory integration therapy for children with DS-ASD to reduce challenging or disruptive behaviors.

Based on the practitioner and organization recommendations for DS-ASD-specific interventions, ABA approaches and strategies appear to be a common recommendation for all interventions, including social skills. Visual supports are also recommended frequently reflecting the relative strengths in visual processing and preferences over auditory instruction seen in both DS-only and ASD-only populations (Fidler & Nadel, 2007; Samson, Mottron, Soulieres, & Zeffiro, 2012). In addition, systematic instruction, opportunities for practice, and family involvement are consistently recommended. These recommendations for DS-ASD-specific interventions are further supported by the findings of intervention studies involving individuals with ASD and comorbid ID, a population that is similar in profile to many individuals with DS-ASD (Walton & Ingersoll, 2012). Reviews of social skills interventions and other interventions for individuals with ASD across a range of ages and cognitive abilities illustrated the commonality of ABA principles and direct instruction as effective techniques for teaching social skills to the population of interest (Hughes et al., 2012; Reichow & Volkmar, 2010). Studies also indicate the potential benefit of involving peers in interventions for individuals with ASD and ID, especially in terms of generalization of social skills learned (Hughes et al., 2012; Walton & Ingersoll, 2012). In addition, an intervention that indicated a therapeutic effect used a peer-mediated, direct instruction (e.g., repeated practice, prompting, and modeling) approach to teach high school students with ASD and ID conversation skills (Hughes et al., 2011). Walton and Ingersoll (2012) found that a more limited research base also supports the use of video modeling, intensive interaction interventions, and structured teaching (e.g., using the Treatment and

Education of Autistic and Related Communication Handicapped Children [TEACCH] program) for adolescents and adults with ASD and ID.

DS-ASD learners and social behavior. Knowing how social skills instruction is offered to students with DS-ASD may lead to an understanding of how social skills instruction affects learners' social behaviors. Social skills instruction incorporating ABA and systematic instruction has consistently been demonstrated as positively affecting social behaviors of learners' with moderate and severe developmental and/or ID; therefore, reviewing how these techniques affect learner social behaviors is important. A formal or informal assessment of social skills often precedes the intervention to identify specific social skill impairment as well as whether participants are struggling with deficits in social skills acquisition or performance (Gresham, Cook, Crews, & Kern, 2004; Stone et al., 2003). An initial assessment is particularly important when incorporating ABA techniques or strategies, which are based largely on understanding what motivations underlie the presence or absence of certain behaviors. With the understanding that individuals often learn from environmental factors, ABA techniques also include an empirical assessment strategy to identify the antecedent and consequent causes for behavior (Swiezy, 1999). By identifying the motivational factors of the behaviors, social skills instruction founded on ABA principles often affects social behaviors by changing antecedents or consequences of the behavior (Walton & Ingersoll, 2012). For example, assuming an individual's social skills deficit is a performance problem, prompting might be used followed by withholding or providing reinforcement depending on the presence of the appropriate response. By providing an immediate consequence, the learners' social behaviors are affected in that the consequences can

directly affect their future behaviors (Cooper, Heron, & Heward, 2007). The process of establishing effects of consequences on behaviors is known as operant conditioning.

Many social skills instruction techniques focus on changing behaviors through operant conditioning. For example, systematic instruction is closely aligned with principles and techniques of ABA incorporating direct instruction in individual instructional sessions addressing all phases of learning (i.e., acquisition, fluency, maintenance, and generalization; Collins, 2012). The use of response-prompts in ABA influenced systematic instruction is essentially the use of operant conditioning. Several techniques (e.g., most-to-least prompting, system-of-least-prompts, time-delay, and simultaneous prompting) are evidence-based practices for teaching individuals with moderate and severe disabilities; in addition, these techniques, as they relate to improving social behaviors of individuals with DS-ASD, would deliver controlling prompts as needed and fading prompts, and reinforcement, as needed until skills are demonstrated independently (Collins, 2012). The stimulus, response, and consequent format of systematic instruction provide a direct, predictable sequence of events that can potentially improve the social skills of the DS-ASD population.

Theories of Change and DS-ASD Social Skills Instruction

As it relates to social skills instruction recommended for individuals with DS-ASD, groundings in behaviorism and social learning theory frame the primary mechanisms by which learning is theorized to occur (Cooper, Griffith, & Filer, 1999; NASP, 2002).

Behaviorism. Behaviorism as a theory informs the practice of ABA and its associated techniques in systematic instruction. Though there are many definitions of

learning, a central tenet across each theory is behavior change and, indeed, behaviorism arguably provides the best options for direct observation of such change. For the behaviorist, psychology and learning is theorized to occur and to be measured in observable behaviors that can be understood (Cooper et al., 2007); furthermore, there is a basic understanding that external stimuli (e.g., behavioral consequences or antecedent events) largely influence human behaviors as opposed to “internal determinants,” such as feelings or states of mind, which can only be inferred (Skinner, 1987). The influence of external stimuli is summarized in part by models of connectionism, classical conditioning, and operant conditioning (Cooper et al., 2007).

Another central tenet of behaviorism is the importance in understanding psychology as an “objective experimental branch of natural science” with its goal being “the prediction and control of behavior” (Watson, 1913, p. 157). B. F. Skinner (1987) expanded the theory of behaviorism by establishing experimental analysis of behavior, or a scientific analysis of human behavior, and its use in interpreting and modifying behaviors (Cooper et al., 2007). Accordingly, behaviorists posit that behavior is both “lawful and determined” as are laws of nature (Skinner, 1953, p. 6). The scientific analysis of human behavior change, or learning, is present in the experimental (e.g., single-subject research designs) and practitioner (e.g., teacher data collections of baseline and intervention condition behavior) arenas based on behaviorism.

Behaviorism and ABA techniques are closely aligned. Learning for the behaviorist is behavior change; therefore, those practicing ABA greatly value the importance of observation, a clear definition of the target behavior, and systematic data recording. Furthermore, according to the behaviorist, educational settings using ABA

techniques must include clear, direct, and systematic instruction, which allows for individuals to progress at their own rates while teachers increase opportunities to respond in the classroom (Skinner, 1984).

Social cognitive theory. A second theory that offers mechanisms for learning social skills in the DS-ASD population is social cognitive theory. Rotter's (1954) original social learning theory emphasizing the importance of learning in environmental and social settings was built upon and expanded by Bandura's (1986) social cognitive theory especially as it relates to the specific influences of the environment and the importance of self-efficacy and self-regulation in learning (Schunk, Pintrich, & Meece, 2008). In many ways social learning and social cognitive theories are influenced by behaviorism; however, the theories differ from behaviorism in that learning occurs in social environments, is distinguished from immediate performance of a response, and is tied to three reciprocal factors (i.e., personal, environmental, and behavioral factors; Schunk et al., 2008). These tenets also include the importance of imitation and modeling for learning in the context of a model of triadic reciprocity. Instead of a basic response to external stimuli, social cognitive theory highlights motivation and learning in light of environmental factors (e.g., culture, physical environment, or peers), personal factors (e.g., psychological, physiological, or cognitive ability), and behavioral factors (e.g., attention, compliance, or habits). These factors are important for learning in general for humans, and, therefore, are as well beneficial for individuals with DS-ASD as further evidenced by the recommendations for building a *culture of autism* (Newman et al., 2003). For example, building a culture of autism influences environmental factors by utilizing the learners' relative strengths and preferences for processing visual information

in instruction. Furthermore, teachers knowledgeable of DS-ASD should have a better understanding of learner personal and behavioral factors.

Social cognitive theory provides a rationale for peer delivery of interventions through the social learning aspects of modeling. Modeling is essentially an opportunity for an individual to learn by observing the behaviors of others. The behavioral characteristic of an intervention then gives the opportunity for an individual to learn through direct experience, and to learn through repeated opportunities of successful (i.e., rewarded) and unsuccessful behaviors. Social learning aspects of modeling require attention, retention, and motoric reproduction processes that use the symbolical representations guiding the subsequent associated actions (Bandura, 1971). Furthermore, social cognitive theory posits that we are agents in our own development distinguishing among three different types of agency (i.e., personal, proxy, and collective agency; Bandura, 2001). Students with social skill deficits may lack direct control in many settings to intentionally make things happen, or through proxy (i.e., relying on others to reach desired outcomes) and collective (i.e., coordinating group efforts to reach outcomes) agency to reach desired outcomes. Peer delivered social skills instruction expands an individual's agency in the domain to be more effective in their environments. Research findings suggest typical peers can effectively deliver interventions, including modeling, for individuals with moderate to severe disabilities (McConnell, 2002); however, research that incorporates peers with disabilities as the peer teachers is yet to be explored.

Developmental theory. On a final note, developmental factors of learning are important considering the participants involved in studies of adolescents or adults with

DS-ASD. As Walton and Ingersoll (2012) make apparent, all of the interventions reviewed for adolescents or adults with ASD and ID had originally been designed for children focusing on similar target behaviors, level of participant social skill knowledge and understanding, and a lesser likelihood to need significant intervention modifications. Though research findings strongly support early intervention for individuals with ASD, the focus on social skills regardless of age is important for individuals with ASD and DS-ASD considering the impact of poor social skills on long-term prognosis. As evidence-based social skills interventions offered for students with DS-ASD have not yet been established, the consideration of personal characteristics (e.g., age and intellectual functioning) is important for intervention development.

Single-Subject Research Design

In the limited DS-ASD specific intervention literature, two studies have used single-subject designs to examine the effectiveness of interventions (Kroeger & Nelson, 2006; Newman et al., 2003). Kroeger and Nelson (2006) utilized an A-B-A design across verbal behaviors. Newman and colleagues (2003) used two A-B designs measuring positive and challenging behaviors. Single-subject designs have standards that must be followed to establish rigor of the study (Horner et al., 2005). Unfortunately, many of these standards were not met in the single subject designs exploring interventions for individuals with DS-ASD, including failing to meet proper standards for replications of effect, social validity, procedural fidelity data, or the establishment of a stable baseline. The weaknesses in the DS-ASD intervention studies do not preclude the potential benefits of these interventions or the fact that such intervention studies are needed. Still, the single subject criteria indicate the need for 5 *acceptable* studies, across 3 researchers,

and 3 geographic areas with at least 20 participants before a practice can be determined evidence-based (Horner et al., 2005). Essentially, there is a need for more methodologically rigorous research in the DS-ASD field.

Multiple probe designs. The multiple probe (MP) design is a variation of the multiple baseline (MB) design, which falls within single subject research methodology. Similar to the MB design, MP designs serve as an alternative to reversal designs when the behavior of interest is apparently irreversible or when reversing conditions is considered undesirable (i.e., if the reversal of a condition is impractical or unethical; Baer, Wolf, & Risley, 1968). In addition, both MP and MB designs rely on the same *baseline logic* as other designs within single subject research using prediction of future measurement, verification of the hypothesis, and replication of effects to demonstrate experimental control as well as to assist in evaluating threats to internal validity (Gast & Ledford, 2010a; Sidman, 1960). Both the MB and MP designs also require three or more *tiers* of A-B type single subject designs, which are staggered to overcome the disadvantages inherent in the A-B design. The MB design requires continuous measurement of baseline, or pre-intervention, data, and the MP design allows for intermittent baseline data collection of the dependent variable (i.e., there is less frequent data collection prior to introduction of the independent variable in an MP design). Though this change in collection of baseline data seems rather basic procedurally, it separates an MP from an MB design and creates a design that is more suitable for certain research questions, changes experimental control and experimental rigor, creates unique strengths and weaknesses, and requires a different evaluation for establishing internal validity (Gast & Ledford, 2010a).

Research with MP designs. Exploring research questions that examine the effectiveness of an intervention for individuals while still maintaining the rigor as an experimental and empirical methodology is an important purpose of all single subject designs. In single subject designs, individuals serve as their own controls with behavior data collected before and after the implementation of an intervention. Suitable research questions specific for evaluation using an MP design also include those questions that examine the effectiveness of an intervention for individuals, a group, or, with enough support from single subject and other empirical research designs, a certain population. Furthermore, research questions can be applied to several variations of the MP design, including, across multiple individual or group behaviors, across multiple “different stimulus conditions (e.g., settings, adults, arrangements, formats, etc.),” and across multiple participants performing the same behaviors in the same conditions (Gast & Ledford, 2010a, p. 278). As previously mentioned, the MP design allows measurement, recording, and visual analysis of seemingly irreversible behaviors (e.g., teaching academic skills, social skills, or when attempting to reduce self-injurious behaviors) that help to indicate whether an intervention is effective when the intervention condition is implemented.

To this point, the research questions suitable for an MP design closely resemble those questions of an MB design. According to Murphy and Bryan (1980), adding probes to the multiple baseline design allows a unique assessment of performance level that is still able to determine what conditions are controlling the target behaviors of interest. MP designs allow for intermittent probe data collection when continuous collection of baseline data in the MB design is unnecessary (Horner & Baer, 1978). For example, if

the research question involves a skill using simultaneous prompting to teach bedroom cleaning skills, it is unlikely that the individual will learn how to make his bed when the current tier of instruction is focusing on folding and putting away clothing. The practice of an extended, continuous baseline where the individual continuously fails at making his bed in baseline while he is learning to fold clothing is unnecessary. Furthermore, the MP design is often used to address research questions in which certain extraneous, or confounding, variables may cause a threat to internal validity and evidence of a functional relation (Holcombe, Wolery, & Gast, 1994; Kratochwill & Levin, 1978). These confounding variables will be discussed.

According to Gast and Ledford (2010a), experimental control, or the demonstration of a causal relationship between dependent and independent variables, in an MP design largely relies on the researchers first determining that the target behaviors to be measured are similar while still being *functionally independent* of one another (e.g., teaching a child how to hang a shirt versus fold a shirt to put in a dresser are similar tasks, yet one should not influence change in the other). Functional independence helps to guard against threats to internal validity, such as behavioral covariation, which reflects the introduction of the intervention bringing about change in different tiers; in addition, the participants and conditions utilized in the design should be *functionally similar* to one another so that an intervention effect is likely to be replicated (Gast & Ledford, 2010a). Once these two factors are satisfactorily met, experimental control in an MP design is demonstrated through the establishment of a stable baseline followed by three or more demonstrations, or replications, of effect shown across behaviors, participants, or settings while maintaining intermittent and consistent gathering of data and procedural fidelity.

Like characteristics of MB designs (Christ, 2007), experimental control in MP designs can also be strengthened by clearly defined intervention conditions, establishment of hypotheses before beginning baseline, formative assessment, and an abrupt and immediate therapeutic change in behavior when the intervention condition begins.

In regard to the strengths and limitations of the MP design, there are general advantages and disadvantages that apply to the MB design and its other variations as well. These general advantages include the applicability of the design for its realistic use in applied practice settings, such as schools, and its ease to conceptualize and implement (Murphy & Bryan, 1980). Furthermore, Gast and Ledford (2010a) indicated that when using an MP design there is no need to withdraw or reverse an intervention deemed effective in order to establish experimental control as would be needed in an A-B-A-B design. A final general advantage is that MP designs require simultaneous data collection across settings, participants, or behaviors, which may prove time efficient and serve the goals of practitioners and teachers better (e.g., by being integrated into the curriculum with relative ease). General disadvantages include the potential presence of several tiers data collection and the potential for extended baseline conditions which may impact learners' interests in participating or cause ethical dilemmas by delaying interventions for lower tier participants if behaviors are damaging (e.g., self-injurious behaviors or aggressive behaviors; Gast & Ledford, 2010a).

The MP design uses intermittent collection of pre-intervention data as opposed to continuous data collection in MB designs, which creates unique advantages and disadvantages to the MP design. For example, the practical limitations common to MB designs across behaviors (i.e., being time consuming or concurrent data collection during

a prolonged baseline) can be overcome in using a MP design. In addition, MP designs are often considered easier for practitioners to implement and just as effective in evaluation of interventions as the MB design despite fewer data points in the baseline condition (Gast & Ledford, 2010a). However, it is generally accepted that continuous baseline data collection better establishes a stable baseline and justifies a determination of experimental control through visual analysis that is better accepted by research consumers; thus, the MP design potentially does not allow enough opportunities for subjects to display behaviors before the introduction of the independent variable (Horner & Baer, 1978). An MP design does, however, present as an advantageous alternative to the MB design when continuous data collection in the baseline “prove impractical” (e.g., time consuming), “unnecessary” (e.g., if no response or incorrect responses are expected throughout the baseline condition), or “reactive” (e.g., effects of extinction, boredom, or fatigue; Horner & Baer, 1978, p. 194).

The MP design does have several threats to internal validity that are controlled for through the various procedural guidelines required for proper execution of the design. General threats to internal validity in single subject research as well as specific threats related to the variations of the MP design (i.e., across behaviors, across conditions, and across participants) exist. Internal validity threats to MB and MP designs are addressed by including at least three behaviors, conditions, or participants. In addition, researchers must delay the introduction of the intervention to second and third tier variations within a study until a set criterion is met in the first tier. For example, the independent variable would not be introduced to the second participant until the first participant displayed a significant therapeutic change in dependent variable level and trend. Likewise, the third

participant would not receive the intervention until the second participant reached an established criterion (Gast & Ledford, 2010a). The delay, or “staggering” of the introduction of the intervention, addresses and controls several threats to internal validity, including history effects (i.e., external events that might occur during the time of the study that could cause the change in behavior), maturation (i.e., a natural change in the participant that is cause for change), and testing effects (i.e., the influence of taking the specific test used in the study potentially improving the performance on later tests; Gast & Ledford, 2014).

Threats to internal validity (i.e., history, maturation, and testing effects) are controlled in properly planned MP design research by demonstrating three or more replications of effect (i.e., significant therapeutic changes in levels and trends in adjacent conditions) ideally shown immediately following introduction of the intervention using visual analysis techniques. In fact, researchers indicate that when testing effects and instrumentation effects (i.e., an improvement or general change across researcher observation skills throughout the course of a study, which is often controlled for by recording a high inter-observer agreement (IOA) and by collecting procedural fidelity data for reliability purposes) are particular concerns for effecting the accuracy of the results of a study, the MP design should be considered over the use of a MB design (Murphy & Bryan, 1980). Another general threat to internal validity is adaptation effects (i.e., participant behaviors are changed due to the presence of novel stimuli, which is often controlled for through *history training*, which is planned participant exposure to novel materials and researchers before collecting data; Gast & Ledford, 2014). Within adaptation effects, reactive effects, or participants acting differently due to being

observed, pose a possible threat to internal validity that can be controlled for using history training and observers remaining inconspicuous during data collection sessions (Gast & Ledford, 2014).

Multiple treatment effects should also be controlled for if multiple interventions are being used in the design so that researchers and consumers can determine that behaviors recorded are neither due to the order of treatments implemented nor the treatment in one condition being the cause for behaviors in another treatment condition. Counterbalancing the order of treatments across participants is the typical method for controlling multiple treatment interference in addition to a general post-hoc method for analyzing the presence of threats to internal validity by determining the presence of similar baseline trends before and after introduction of the intervention (Gast & Ledford, 2014). A final general threat to validity, though more closely related to external validity than internal validity, across single-subject research designs is the risk of attrition and, therefore, a risk to generalizability that can be controlled for by including more than the recommended minimum of three participants or by utilizing a replication design (e.g., planning for a multiple probe design across behaviors within a multiple probe design across participants).

The major threats to internal validity and experimental control particularly important to consider and control for MP designs include data variability, or data instability, and the impacts to internal validity in using the MP design technique of intermittent data collection (Gast & Ledford, 2010b, p. 307). Controlling threats related to data instability involve continuing data collection in the condition of concern until data is stabilized (e.g., three relatively stable data points recorded in sequence or the presence

of a contra-therapeutic trend). Once data points in the behavior, participant, or condition have reached stability, introduction of the independent variable can commence. Using intermittent data collection in the baseline condition prevents prolonged baseline conditions; however, intermittent recording can lead to errors due to the inability to detect change in participant responding within and across tiers and a delay in the detection of response generalization, meaning that the introduction of the intervention to the first behavior leads to improvements in other tiers without the researcher knowing immediately (Gast & Ledford, 2010a). In order to guard against such threats, researchers using an MP design must be confident that participants are unlikely to respond correctly in the baseline conditions (e.g., by administering an initial screening of skills) and that behaviors are functionally independent. If response generalization, or behavioral covariation in MP designs across behaviors, is suspected, increasing the frequency of probes is recommended (Gast & Ledford, 2010a). Despite these unique threats to internal validity, Christ (2007) states that the MP design actually works to limit threats to internal validity (e.g., guarding against extinction or fatigue in the baseline condition) and strengthens experimental control through the introduction of probe sessions throughout a study and before phase changes to further strengthen internal validity.

Statement of the Problem

Prevalence studies indicate that approximately 14-20 percent of individuals with DS also have comorbid ASD (DiGuseppi et al., 2010; Hickey & Patterson, 2006; Moss et al., 2012). However, individuals with DS-ASD are likely not being provided with the important early intervention needed for ASD characteristics due to causes such as diagnostic overshadowing, delayed regression, or the perception that individuals with DS

do not have social difficulties (Castillo et al., 2008). Therefore, there are potentially large numbers of individuals with DS-ASD who are not receiving interventions to address ASD-related deficits until their adolescent and adult lives. In addition, individuals with DS-ASD are not only receiving interventions later, but there are no group specific evidence-based interventions identified in the related literature to help in guiding their treatment. Considering the difficulties with generalizability in single-subject design research, group specific factors and client characteristics are considered important as research quality indicators of single-subject studies as well as evidence-based practices. The interventions that are available have numerous methodological flaws reducing generalizability to other groups or individuals, and no studies to date have focused directly on social skills interventions. Based on the inherent social deficits and needs of the DS-ASD population, interventions need to be examined addressing effectiveness for adolescents and adults in developing social skills. A paucity of DS-ASD intervention research is particularly notable in treating social communication impairments, which are, by definition, present in all individuals with ASD. What is known is that there is a unique behavioral phenotype for individuals with DS-ASD, and interventions are presently focused on adapting ASD-specific interventions (e.g., Kroeger & Nelson, 2006), which may or may not be effective.

Purpose

The purpose of the study is to evaluate the effectiveness of a peer-delivered social skills intervention utilizing simultaneous prompting for a group of adults with DS-ASD. Furthermore, this study evaluates whether peers with DS are able to reliably deliver the social skills intervention. Peers delivered the social skills intervention and the researcher

gathered effectiveness and reliability data. Social validity data were gathered via Likert scale responses to questions about peer mediators' and the study participants' private school teachers' perceptions and experiences with the social skills intervention. The overarching goal of this study is to explore the effectiveness of the social skills intervention implemented for increasing pro-social behaviors using a methodologically rigorous single-subject research design. More specifically, the aims of this study are to: (a) report on intervention efficacy for each adult across their own behaviors, (b) report on the efficacy of the intervention across adults participating, (c) explore the history of participant social skill interventions and age of ASD diagnosis, (d) report on generalization and maintenance of targeted social behaviors, (e) examine the social validity of the intervention, and (f) report on reliability of simultaneous prompting procedures delivered by peers with DS. These aims, research questions and corresponding hypotheses are as follows:

Aim 1: To explore the history of participant interventions and age of ASD diagnosis.

Research Question 1a: How common are social skills interventions in the student participants' histories?

Research Question 1b: What is the average age of ASD diagnosis for student participants in the study?

No a priori hypotheses are made about commonality of social skills interventions as such statistics are not available for the DS-ASD population; however, it is anticipated that the average age of ASD diagnosis is likely near 14-15 years of age based on previous findings in the DS-ASD population (Rasmussen et al., 2001).

Aim 2: To evaluate the efficacy of the intervention for each adult across their own behaviors.

Research Question 2: Will the intervention be effective in increasing multiple targeted social skills for each participant (i.e., is there a functional relation between the use of a peer mediated simultaneous prompting strategy and an increase in both level and trend across three identified social skills within a participant with DS-ASD?)

It is expected that the social skills intervention utilized will be effective within subjects as both variations of peer-mediated interventions (Wang et al., 2011) and the use of simultaneous prompting in teaching skills to individuals with moderate to severe disabilities (Morse & Schuster, 2004) are effective interventions.

Aim 3: To evaluate the efficacy of the intervention across adults participating.

Research Question 3: Will the intervention be effective in increasing at least one targeted social skill across three student participants (i.e., is there a functional relation between the use of a peer mediated simultaneous prompting strategy and an increase in both level and trend in identified social skills across at least three participants with DS-ASD?)

It is expected that the social skills intervention utilized will be effective between subjects as both variations of peer-mediated interventions (Wang et al., 2011) and the use of simultaneous prompting in teaching skills to individuals with moderate to severe disabilities (Morse & Schuster, 2004) are effective interventions.

Aim 4: To report on generalization and maintenance of targeted social behaviors.

Research Question 4a: Are student participants able to generalize skills learned to different settings?

Research Question 4b: Are student participants able to generalize skills learned to different peers?

Research Question 4c: Are student participants able to maintain targeted social skills for at least 10 days following the end of the intervention?

It is anticipated that participants will be able to generalize skills to different settings and peers, as well as maintain skills over time. Published studies of social skills interventions for adults with ID and/or with ASD show that when appropriate techniques are integrated into a study's interventions (e.g., varying peers and settings, fading reinforcement, modeling) the probability of both generalization and maintenance are improved (Krasney, Williams, Provencal, & Ozonoff, 2003; O'Reilly et al., 2004).

Aim 5: To report on reliability of simultaneous prompting procedures delivered by peers with Down syndrome.

Research Question 5a: Are peers with Down syndrome able to reliably deliver (i.e., >80% procedural fidelity) simultaneous prompting procedures?

Research Question 5b: Are the dependent variables reliably recorded (i.e., an inter-observer agreement > 80%)?

No a priori hypotheses are made regarding the specific use of simultaneous prompting procedures delivered by peers with DS due to a lack of related published and unpublished studies. However, typically developing peers have been able to deliver simultaneous prompting procedures to effectively and efficiently teach individuals with

ID (Tekin-Iftar, 2003). Previous findings suggest that reliability data collected could potentially reach acceptable thresholds.

Aim 6: To examine social validity of the intervention.

Research Question 6a: What are teachers' perceptions of the importance of targeted social skills in the school and community?

Research Question 6b: What are teachers' perceptions of the practicality and cost effectiveness of the intervention used?

Research Question 6c: Do peer-mediators believe that simultaneous prompting is easy to implement?

It is expected that teachers will rate the intervention as important, practical, and cost-effective. The importance of social skills for life functioning and creating meaningful relationships is well established (DeMatteo, Arter, Sworen-Parise, Fasciana, & Paulhamus, 2012). In addition, simultaneous prompting has been identified as an effective, evidence-based instructional procedure that instructors prefer because of the ease of data collection and simplicity of the procedure (Head, Collins, Schuster, & Ault, 2011).

CHAPTER 2

METHODOLOGY

The purpose of this study is to investigate the effectiveness of a peer-mediated social skills intervention for adults with comorbid Down syndrome and autism spectrum disorder (DS-ASD), utilizing multiple probe designs across behaviors with three pairs of peer mediator and student participants. This section describes: (a) research participants, (b) tasks, (c) setting, (d) materials, (e) training and feedback sessions, (f) general procedures, (g) experimental design, (f) data analyses, (g) significance of the study, and (h) study limitations.

Participants

Participants consisted of two groups. The first group included four adults with DS-ASD (1 female, 3 males) who served as *student participants*. All *student participants* (a) had a diagnosis of DS and (b) either a diagnosis of ASD or reported evidence of symptoms associated with ASD. The second group included four adult females with a diagnosis of DS-only who served as *peer mediator participants*. School administrators helped in identifying *peer mediator participants* who exhibit strengths in communication and social skills. All participants attended a private residential and academic campus in the southeast region of the United States. There were no records of whether any participants had ever received prior instruction using a simultaneous prompting procedure.

Recruitment procedures. The administrator of the private school sent a letter of invitation to participate in the study (Appendix B). Procedures indicated that a follow-up phone call one week following the initial letter would be made if a response were not

received from the administrator. If no response was received two weeks from the original dissemination date, a final phone call to the administrator would be attempted. Additional follow-up procedures were not required in the present study. The private school has no institutional review board, and the administrators make decisions regarding research projects on their campus. The researcher and the private school made verbal and written agreements to conduct the present research project.

Once a formal agreement from the private school was obtained, the administrator of the private school sent a letter of informed consent to a Legally Authorized Representative of the participants followed by a reminder email one week (Appendix C) following the initial letter if a response was not obtained. Procedures allowed a follow-up phone call from the administrator if no response was received two weeks from the original dissemination date. Gaining written consent and adult assent from study participants (Appendix D) was attempted and completed by all peer-mediator participants. Verbal assent was deemed satisfactory as well for three of the student participants who were unable to write. When adult assent could not be obtained due to participants being incapable of responding to investigator questions, then methods of assessing dissent were used such as the presence of non-verbal cues (e.g., a participant becoming agitated or upset) or refusal to follow the researcher.

All paperwork, including inclusion materials, consent forms, and data sheets, were kept locked in a filing cabinet and kept secure. Once transferred to an electronic database, paperwork was destroyed and all information was kept confidential in accordance with the 2016 University of Kentucky Office of Research Integrity's standards for collection and storage of electronic data. All data will be kept on a personal

password protected computer, with reported identifiable data (e.g., participants' names) stored separately from other data in an encrypted password protected file.

Inclusion Criteria. In order to establish evidence of ASD symptoms and inclusion within the present study, legally authorized representative (LAR) completed the Social Communication Questionnaire (SCQ; Rutter, Bailey, & Lord, 2003). The SCQ is a 40-item ASD screening instrument for individuals 4 years old and above with a mental age of 2.0 years or higher. Student participants required a score of 15 or higher on the SCQ to be included in the study. In addition, all participants were administered the Autism Diagnostic Observation Schedule, Second Edition (ADOS-2; Lord, Luyster, Gotham, & Guthrie, 2012) by the university-trained researcher. The ADOS is considered the “gold standard” for ASD diagnosis (McCrimmon & Rostad, 2014). Student participants' scores had to exceed the autism spectrum cut-off score using the appropriate module and algorithm. An LAR also completed a CARS-2 Questionnaire for Parents or Caregivers (QPC; Schopler, Van Bourgondien, Wellman, & Love, 2010). The completed CARS-2-QPC provided additional information from parent or caregiver about behaviors related to the presence of autism to inform CARS-2 ratings (Schopler et al., 2010). The CARS-2-QPC, along with behavioral observations using ADOS-2 videos, provided information for a research assistant to make final CARS-2, Standard Form (ST) ratings for all participants. Student participants' scores of 27.5 or higher on the CARS-2-ST were included in the study. To be included in the study, peer-mediators had scores across autism-specific measures that did not meet the scores indicating evidence of autism, did have consistent attendance in the setting, and expressed interest in being trained in

simultaneous prompting and in serving as a peer mediator in the study. All participants required informed consent of a LAR. No other exclusionary factors were set.

For descriptive information purposes, all participants involved in the intervention were also administered a brief intelligence test (i.e. the Kaufman Brief Intelligence Test; KBIT-2; Kaufman & Kaufman, 2004), and the LAR also completed an adaptive measure (i.e., the Vineland Adaptive Behavior Scale, Second Edition Survey Interview Form; Vineland-2; Sparrow, Cicchetti, & Balla, 2005). In addition, Vineland-2 Expressive Communication sub-domain scores identified the appropriate ADOS-2 module for participant administration as advised in the ADOS-2 manual.

The following tables provide participant demographic information and results of assessments.

Table 1

Demographic information for all participants

<u>Name</u>	<u>Age</u>	<u>Gender</u>	<u>Years enrolled in current private school</u>	<u>Group</u>
Jill	41 y.o.	Female	31	Student Participant with DS-ASD
Matt	24 y.o.	Male	2	Student Participant with DS-ASD
Adam	40 y.o.	Male	13	Student Participant with DS-ASD
Mike	31 y.o.	Male	8	Student Participant with DS-ASD
Janie	40 y.o.	Female	26	Peer mentor with DS
Carol	24 y.o.	Female	4	Peer mentor with DS
Emily	25 y.o.	Female	2	Peer mentor with DS
Katie	33 y.o.	Female	14	Peer mentor with DS

Note. DS = Down syndrome; ASD = autism spectrum disorder; y.o. = years old.

Table 2

Assessment Results for Student Participants

Name	SCQ Total Score*	CARS-2-ST Raw Score (Severity Group)	ADOS-2 Module 1 Overall Total (Classification)	KBIT-2 IQ Composite (Descriptive Classification)	Vineland-2 ABC Standard Score (Adaptive Level)	Vineland-2 Expressive Communication V-Scale Score (Age Equivalency year: month)
Jill	21	31 (Mild-to-Moderate Symptoms of ASD)	18 (Autism)	40 (Lower Extreme)	20 (Low)	1 (0:10)
Matt	26	31 (Mild-to-Moderate Symptoms of ASD)	15 (Autism)	40 (Lower Extreme)	20 (Low)	1 (2:3)
Adam	18	32 (Mild-to-Moderate Symptoms of ASD)	14 (Autism)	40 (Lower Extreme)	20 (Low)	1 (1:5)
Mike	14	35.5 (Severe Symptoms of ASD)	12 (Autism Spectrum Disorder)	40 (Lower Extreme)	Not Interpretable	1 (0:7)

Note. SCQ = Social Communication Questionnaire; CARS-2-ST = Childhood Autism Rating Scale-Second Version-Standard Form; ADOS-2 = Autism Diagnostic Observation Schedule-Second Edition; KBIT-2 = Kaufman Brief Intelligence Test-Second Edition; IQ = Intelligence Quotient. SCQ scores of 15 or higher indicate evidence of significant ASD symptoms

Table 3

Assessment Results for Peer Mediator Participants

Name	SCQ Total Score	CARS-2-ST Raw Score (Severity Group)	ADOS-2 Module 4 Communication + Social Interaction Total (Classification)	KBIT-2 IQ Composite (Descriptive Classification)	Vineland-2 ABC Standard Score (Adaptive Level)	Vineland-2 Expressive Communication V-Scale Score (Age Equivalency year:month)
Janie	7	16.5 (Minimal-to-No Symptoms of ASD)	1 (Non-spectrum)	65 (Lower Extreme)	69 (Low)	16 (22+)
Carol	1	18.5 (Minimal-to-No Symptoms of ASD)	6 (Non-spectrum)	50 (Lower Extreme)	89 (Adequate)	16 (22+)
Emily	3	17 (Minimal-to-No Symptoms of ASD)	0 (Non-spectrum)	43 (Lower Extreme)	73 (Moderately Low)	12 (10:6)
Katie	0	16 (Minimal-to-No Symptoms of ASD)	0 (Non-spectrum)	53 (Lower Extreme)	77 (Moderately Low)	16 (22+)

Note. SCQ = Social Communication Questionnaire; CARS-2-ST = Childhood Autism Rating Scale-Second Version-Standard Form; ADOS-2 = Autism Diagnostic Observation Schedule-Second Edition; KBIT-2 = Kaufman Brief Intelligence Test-Second Edition; IQ = Intelligence Quotient.

The researcher is an administrator at the private school in which the students attend. The trainer worked at the school for 5 weeks in his role at the time of intervention, and seasonally at the school for the previous 10 years. The trainer knew all peer mediators and students before the research commenced. He had previous experience and training in using simultaneous prompting procedures in a university setting. He also had 10 years of experience in working with individuals with developmental and intellectual disabilities in various capacities, including coaching Special Olympics, providing recreational activities, serving as a school psychology intern in a public school

district, and substitute teaching. The trainer previously obtained Masters' degrees in both educational psychology and school psychology.

Tasks

Based on teacher and/or administrator reports and a review of student participant individual education plans the researcher identified several social skill strengths and deficits of participants. Final social skill task analyses were determined using LAR completed social skills surveys adapted from the TRIAD Social Skills Assessment (TSSA; Stone, Ruble, Coonrod, Hepburn, & Pennington, 2003). The TSSA is a criterion-based instrument used to provide information regarding social skills and behaviors of individuals with ASD (e.g., affective understanding, initiating interactions, responding to initiations, and friendships). Using a 1-4 Likert scale, ratings indicate a social skill is performed Not Very Well (1) to Very Well (4). Specific social skills for intervention were determined by matching student participants with individual social skills rated at Not Very Well (1) with peer mediators whose same social skills were rated at Very Well (4).

Table 4 provides the four social skills selected for intervention and the task analyses created by the researcher using the steps in which the researcher himself typically completes the tasks. Each task analysis features five steps and was written in language that was believed to be familiar to the peer mediators.

Table 4

Social Skills Task Analyses

Steps for Requesting More	Steps for Joining an Activity	Steps for Congratulating	Steps for Providing Help
1. Turns towards peer mediator	1. Turns towards peer mediator	1. Stops current activity	1. Asks peer mediator if he/she is okay verbally or non-verbally (e.g., patting shoulder).
2. Asks for more (e.g., by pointing, verbally asking, or signing)	2. Moves to area being invited to	2. Turns towards peer mediator	2. Waits approximately 5 seconds for response
3. Takes item	3. Responds to invitation verbally or non-verbally with “yes” or “no”	3. Indicates congratulations (e.g., claps hands)	3. Provides needed assistance
4. Indicates thank you verbally or non-verbally	4. Indicates “Thank you” with sign or by saying “Thank you”	4. Waits for peer mediator response (e.g., “thank you”)	4. Responds “you’re welcome” to peer mediators saying “thank you”
5. Uses requested item	5. Joins in with activity or returns to previous area	5. Returns to activity or stays with peer mediator	5. Returns to activity or stays with peer mediator

Setting

All probe, instructional, generalization, and maintenance sessions used a 1:1 teaching format; however, the researcher was also present in the room for all sessions. This study used various rooms (i.e., an office, conference room, mailroom, and game room) in the academic programming area of a private home and school for individuals with ID. The office and conference room are located in an academic building, and each setting is approximately the same size (15 ft. x 15 ft.) with a large window facing the campus. The mailroom is an 8 ft. by 20 ft. room with a window facing the hallway in an

academic building. The game room is a large 60 ft. by 60 ft. room with four pool tables and four 8 ft. folding tables. The private school is located in the southeast region of the United States, and was selected due to the convenience of the location and the population of interest (i.e., individuals with DS-ASD). Generalization sessions took place in the dining area of the students' residence halls. Residence halls are separated with male dorms (6) on one side of campus and female dorms (8) on the opposite side of campus. Residence halls have approximately 25 individual rooms for students (typically a 10 ft. x 12 ft. area) and one shared dining room (approximately 30 ft. x 30 ft.). The private school is home to approximately 350 students with intellectual or developmental disabilities with administrative, academic, residential, food service, equestrian, storage, and health office buildings. Students of the school range in age from 11-86 years old. Regardless of age, students at the school either attend daily classes or work jobs in on- or off-campus settings. The study was designed to take place in the student's typical environment.

Materials

Materials included for this study were dependent on the social skills to be targeted and the reinforcement materials/activity deemed appropriate for students' and peer-mediators participating in the study. Across social skills taught, a variety of puzzles were used so that the peer mediator and researcher could adapt the puzzles for the purpose of the individual skill being taught (Appendix E). The use of multiple exemplars allowed the opportunity for the likelihood of accurate student response to a class of stimuli instead of a single stimulus (Collins, Schuster, & Nelson, 1992). In addition, one student participant (i.e., Jill) included the use of material reinforcement in the form of a fidget toy

(Appendix F). The initial training and feedback sessions included the use of a fidelity check sheet completed by the researcher at the end of the session (Appendix G). For instructional sessions, peer mediators used visual schedules to help in teaching all social skills (Appendix H). In addition, data collection sheets for the researchers (Appendix I) and for the peer mediators (Appendix J) as well as writing utensils to record responses during baseline and probe sessions were made available. Each social skill required its own unique data collection sheet. The same researcher designated data sheet was utilized for collection of procedural reliability and inter-observer agreement (Appendix I). In addition, all training, baseline, probe, and intervention sessions utilized a smart phone with video camera and a personal computer with external hard drive to store session recordings. The researcher and the peer mediator arranged all materials needed prior to the beginning of each session. Finally, two social validity surveys were adapted from a scale provided by The Iris Center at Vanderbilt University to assess social validity of the procedures, target behaviors being taught, and the study overall (n.d.; Appendix K and L). Teachers and peer mediators completed social validity surveys independently.

Peer Mediator Training and Feedback Sessions

All peer mediators participated in researcher-led training sessions that taught the requisite skills for conducting baseline, probe, and simultaneous prompting trials. The training sessions included an explanation of baseline/probe and instructional session procedures, a review of social skill task analyses, examples and non-examples, role-playing, and advice for handling challenges. Three 1-hour trainings were conducted with the peer-mediators in a small group setting. Peer mediators participated in role plays of probe and instructional sessions with one another and with the researcher. Peer mediators

practiced role-plays until procedural reliability reached 100 percent. Before all sessions, the researcher reviewed with the peer mediators the skills to collect baseline, probe, or intervention data for simultaneous prompting for the identified behavior and the peer mediator was given a task analysis and visual schedule for procedural requirements. Informal feedback sessions followed each probe and intervention session to compare data collected (i.e., procedural reliability and inter-observer agreement data) or re-teach procedures, respectively. Peer mediators also learned appropriate reinforcement for each student participant.

General Procedures

The simultaneous prompting procedure across settings, researchers, populations, and skills has been deemed an evidence-based practice for teaching individuals with and without moderate and severe disabilities (Morse & Schuster, 2004). The simultaneous prompting procedure uses a 0-second time delay with no increase across trials or sessions until criterion is met (Collins, 2012). In addition, a test probe is conducted immediately prior to *instructional*, or *intervention*, sessions to measure progress and skill development. Simultaneous prompting has been identified as an effective, evidence-based instructional procedure that some instructors prefer because of the ease of data collection and simplicity of the procedure (Head et al., 2011).

In this study, a simultaneous prompting procedure was used to teach social skills to four adults with DS-ASD. Peer mediators taught peers in a 1:1 teaching format with the support of the researcher. Probe sessions were immediately followed by instructional sessions and occurred no more than three times daily, 5 days a week (Monday through Friday) dependent on the availability of peer mediator and student participants. No less

than one hour between an instructional session and the next probe session was planned to assist in maintenance of skills and valid recording of progress. Times for instruction were dependent on availability of students and peer mediators based on class schedules in the morning (8:30am to 11:30am) and afternoon (1:00pm to 4:30pm). Only student responses during probe sessions counted toward meeting criterion to move on to the next social skill task training. Instructional programs for teaching each social skill are provided to further illustrate procedural information (Appendix M).

Instructional objectives. Training continued for each task until criterion was met with 100% accuracy for 3 probe trials. Rationale for this objective is based on the consideration of using multiple exemplars and the potential for a longer training time to criterion, yet a better chance for high completion rates during maintenance and generalization sessions.

Experimental Design

A multiple probe across behaviors single-subject research design replicated across participants was utilized to assess the effectiveness of simultaneous prompting to teach and elicit functionally similar, functionally independent, and non-reversible social skills from adults with DS-ASD. The design includes probing all student participants and social skill tasks to develop a stable baseline, training the first task until criterion is met for each participant, probing all social skills again, and then beginning training on the next task until criterion is met. The pattern is repeated until all three tasks meet the criteria set. Experimental control was established by recording a stable baseline during initial probes and by implementing visual analysis techniques showing changes in the number of steps correctly completed and replication of effects upon the introduction of

the instruction for the specific task is implemented. A minimum of five data points were collected for each phase for each participant. The independent variable was the instructional procedure used. The dependent variables measured in the baseline and probe conditions were the number of correct responses to social behavior tasks. After a stable baseline performance was established for each student, three simultaneous prompting instructional sessions were planned each school day until criterion was met or therapeutic trends were detected by visual analysis.

Data collection. During all probe sessions, the peer mediators and the researcher collected data on the student's ability to perform each step of the task analysis for social skills. If it was deemed necessary by the researcher based on inconsistent data collection, researcher observations, or peer mediator requests, probe data on the dependent variable was collected by peer mediators post session by viewing videotaped probe sessions. During the probe sessions, the students' responses were either recorded as correct (✓) or incorrect (X). After delivery of the task direction, the next step needed to be initiated within 10 seconds and there was no time limit for completion after the task was initiated as long as the student did not move to the next step. An incorrect response was defined as either (1) skipping a step, (2) incorrect actions in a response, (3) or no response. Simultaneous prompting data collection sheets were created for each behavior during the baseline, probe, intervention, maintenance, and generalization sessions (see Appendix I and Appendix J).

Screening. The students and peer mediator participants participated in screenings to determine whether they possessed the prerequisite skills for the study. Screening included researcher observations of student motor skills, ability to imitate a model, and

ability to understand one and two-step directions. Initial screeners helped in identifying a controlling prompt (i.e., physical, model, visual, verbal, or gestural) that was the least intrusive, but most consistent in eliciting correct responses (Neitzel & Wolery, 2009). In addition, screening for student participants included a brief assessment of target social skills chosen. Informal screening procedures for target social skills chosen consisted of presentation of the task direction to see if the student followed the correct steps for completion. The student was allowed to complete the task to his or her satisfaction. During screening, appropriate reinforcement ideas were surveyed for all participants and/or participant teachers when students exhibited low expressive language skills.

There were no known risks in teaching these skills. However, precautions were taken to ensure the room was safe and individuals other than those necessary for the study were not present. Following the screening session, a test of non-targeted items (i.e., matching the names of the peer mediators with the correct picture) was administered. An example of non-targeted items tested is included in Appendix N.

Baseline procedures. Baseline data were collected for at least five sessions prior to the beginning of the training or until a stable baseline was established. Baseline sessions began once the researcher and peer mediators readied materials and delivered a general attention cue by stating the student's name. The peer mediator then waited for the student to respond appropriately. Once attention was established, the peer mediator delivered the task direction (e.g., "It's time to practice...") followed by one of the target skills. In most cases involving teaching social skills, a task direction is not warranted as the peer-mediator is considered a naturally occurring event. In such cases, the peer-mediator saying, for example, "I need help," acts as the task direction naturally

prompting a reciprocal response. All baseline probe sessions presented target behaviors to be performed in the same order (e.g., requesting more, joining an activity, and congratulating). During baseline, no prompting or reinforcement was given for correct or incorrect responses. Single opportunity probe sessions (i.e., the peer mediator stopped after an error) were used initially. The single opportunity approach was maintained throughout the study; however, a change in procedure was executed as indicated by a dashed line on graphs during the first simultaneous prompting instructional phase. The procedural change allowed student participants to conduct steps in non-exact order as long as the responses were still socially appropriate (e.g., saying “thank you” and then “yes” to being invited to participate in an activity or vice versa). Recorded responses as correct or incorrect were used throughout all baseline and instructional probe sessions. Errors resulted in the session being immediately terminated. Errors were defined as: (1) not initiating the step within 10 seconds or (2) an incorrect response.

Daily probe procedures. Simultaneous prompting procedures required the use of daily probing sessions before instructional sessions. This is due to the nature of simultaneous prompting procedures delivering an immediate, 0-second delay controlling prompt allowing for errorless learning, but also no opportunity for independent responding. Therefore, in order to assess learning, daily probes before instruction were conducted. In this study, daily probe trials occurred immediately prior to instructional sessions in a 1:1 teaching format. Student responses recorded during these daily probe sessions counted toward the instructional objectives and criterion. Daily probe sessions before instruction followed the same format as baseline procedures.

Simultaneous prompting instructional procedures. Simultaneous prompting procedures were used during instruction in a 1:1 format. The instructional session began with the peer mediator stating the attention cue, “Are you ready?” or by stating the student’s name. Once the student responded to the attention cue by looking or turning towards the peer mediator or by providing an appropriate verbalization, the peer mediator delivered the task direction, “It’s time to…” followed by the skill being trained or by delivering the discriminative stimulus (e.g., “I did it!” in the Congratulating task). The peer mediator used a controlling prompt procedure specific to each student with a 0-second delay. If the first step of a chained task was completed successfully, the peer mediator immediately delivered reinforcement (e.g., verbal praise such as “Great!” or “Good job!”) and was permitted as needed to ask “What’s next?” followed immediately by the controlling prompt for the next step. If a response error occurred, the controlling prompt was provided until the student responded correctly. This sequence of events was followed for each step of the task analysis until the task was completed successfully. During the instructional sessions, the peer mediator provided reinforcement following each step at a continuous reinforcement rate (CRF) schedule. Once the student reached 100% correct responses on one probe trial for the first time, praise was thinned to the end of the task to facilitate maintenance.

Maintenance procedures. Once students reached criterion (i.e., 100% task completion during a daily probe session) for a target behavior on three probe sessions, probes for all target behaviors were conducted using the same procedures that were utilized in the baseline probe sessions. A final maintenance probe was conducted one week following the completion of all instruction.

Generalization procedures. Generalization probes procedures were identical to baseline probe and daily probe condition procedures. Multiple exemplars (i.e., different types of puzzles and different settings) were used in instructional and probe sessions. Once a student met criterion across all social skill behaviors, one generalization probe session was conducted in a new location (i.e., the residence hall of the student) and one generalization probe session was conducted with a peer mediator who had not previously worked with the student participant or who had worked with that student the least.

Non-targeted information. Non-targeted information included the names of all peer mediator participants. During instructional sessions, non-targeted information was randomly delivered by the researcher at the end of the session with the actual student present (e.g., “(Peer-mediator’s name) is so proud of you!”). This was deemed a socially valid collection of information to expand the students’ social network and support. An example of the data sheet with fictional names and pictures is provided in Appendix N.

Reliability. Dependent and independent variable reliability data was collected concurrently in each condition and at each trial. The observer (i.e., the researcher) was in a position with a clear view to both peer mediator and student behaviors. Inter-observer agreement data was collected using the task analyses to record the number of correct and incorrect responses between observer (i.e., the researcher), peer mediators, and a research assistant. Videotaped sessions were also available to the peer mediator and research assistant to gather IOA data. The researcher and research assistant have previous training in using and collecting data for simultaneous prompting procedures and designed the task analyses for this study. Inter-observer agreement was calculated using the point-by-point agreement method using the formula that divides the number of agreements by the

number of agreements plus disagreements and multiplying by 100 (Wolery, Bailey, & Sugai, 1988). The average percentage of agreement during instructional and probe sessions was calculated during the study.

Using the same recording sheet for collecting IOA, procedural fidelity was collected on the independent variable across all sessions (Appendix I). Reliability of the independent variable was calculated by dividing the number of observed peer mediator behaviors by the number of planned peer mediator behaviors and multiplying by 100 (Billingsley, White, & Munson, 1980). Peer mediator behaviors were: delivery of the attention cue, delivery of the task direction (if applicable), delivery of the discriminative stimulus, obeying response interval rules (10 seconds), providing the controlling prompt during instruction of task analysis steps, and delivery of appropriate consequences. Average percentage of correct executed planned behaviors in all probe sessions and the percentage range were calculated.

Data Analyses

Quantitative and descriptive data were collected in this study. Data were transferred from data sheets completed and social validity scales into a Microsoft® Excel spread sheet. Quantitative data were converted into graphs following visual representation of data guidance for each target behavior for single-subject design for visual analysis (Gast & Spriggs, 2010). The following analyses were used based on each research question:

Research Question 1a: How common are social skills interventions in the students' histories?

Research Question 1b: What is the average age of ASD diagnosis or reported concerns related to ASD for students in the study?

Data that reviews the commonality of social skills interventions has not been identified. Average age of ASD diagnosis for individuals with DS-ASD is believed to be 14-15 years of age. Relevant descriptive data collected from record reviews will be obtained and reported in terms of descriptive statistics.

Research Question 2: Will the intervention be effective in increasing multiple targeted social skills for each participant (i.e., is there a functional relation between the use of peer mediated simultaneous prompting and an increase in both level and trend across three identified social skills within a participant with DS-ASD?).

It is expected that the intervention will be effective for each participant. Within-condition and between-condition data were analyzed using established visual analysis procedures. Level change determination included analysis of the following variables: median condition level, range, mean, absolute change value, and relative change value (Gast & Spriggs, 2010). Level stability was determined by using a 20 percent stability envelope, which indicates 80 percent of data points must be on or within a 20 percent range (Gast & Spriggs, 2010). Trend analyses include the determination of direction of change and determination of multiple trend paths. The split-middle method for trend analyses was utilized (White & Haring, 1980). Between-condition comparisons of adjacent conditions included percentage of non-overlapping data (PND) values, percentage of overlapping data (POD) values, change in trend direction between adjacent conditions, absolute change values, and value comparisons of first baseline value and

final intervention value. Integration of the information gathered across all phases was used to determine if at least three demonstrations of effect at different points in time and a predictable pattern of effect indicated a functional relation.

Statistical analyses were also conducted using the free, web-based Tau-U Calculator (Vannest, Parker, & Gonen, 2011) to supplement visual analysis strategies as well as to estimate intervention effect sizes for participants. Tau-U was calculated for each student participant to determine effectiveness of the peer-delivered simultaneous prompting intervention to teach social skills. Tau-U is non-parametric technique allowing for analysis of small samples, and combines non-overlap between conditions (i.e., comparisons of individual data points across baseline and intervention conditions) with the trend data from within the intervention condition (Parker, Vannest, Davis, & Sauber, 2011). Furthermore, Tau-U uses an S sampling distribution and rests firmly on Mann-Whitney U and Kendall's Rank Correlation techniques, and Tau-U calculations can provide simple non-overlap (Tau) results and a simple non-overlap controlling for positive baseline trend (Tau-U) results (Vannest et al., 2011). Tentative benchmarks for interpreting effect sizes using Tau-U have been established for non-overlap data analyses in previous research (Parker & Vannest, 2009; Rakap, 2015).

Research Question 3: Will the intervention be effective in increasing at least one targeted social skill across three participants (i.e., is there a functional relation between the use of peer mediated simultaneous prompting and an increase in both level and trend in identified social skills across at least three participants with DS-ASD?)

It is expected that the social skills intervention would be effective in teaching at least one behavior for all participants. Visual analysis techniques and information gathered for Research Question 2 was used to answer Research Question 3. Integration of the information gathered across all phases was used to determine if at least three demonstrations of effect at different points in times and a predictable pattern of effect indicated a functional relation.

Statistical analysis of data are also utilized with Tau-U calculations to obtain an overall effect size across participants and social skill tasks.

Research Question 4a: Are students able to generalize skills learned to different settings?

Research Question 4b: Are students able to generalize skills learned to different peers?

Research Question 4c: Are students able to maintain targeted social skills for at least one week following the end of the intervention?

Participants were expected to be able to generalize skills to different settings and peers, as well as maintain skills over time. Descriptive data collected from generalization and maintenance sessions was collected to evaluate the generalizability of intervention effects.

Research Question 5a: Are peers with Down syndrome able to reliably deliver (i.e., >80% procedural fidelity) simultaneous prompting procedures?

Research Question 5b: Are the dependent variables reliably recorded (i.e., an inter-observer agreement > 80%)?

Reliability on the independent variable was calculated by dividing the number of observed peer-mediator behaviors by the number of planned peer mediator behaviors and multiplying by 100 (Billingsley et al., 1980). IOA was calculated using the point-by-point agreement method using the formula that divides the number of agreements by the number of agreements plus disagreements and multiplying by 100 (Wolery et al., 1988). The average percentage of agreement during probe sessions was calculated along with a description of errors that most typically occurred.

Research Question 6a: What are teachers' perceptions of the importance of social skills targeted in the school and community?

Research Question 6b: What are teachers' perceptions of the practicality and cost effectiveness of the intervention used?

Research Question 6c: Do peer-mediators believe that simultaneous prompting is easy to implement?

Quantitative data in the form of responses to 5 point Likert scale items was collected for analysis. Teachers and peer mediators provided responses regarding the appropriateness of the peer mediated social skills intervention, the perceived improvements in student social skills, the perceived practicality and cost effectiveness of the intervention, the perceived increase in student use of specific target behaviors, perceived student self-efficacy in performing targeted social skills, and the overall effectiveness of the intervention (Appendix K & L). In addition, peer mediators reported the ease of use of simultaneous prompting procedures. Mean values for each scale item by teacher and peer mediator respondent groups and indications of any negative reviews are reported in the Results section.

CHAPTER 3

RESULTS

Study findings are presented in order of aims and research questions previously presented. It is notable that the fourth student participant (i.e., Mike) did not meet the SCQ cut-off to be included in the study, and, the fourth peer mediator (i.e., Katie) left the private school before the intervention began. Therefore, the fourth intervention pair was not included in the intervention. The following results reflect the findings related to all other student participants and peer mediators.

Student Participant ASD Diagnosis and Social Skill Intervention History

Table 5 provides information on age of student participants' ASD diagnosis and social skills intervention history as gathered from available records and/or information provided by the legally authorized representative.

Table 5

Information on age of student participants' ASD diagnosis and social skills intervention history

<u>Student Name</u>	<u>Age of ASD Diagnosis</u>	<u>Social Skills Intervention History</u>
Jill	Parent report indicated recognizing ASD-specific symptoms and testing when Jill was 31 years old.	Parent report and records did not indicate specific social skills intervention. Jill began early intervention services at 3 years of age, special education services at age 5, and began attending her current school at age 11.
Matt	Diagnosis of Autism at 8 years old.	Intensive behavioral training at an "autism center" in the southern region of the United States, yet no programs specifically focusing on social skills. Parent report indicated working with Matt on social skills at home with family.
Adam	Parent report indicated recognizing autistic tendencies (e.g., repetitive behaviors and poor social communication) at age 10 years old.	Parents provided social opportunities for Adam as a child. Parent report indicated working with Adam on social skills at home with family (e.g., shaking hands) and in one-on-one learning opportunities. Adam also took sign language classes for two years after turning 12 years old.

Note. ASD = Autism Spectrum Disorder

Parent reports and records were unable to provide a specific number of or amount of social skills instruction that the student participants had previously experienced. Two families mentioned frequent use of family-led social skills practice and instruction opposed to specific programming. Matt's family noted the use of an intensive behavioral program for two months to help correct challenging behaviors certainly interfering with social skills.

Based on parent report and record review, the average age of ASD diagnosis or reported ASD symptoms for student participants in the study was 16.33 years old ($R = 8 - 31$ years of age; $SD = 10.40$). Of the three student participants, Matt was the only participant with an official diagnosis of ASD.

Effectiveness of Intervention for Student Participants Across Their Own Behaviors

Figures 1, 2, and 3 provide opportunities for visual analysis of collected data allowing both within-condition and between-condition analyses.

Student Participant Jill. Figure 1 displays the data indicating evidence that the peer mediated simultaneous prompting procedure was effective in teaching Jill several social skills (i.e., requesting more, joining an activity, and congratulating). Jill was able to meet criterion on all three tasks, which consisted of 5 steps in each social skill task analysis. Jill's controlling prompt determined through screening included a combined verbal and gestural prompt with the option of using a physical prompt only when necessary. One procedural modification occurred during the simultaneous prompting phase for "requesting more" as indicated by the first dashed line on the graph. It was determined that a total task approach would be adopted, thus it did not affect accuracy if steps were not completed in order as long as the steps were still socially appropriate as

determined by the researcher. Therefore, as long as each step was completed in an appropriate manner, the 100% criterion rule was achieved.

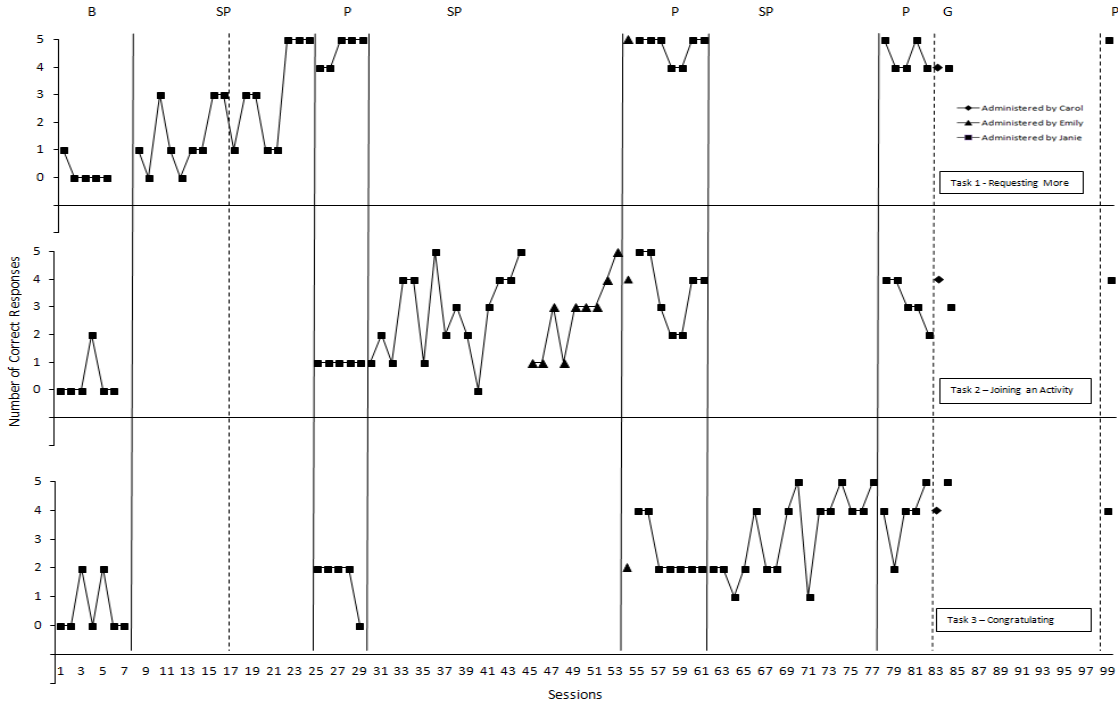


Figure 1. Number of correct response by Jill. The first dashed line in the graph represents the procedural change from single opportunity to a total task approach for data collection. Key: B – Baseline; SP – Simultaneous Prompting Intervention; P – Maintenance Probes; G – Generalization.

Single-subject designs rely on within-condition measurements of condition length, level change and stability, and trend. Condition length data helps to identify how long a phase is in effect (Gast & Spriggs, 2010). Jill’s baseline data required 5-7 sessions and maintenance sessions were 5-8 sessions. Simultaneous prompting instructional session data for “requesting more” indicates 17 sessions to reach criterion. Simultaneous prompting instructional session data for “joining an activity” indicates 24 sessions to reach criterion. Simultaneous prompting instructional session data for “congratulating” indicates 16 sessions to reach criterion.

Level stability was determined by using a 20 percent stability envelope, which indicates 80 percent of data points must be on or within a 20 percent range of the median (Gast & Spriggs, 2010). Following the 80-20 stability envelope guidelines all phases requiring stability for this study (i.e., baseline and maintenance phases immediately prior to instructional phases) are considered stable with the exception of the baseline phase and second maintenance phase for Task 3.

Level change findings within the intervention conditions include the median level value (i.e., the middle value of a set of ordered values), range (i.e., range of values), mean ($\mu = (\sum X_i) / N$), absolute change value (i.e., subtracting the smallest from the largest ordinate value when considering the first and last data points of a condition), and relative level change value (i.e., subtraction of the largest from the smallest median value when considering the median value of the first half of a condition and the median value of the second half of a condition) (Gast & Spriggs, 2010). Level change data is provided in the following table for Jill’s simultaneous prompting instructional data:

Table 6

Level change data for Jill’s simultaneous prompting instructional data

<u>Task</u>	<u>Median Level Value</u>	<u>Range</u>	<u>Mean</u>	<u>Absolute Level Change Value</u>	<u>Relative Level Change Value</u>
Requesting More	2	0-5	2.18	[5 – 1] = 4 (Therapeutic)	[3 – 1] = 2 (Therapeutic)
Joining an Activity	3	0-5	2.71	[5 – 1] = 4 (Therapeutic)	[3 – 2] = 1 (Therapeutic)
Congratulating	4	1-5	3.19	[5 – 2] = 3 (Therapeutic)	[4 – 2] = 2 (Therapeutic)

Trend analyses include the determination of direction of change and determination of multiple trend paths. The split-middle method for trend analyses is

utilized (White & Haring, 1980). Based on this method, all baselines and pre-instruction maintenance phases for Jill end in zero-celerating or decelerating trends. Trend data are provided in the following table for simultaneous prompting instructional data:

Table 7

Trend data for Jill's simultaneous prompting instructional data

<u>Task</u>	<u>First Half Median Value</u>	<u>Second Half Median Value</u>	<u>Trend</u>
Requesting More	1	3	Accelerating
Joining an Activity*	1	5	Accelerating
Congratulating	2	4	Accelerating

Note. Multiple data paths within the trend were identified for Task 2 (i.e., Joining an Activity), therefore, the last data path within the trend is reported.

Between-condition comparisons of adjacent conditions are provided for baseline or maintenance probe phases immediately followed by, or adjacent to, simultaneous prompting instructional sessions for each task. Between-condition comparison data are provided in the following table:

Table 8

Between-condition comparison data for Jill

<u>Task</u>	<u>Percentage of Non- Overlapping Data (PND)</u>	<u>Percentage of Overlapping Data (POD)</u>	<u>Change in Trend Direction</u>	<u>Absolute Level Change Value</u>	<u>Relative Level Change Value</u>	<u>Value Comparison of First Baseline Value and Final Intervention Value</u>
Requesting More	47.05%	53.94%	Decelerating to zero- celerating	1 (Impro- ving)	1	4
Joining an Activity	70.83%	29.16%	Change in variability	0 (No change)	1	5
Congratulating	18.75%	81.25%	Decelerating to accelerating	0 (No change)	0	5

Efficiency data indicates that Jill required 14 instructional sessions to complete the “requesting more” task analysis with 100% accuracy and 16 instructional sessions to reach criterion set as identified in the instructional objective (i.e., 3 probe sessions at 100% accuracy). Jill required 6 instructional sessions to complete the “joining an activity” task analysis with 100% accuracy and 23 instructional sessions to reach criterion set as identified in the instructional objective. Jill required 8 instructional sessions to complete the “congratulating task” analysis with 100% accuracy and 15 instructional sessions to reach criterion set as identified in the instructional objective. Jill required 138 total probes sessions to reach study completion.

Tau-U was calculated for Jill to determine overall effectiveness of the peer-delivered simultaneous prompting intervention to teach three social skills. Tentative benchmarks for interpreting effect sizes for Tau-U have been established for non-overlap data analyses in previous research (Parker & Vannest, 2009; Rakap, 2015). These benchmarks indicate the following Tau-U value criteria: less than or equal to .65 equals a small effect, .66 - .92 equals a medium effect, and .93 and above equals a strong effect. For Jill, peer intervention resulted in a $Tau_{Weighted} = .55$, 90% CI [.29, .82], $Z = 3.40$, $p < .001$, indicating a statistically significant, yet small, effect of intervention. Complete results of the Tau-U calculations are provided in Appendix O for Jill.

Student Participant Matt. Figure 2 displays the data indicating evidence that the peer mediated simultaneous prompting procedure was effective in teaching Matt several social skills (i.e., requesting more, joining an activity, and offering help). Matt was able to meet criterion on all three tasks, which consisted of 5 steps in each social skill task analysis. Matt’s controlling prompt determined through screening included a

combined verbal and gestural prompt. One procedural modification occurred during the simultaneous prompting phase for “requesting more” as indicated by the first dashed line on the graph. It was determined that a total task approach would be adopted, thus it did not affect accuracy if steps were not done in order as long as the steps were still socially appropriate as determined by the researcher. Therefore, as long as each step was completed in an appropriate manner, the 100% criterion could be reached.

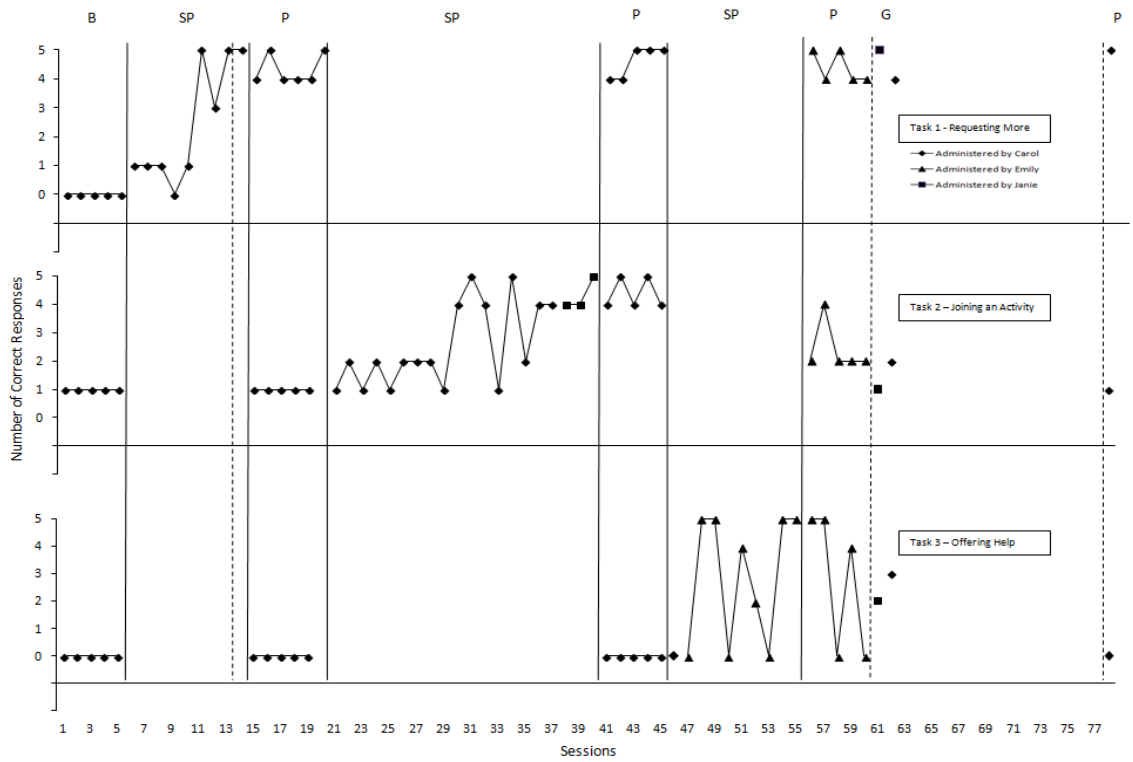


Figure 2. Number of correct response by Matt. The first dashed line in the graph represents the procedural change from single opportunity to a total task approach for data collection. Key: B – Baseline; SP – Simultaneous Prompting Intervention; P – Maintenance Probes; G – Generalization

Matt’s baseline data required 5 sessions for each task and maintenance sessions were 5-6 sessions. Simultaneous prompting instructional session data for “requesting more” indicates 9 sessions to reach criterion. Simultaneous prompting instructional session data for “joining an activity” indicates 20 sessions to reach criterion.

Simultaneous prompting instructional session data for “offering help” indicates 8 sessions to reach criterion.

Level stability was determined by using a 20 percent stability envelope, which indicates 80 percent of data points must be on or within a 20 percent range of the median (Gast & Spriggs, 2010). Following the 80-20 stability envelope guidelines all phases requiring stability for this study (i.e., baseline and maintenance phases immediately prior to instructional phases) are considered stable. Level change findings within the intervention conditions include the median level value (i.e., the middle value of a set of ordered values), range (i.e., range of values), mean ($\mu = (\sum X_i) / N$), absolute change value (i.e., subtracting the smallest from the largest ordinate value when considering the first and last data points of a condition), and relative level change value (i.e., subtraction of the largest from the smallest median value when considering the median value of the first half of a condition and the median value of the second half of a condition) analysis variables (Gast & Spriggs, 2010). Level change data is provided in the following table for simultaneous prompting instructional data:

Table 9

Level change data for Matt’s simultaneous prompting instructional data

<u>Task</u>	<u>Median Level Value</u>	<u>Range</u>	<u>Mean</u>	<u>Absolute Level Change Value</u>	<u>Relative Level Change Value</u>
Requesting More	1	0-5	2.55	[5 – 1] = 4 (Therapeutic)	[5 – 1] = 4 (Therapeutic)
Joining an Activity	2	1-5	2.80	[5 – 1] = 4 (Therapeutic)	[4 – 2] = 2 (Therapeutic)
Offering Help	3	0-5	2.89	[5 – 0] = 5 (Therapeutic)	[4 – 0] = 4 (Therapeutic)

Trend analyses included the determination of direction of change and determination of

multiple trend paths. The split-middle method for trend analyses is utilized (White & Haring, 1980). Based on this method, all baselines and pre-instruction maintenance phases for Matt end in zero-celerating trends. Trend data is provided in the following table for simultaneous prompting instructional data:

Table 10

Trend data for Matt's simultaneous prompting instructional data

<u>Task</u>	<u>First Half Median Value</u>	<u>Second Half Median Value</u>	<u>Trend</u>
Requesting More	1	5	Accelerating
Joining an Activity	2	4	Accelerating
Offering Help*	0	4	Accelerating

* Multiple data paths within the trend were identified for Task 3 (i.e., Offering Help), therefore, the last data path within the trend is reported.

Between-condition comparisons of adjacent conditions are provided for baseline or maintenance probe phases immediately followed by, or adjacent to, simultaneous prompting instructional sessions for each task. Between-condition comparison data are provided in the following table:

Table 11

Between-condition comparison data for Matt

<u>Task</u>	<u>Percentage of Non-Overlapping Data (PND)</u>	<u>Percentage of Overlapping Data (POD)</u>	<u>Change in Trend Direction</u>	<u>Absolute Level Change Value</u>	<u>Relative Level Change Value</u>	<u>Value Comparison of First Baseline Value and Final Intervention Value</u>
Requesting More	88.89%	11.11%	Zero-celerating to accelerating	1 (Improving)	1	5
Joining an Activity	75%	25%	Zero-celerating to accelerating	0 (No Change)	0.5	4
Offering Help	60%	40%	Change in variability	0 (No Change)	5	5

Matt required 5 instructional sessions to complete the requesting more task analysis with 100% accuracy and 8 instructional sessions to reach criterion set as identified in the instructional objective (i.e., 3 probe sessions at 100% accuracy). Matt required 10 instructional sessions to complete the joining an activity task analysis with 100% accuracy and 19 instructional sessions to reach criterion set as identified in the instructional objective. Matt required 2 instructional sessions to complete the offering help task analysis with 100% accuracy and 8 instructional sessions to reach criterion set as identified in the instructional objective. Matt required 109 total probe sessions to reach completion.

Tau-U was calculated for Matt to determine overall effectiveness of the peer-delivered simultaneous prompting intervention to teach social skills. Tentative benchmarks for interpreting effect sizes for Tau-U have been established for non-overlap data analyses in previous research (Parker & Vannest, 2009; Rakap, 2015). These benchmarks indicate the following Tau-U value criteria: less than or equal to .65 equals a

small effect, .66 - .92 equals a medium effect, and .93 and above equals a strong effect. For Matt, peer intervention resulted in a $Tau_{Weighted} = .75$, 90% CI [.44, 1], $Z = 4.05$, $p < .001$, indicating a statistically significant, medium effect of intervention. Complete results of the Tau-U calculations are provided in Appendix P for Matt.

Student Participant Adam. Figure 3 displays the data indicating evidence that the peer mediated simultaneous prompting procedure was effective in teaching Adam several social skills (i.e., requesting more, joining an activity, and offering help). Adam was able to meet criterion on all three tasks, which consisted of 5 steps in each social skill task analysis. Adam's controlling prompt determined through screening included a combined verbal and gestural prompt. One procedural modification occurred during the simultaneous prompting phase for "requesting more" as indicated by a dashed line the graph. It was determined that a total task approach would be adopted, thus it did not affect accuracy if steps were not done in order as long as the steps were still socially appropriate as determined by the researcher. Therefore, as long as each step was completed in an appropriate manner, the 100% criterion could be reached.

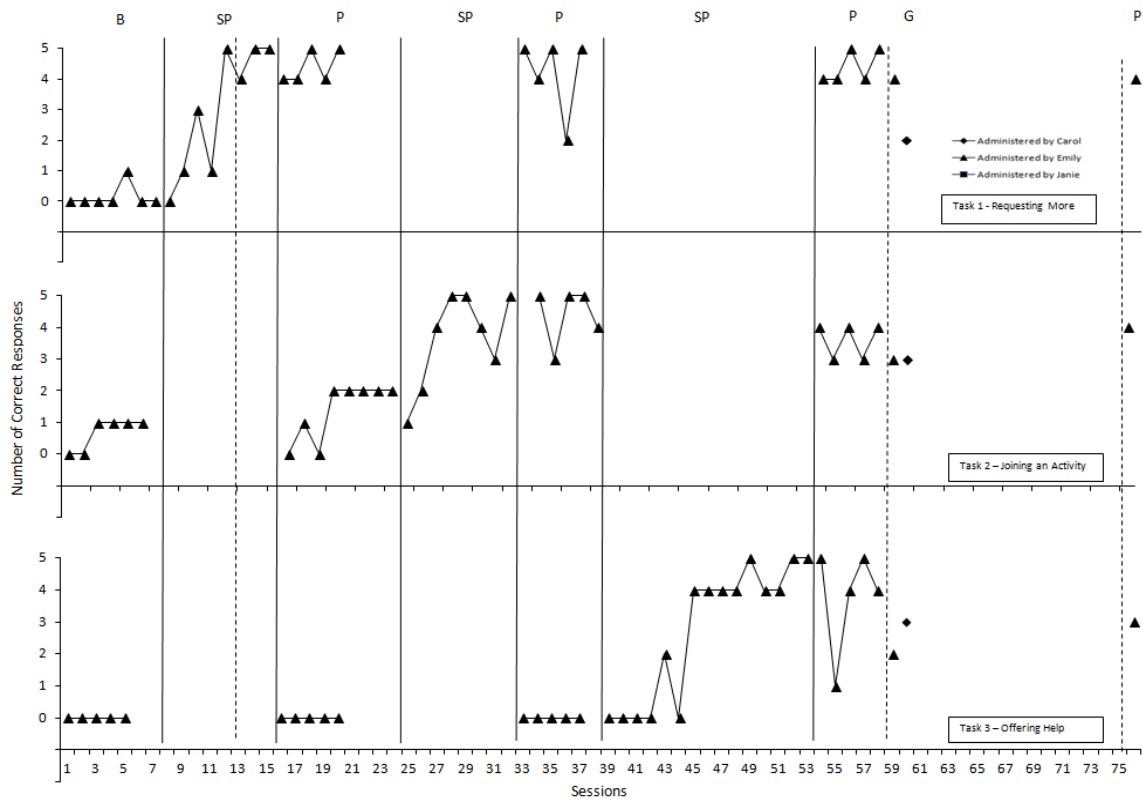


Figure 3. Number of correct response by Adam. The first dashed line in the graph represents the procedural change from single opportunity to a total task approach for data collection. Key: B – Baseline; SP – Simultaneous Prompting Intervention; P – Maintenance Probes; G – Generalization

Single-subject designs rely on within-condition measurements of condition length, level change and stability, and trend. Condition length data helps to identify how long a phase is in effect (Gast & Spriggs, 2010). Adam’s baseline data required 5-7 sessions and maintenance sessions were 5-8 sessions. Simultaneous prompting instructional session data for “requesting more” indicates 8 sessions to reach criterion. Simultaneous prompting instructional session data for “joining an activity” indicates 8 sessions to reach criterion. Simultaneous prompting instructional session data for “offering help” indicates 15 sessions to reach criterion.

Level stability is determined by using a 20 percent stability envelope, which

indicates 80 percent of data points must be on or within a 20 percent range of the median (Gast & Spriggs, 2010). Following the 80-20 stability envelope guidelines all phases requiring stability for this study (i.e., baseline and maintenance phases immediately prior to instructional phases) are considered stable.

Level change findings within the intervention conditions include the median level value (i.e., the middle value of a set of ordered values), range (i.e., range of values), mean ($\mu = (\sum X_i) / N$), absolute change value (i.e., subtracting the smallest from the largest ordinate value when considering the first and last data points of a condition), and relative level change value (i.e., subtraction of the largest from the smallest median value when considering the median value of the first half of a condition and the median value of the second half of a condition) analysis variables (Gast & Spriggs, 2010). Level change data is provided in the following table for simultaneous prompting instructional data:

Table 12

Level change data for Adam's simultaneous prompting instructional data

<u>Task</u>	<u>Median Level Value</u>	<u>Range</u>	<u>Mean</u>	<u>Absolute Level Change Value</u>	<u>Relative Level Change Value</u>
Requesting More	3.5	0-5	3	[5 - 0] = 5 (Therapeutic)	[5 - 1] = 4 (Therapeutic)
Joining an Activity	4	1-5	3.63	[5 - 1] = 4 (Therapeutic)	[4.5 - 3] = 1.5 (Therapeutic)
Offering Help	4	0-5	2.73	[5 - 0] = 5 (Therapeutic)	[4 - 0] = 4 (Therapeutic)

Trend analyses include the determination of direction of change and determination of multiple trend paths. The split-middle method for trend analyses is utilized (White & Haring, 1980). Based on this method, all baselines and pre-instruction maintenance phases for Adam end in zero-accelerating or decelerating trends. Trend data is provided in the following table for simultaneous prompting instructional data:

Table 13

Trend data for Adam's simultaneous prompting instructional data

<u>Task</u>	<u>First Half Median Value</u>	<u>Second Half Median Value</u>	<u>Trend</u>
Requesting More	1	5	Accelerating
Joining an Activity	3	4.5	Accelerating
Offering Help	0	4	Accelerating

Between-condition comparisons of adjacent conditions are provided for baseline or maintenance probe phases immediately followed by, or adjacent to, simultaneous prompting instructional sessions for each task. Between-condition comparison data are provided in the following table:

Table 14

Between-condition comparison data for Adam

<u>Task</u>	<u>Percentage of Non- Overlapping Data (PND)</u>	<u>Percentage of Overlapping Data (POD)</u>	<u>Change in Trend Direction</u>	<u>Absolute Level Change Value</u>	<u>Relative Level Change Value</u>	<u>Value Comparison of First Baseline Value and Final Intervention Value</u>
Requesting More	62.5%	37.5%	Zero- celerating to accelerating	0 (No Change)	2	5
Joining an Activity	75%	25%	Accelerating to accelerating	-1 (Deteriorating)	1	5
Offering Help	66.67%	33.33%	Zero- celerating to accelerating	0 (No Change)	0	5

Adam required 4 instructional sessions to complete the requesting more task analysis with 100% accuracy and 7 instructional sessions to reach criterion set as identified in the instructional objective (i.e., 3 probe sessions at 100% accuracy). Adam

required 3 instructional sessions to complete the joining an activity task analysis with 100% accuracy and 7 instructional sessions to reach criterion set as identified in the instructional objective. Adam required 10 instructional sessions to complete the offering help task analysis with 100% accuracy and 14 instructional sessions to reach criterion set as identified in the instructional objective. Adam required 106 total probes sessions to reach completion.

Tau-U was calculated for Adam to determine overall effectiveness of the peer-delivered simultaneous prompting intervention to teach social skills. Tentative benchmarks for interpreting effect sizes for Tau-U have been established for non-overlap data analyses in previous research (Parker & Vannest, 2009; Rakap, 2015). These benchmarks indicate the following Tau-U value criteria: less than or equal to .65 equals a small effect, .66 - .92 equals a medium effect, and .93 and above equals a strong effect. For Adam, peer intervention resulted in a $Tau_{Weighted} = .75$, 90% CI [.46, 1], $Z = 4.25$, $p < .001$, indicating a statistically significant, medium effect of intervention. Complete results of the Tau-U calculations are provided in Appendix Q for Adam.

Visual analysis results indicate a functional relation between social skills instruction using simultaneous prompting delivered by peer mediators with DS and an increase in both level and trend across three identified social skills within a participant with DS-ASD (i.e., Matt and Adam). Across student participants, visual analysis suggests a small to medium effect in teaching identified social skills; however, the change in level and trend were often variable and delayed. Jill required the most sessions to meet criteria for each task as well as the most variability in simultaneous prompting sessions. Matt showed great variability in Task 3 (i.e., offering help) simultaneous

prompting sessions; however, showed consistent therapeutic changes in level and trend for Tasks 1 and 2. Adam showed relatively immediate and abrupt changes in level and trend across all three tasks. Statistical analyses utilizing Tau-U suggests small effects for Jill ($Tau-U = 0.5541$; $p = 0.001$) and medium effects for Matt ($Tau-U = 0.7455$; $p = 0.001$) and Adam ($Tau-U = 0.7458$; $p < 0.001$). Of note, Tau-U calculations for single-subject research are often used when baseline data requires correction due to an accelerating trend. Across all participants and tasks, baseline correction was not required, as baseline trend contrast p-values never fell below the suggested .05 level of significance.

Effectiveness of Intervention across Student Participants

The hypothesis indicated the social skills intervention would be effective in teaching at least one behavior for all participants. Visual analysis techniques and information gathered for Research Question 2 indicate that there is a functional relation between behaviors as previously supported, and that effect was replicated across participants. Evidence, therefore, suggests that the intervention works for multiple participants though this cannot be definitively generalized to the wider population.

Statistical analyses using Tau-U were also conducted to supplement visual analysis and to get an overall effect size considering all participants and all social skill tasks taught. Table 15 provides the Tau-U calculations for overall effect of the intervention across student participants and behaviors.

Table 15

Tau-U analysis data across all participants and tasks

<u>Tau</u>	<u>Var-Tau</u>	<u>Z</u>	<u>P-Value</u>	<u>CI 85%</u>	<u>CI 90%</u>	<u>CI 95%</u>
0.6774	0.1006	6.7313	< .0001	0.5324<>0.8223	0.5118<>0.8429	0.4801<>0.8746

Statistical analyses utilizing Tau-U suggests medium effects considering all participants and tasks in the study ($Tau-U = 0.68$; $p < 0.0001$).

Maintenance and Generalization of Targeted Social Behaviors

Student participant Jill. Jill maintained 80-100% accuracy for “requesting more” following simultaneous instructional sessions ($M = 4.63$ steps; $SD = 0.28$). A maintenance session following one week after the completion of all sessions indicated that Jill was able to complete 100% (i.e., 5 of 5 steps) of the “requesting more” task analysis. Jill maintained 40-100% accuracy for “joining an activity” following simultaneous instructional sessions ($M = 3.5$ steps; $SD = 0.96$). A maintenance session following one week after the completion of all sessions indicated that Jill was able to complete 80% (i.e., 4 of 5 steps) of the “joining an activity” task analysis. Jill maintained 40-80% accuracy for “congratulating” following simultaneous instructional sessions ($M = 3.83$ steps; $SD = 0.81$). A maintenance session following one week after the completion of all sessions indicated that Jill was able to complete 80% (i.e., 4 of 5 steps) of the “congratulating” task analysis.

Generalization probe sessions following the completion of sessions were conducted using new settings and a different peer mediator. In a new setting (i.e., the student participant’s residence hall dining area), Jill was able to “request more” with 80% accuracy, “join an activity” with 60% accuracy, and “congratulate” with 100% accuracy.

With a new or different peer mediator, Jill was able to “request more” with 80% accuracy, “join an activity” with 80% accuracy, and “congratulate” with 80% accuracy.

Student participant Matt. Matt maintained 80-100% accuracy for “requesting more” following simultaneous instructional sessions ($M = 4.47$ steps; $SD = 0.25$). A maintenance session following one week after the completion of all sessions indicated that Matt was able to complete 100% (i.e., 5 of 5 steps) of the “requesting more” task analysis. Matt maintained 20-100% accuracy for “joining an activity” following simultaneous instructional sessions ($M = 3.18$ steps; $SD = 1.79$). A maintenance session following one week after the completion of all sessions indicated that Matt was able to complete 20% (i.e., 1 of 5 steps) of the “joining an activity” task analysis. Matt maintained 0-100% accuracy for “offering help” following simultaneous instructional sessions ($M = 2.33$ steps; $SD = 5.56$). A maintenance session following one week after the completion of all sessions indicated that Matt was able to complete 0% (i.e., 0 of 5 steps) of the “offering help” task analysis.

Generalization probe sessions following the completion of sessions were conducted using new settings and a different peer mediator. In a new setting (i.e., the student participant’s residence hall dining area), Matt was able to “request more” with 80% accuracy, “join an activity” with 40% accuracy, and “offer help” with 60% accuracy. With a new or different peer mediator, Matt was able to “request more” with 100% accuracy, “join an activity” with 20% accuracy, and “offer help” with 40% accuracy.

Student participant Adam. Adam maintained 40-100% accuracy for “requesting more” following simultaneous instructional sessions ($M = 4.0625$ steps; $SD =$

0.65). A maintenance session following one week after the completion of all sessions indicated that Adam was able to complete 80% (i.e., 4 of 5 steps) of the “requesting more” task analysis. Adam maintained 60-100% accuracy for “joining an activity” following simultaneous instructional sessions ($M = 4$ steps; $SD = 0.54$). A maintenance session following one week after the completion of all sessions indicated that Adam was able to complete 80% (i.e., 4 of 5 steps) of the “joining an activity” task analysis. Adam maintained 20-100% accuracy for “offering help” following simultaneous instructional sessions ($M = 3.67$ steps; $SD = 1.89$). A maintenance session following one week after the completion of all sessions indicated that Matt was able to complete 60% (i.e., 3 of 5 steps) of the “offering help” task analysis.

Generalization probe sessions following the completion of sessions were conducted using new settings and a different peer mediator. In a new setting (i.e., the student participant’s residence hall dining area), Adam was able to “request more” with 80% accuracy, “join an activity” with 60% accuracy, and “offer help” with 40% accuracy. With a new or different peer mediator, Adam was able to “request more” with 40% accuracy, “join an activity” with 60% accuracy, and “offer help” with 60% accuracy.

Non-targeted information data. During screening, all student participants were asked to point to the peer mediator picture matching the name that the researcher stated aloud. The same test was provided at the end of all sessions following instructional procedures throughout the study. Below is the pre- and post-test data for each student participant:

Table 16

Non-targeted information data representing correctly matching peer mediator pictures with names

<u>Student Participant Name</u>	<u>Pre-test score</u>	<u>Post-test score</u>
Jill	2 of 3 correctly named peer mediators	2 of 3 correctly named peer mediators
Matt	1 of 3 correctly named peer mediators	2 of 3 correctly named peer mediators
Adam	1 of 3 correctly named peer mediators	2 of 3 correctly named peer mediators

All student participants were able to correctly identify their peer mediator in the post-test. Only Adam correctly identified his peer mediator during the pre-test. Overall findings suggest that when randomly provided throughout the intervention with the name of their peer mediator, the student participants were each able to correctly identify the peer mediator that he or she worked with most often.

Reliability

Across all participants and behaviors, a total of 353 probe sessions were recorded for visual analysis purposes. In addition, 127 instructional sessions were conducted in which student participant accuracy data is not presented given the nature of simultaneous prompting and errorless instruction.

Across all student participants and behaviors, Carol delivered a total of 85 probe sessions, 27 simultaneous prompting instructional sessions, and 47.06% of sessions she delivered were reviewed for reliability calculations. Emily delivered 139 probe sessions, 49 simultaneous prompting instructional sessions, and 61.87% of sessions she delivered

were reviewed for reliability calculations. Janie delivered 129 probe sessions, 51 simultaneous prompting instructional sessions, and 50.39% of sessions she delivered were reviewed for reliability calculations. The following table provides additional information used for reliability calculations:

Table 17

Information used for Inter-Observer Agreement (IOA) calculations

<u>Phase</u>	<u>Number of Probe Sessions</u>	<u>Sessions Reviewed for Reliability Calculations</u>	<u>Percentage of Total Sessions Reviewed for Reliability Calculations</u>
Baseline	51	22	43%
Maintenance	156	59	38.46%
Generalization	18	7	38.89%
Daily Probe	127	52	40.94%
TOTAL	352	140	39.77%
Instructional Sessions (for reliability on the independent variable)	127	51	40.16%

Inter-observer Agreement (IOA) was calculated using the point-by-point agreement method using the formula that divides the number of agreements by the number of agreements plus disagreements and multiplying by 100 (Wolery et al., 1988). The percentage of agreement on the dependent variable during probe sessions between the researcher and the *research assistant* was 92.73% suggesting that the dependent variables were reliably recorded (i.e., IOA > 80%). The percentage of agreement on the dependent variable during probe sessions between the researcher and *peer mediators* was 95.45% suggesting that the dependent variables were reliably recorded (i.e., IOA >80%).

IOA values between the researcher and specific peer mediators were 95.41% (Janie), 94.48% (Carol), and 95.82% (Emily).

Reliability on the independent variable was calculated by dividing the number of observed peer mediator behaviors by the number of planned peer mediator behaviors and multiplying by 100 (Billingsley et al., 1980). Researcher reliability calculations indicate that overall procedural fidelity across all simultaneous prompting intervention instructional sessions and probe sessions was 94.75%, indicating good procedural reliability. Overall, probe sessions were delivered with 97.79% procedural fidelity. Overall, instructional sessions were delivered with 85.72% procedural fidelity. The following table provides information related to specific peer mediator reliability:

Table 18

Peer mediator procedural reliability data

<u>Peer Mediator</u>	<u>Overall Procedural Reliability</u>	<u>Probe Session Reliability</u>	<u>Instructional Session Reliability</u>
Janie	94.19%	97.01%	86.20%
Carol	93.85%	98.43%	80.77%
Emily	94.22%	96.17%	88.02%

Researcher procedural reliability calculations indicate that each peer mediator across simultaneous prompting intervention sessions and probe sessions were able to maintain greater than 80% procedural fidelity. Peer mediator errors most typically occurred in the consequence either delivering a consequence in probe sessions when none is mandated or failing to provide a consequence in instructional sessions when a consequence is required. Though peer mediators reliably delivered instructional sessions, another common error was in forgetting to deliver the controlling prompt as a discriminative stimulus.

In order to further validate independent variable reliability findings, a point-by-point agreement method was utilized using the researcher and the research assistant completed session data sheets for independent variable indicators. Findings show that the researcher and research assistant agreed on 93.82% of recorded measures for appropriate execution of procedures (e.g., use of attention cue, task direction, discriminative stimulus, response interval, and consequences). When considering only instructional sessions procedural fidelity, researcher and research assistant agreed on 88.34% of independent variable indicators.

Social Validity

Following the completion of data collection, social validity surveys were distributed to peer mediators ($n = 3$) and all of the study participants' teachers ($n = 4$). Quantitative data in the form of responses to 5 point Likert scale items were obtained for analysis. Mean values and standard deviations for each scale item by teacher and peer mediator respondent groups and indications of any negative reviews are reported.

Table 19 and Table 20 illustrates the results of the social validity scales:

Table 19

Teacher social validity data (1 = Strongly Disagree to 5 = Strongly Agree)

<u>Social Validity Item</u>	<u>Mean</u>	<u>Range</u>	<u>Standard Deviation</u>
1. I think teaching social skills to students with disabilities is important.	5	5-5	0
2. I think simultaneous prompting is an effective instructional strategy.	3.75	3-4	.5
3. The intervention used in this study was effective.	3.75	3-4	.5
4. I believe using peer mediators with disabilities in intervention is meaningful.	4.75	4-5	.5
5. The intervention used in this study was practical and cost effective.	4.5	4-5	.58
6. The intervention used in this study is worth replicating with other activities and/or other students.	4.75	4-5	.5
7. The intervention improved target behaviors.	4.33	4-5	.58
8. The intervention used in this study should be used in the future.	5	5-5	0

Four out of six teachers completed the teacher social validity scale for a 66% return rate. All teachers indicated that they strongly agreed that it is important to teach ($M = 5$) and target social skills for students with disabilities and that they agreed that the intervention was practical and cost effective ($M = 4.5$). Teacher responses that indicated the lowest ratings included simultaneous prompting being an effective instructional strategy ($M = 3.75$) and simultaneous prompting used in this study was effective ($M = 3.75$). One teacher provided additional comments stating, “I believe that this has been very good for my student. These sessions have boosted her self-confidence and given her a sense of pride.”

Table 20

Peer mediator social validity data (1 = Strongly Disagree to 5 = Strongly Agree)

<u>Social Validity Item</u>	<u>Mean</u>	<u>Range</u>	<u>Standard Deviation</u>
1. Knowing how to respond to others is important	4.67	4-5	.58
2. Teaching people how to respond to others is important	5	5-5	0
3. Teaching people the way we did it was easy	5	5-5	0
4. I understand the way we were teaching	5	5-5	0
5. I believe what we taught helped	5	5-5	0
6. The student I taught learned something new	4.67	4-5	.58
7. I like teaching students something new	4.67	4-5	.58

All peer mediators completed the peer mediator social validity scale for a 100% return rate. Peer mediators indicated that they strongly agreed teaching people using the simultaneous prompting procedures “was easy” ($M = 5$) and that they understood the way they were teaching ($M = 5$). Peer mediators agreed or strongly agreed with all social validity items. Peer mediators provided the following additional comments: (a) “Thank you for a good time. Goals have been achieved;” (b) “I loved teaching students because it helps me practice to try on other new people. I feel I can help other students, too;” (c) “It was a great opportunity to help with [the researcher’s] degree. I like helping other people, not just myself.”

CHAPTER 4

DISCUSSION

Based on the needs mentioned in the literature and those unique to adults with DS-ASD, the present study was designed to examine the effectiveness of a peer mediated intervention using simultaneous prompting for teaching individuals with DS-ASD social skills. The general purpose of this project was supplemented by the following research questions: (1) How common are social skills interventions in the students' histories, and what is the average age of ASD diagnosis or reported concerns related to ASD for students in the study?, (2) Will the intervention be effective in increasing multiple targeted social skills for each participant?, (3) Will the intervention be effective in increasing at least one targeted social skill across three participants, (4) Are students able to generalize skills learned to different settings and peers, and are students able to maintain targeted social skills for at least one week following the end of the intervention?, (5) Are peers with DS able to reliably deliver (i.e., >80% procedural fidelity) simultaneous prompting procedures, and are the dependent variables reliably recorded (i.e., an inter-observer agreement > 80%)?, (6) What are teachers' perceptions of the importance of social skills targeted in the school and community, of the intervention practicality and cost effectiveness, and do peer-mediators believe that simultaneous prompting is easy to implement?

Age of ASD diagnosis, or initial concerns related to the presence of ASD symptoms, for this study's participants with DS-ASD closely match previous research findings suggesting much later diagnosis (i.e., age 14-15 years old) than is typical for the wider population (Rasmussen et al., 2001). The average age of ASD identification of 16 years old in the present sample corresponds well with prior findings. Furthermore, parent

reports and student records suggest no previous social skills instruction formally provided to the student participants despite all participants being adults. Parents noted, however, that social skills were an area that family often focused on improving through repeated practice of certain skills as well as trying to provide social opportunities for their children to practice skills.

Procedural reliability, interobserver agreement, efficiency data, and effectiveness data indicate that the procedures and the instructors were successful in teaching three different, yet functionally equivalent social skills to adults with DS and comorbid ASD. Experimental control was strengthened by the replication of the independent variable (i.e., simultaneous prompting) across task directives and participants. These findings extend the evidence for the use of simultaneous prompting procedures in teaching various adaptive and daily living skills to individuals with developmental disabilities (Dollar, Fredrick, Alberto, & Luke, 2012; Fetko, Schuster, Harley, & Collins, 1999; Morse & Schuster, 2004). In addition, the researcher believes this is the first study that has taught individuals with developmental disabilities, and more specifically individuals with a diagnosis of DS, to deliver simultaneous prompting instruction with fidelity. Most other studies have used either teachers or researchers as primary trainers using simultaneous prompting (Morse & Schuster, 2004). In order for individuals with developmental disabilities to continue lifelong learning and become more independent, they will need to learn various skills from many different instructors and learning theory suggests peer observation and modeling can be particularly effective.

Integration of the information gathered across all phases is used to determine if at least three demonstrations of effect at different points in time and a predictable pattern of

effect can be concluded to indicate a functional relation across behaviors for each of the three student participants. Visual analysis of graphs supports these findings; however, there are interesting observations to be made regarding the success of the intervention. Despite several positive results, there are concerns that might impact the conclusion of a functional relation between independent and dependent variables. Results indicate that for some participants, and even certain behaviors, there appears to be a “delayed change in level and trend.” For at least one social skill task for each participant, peer mediators administered at least six sessions before the student participant met criterion for the first time. There is a possible consideration for this phenomenon. Could the results be influenced by peer mediators continuing to learn and adapt to delivering the procedures for simultaneous prompting? Further research with individuals with DS-ASD learning from individuals with DS or an ID could more closely look at the impact of peer mediator errors in teaching these skills. Findings from this study suggest that overall each of the peer mediators were able to reliably deliver simultaneous prompting instructional sessions (i.e., reliability >80 percent). However, some research suggests that particular errors in instruction and delivery can affect student learning and efficiency (Holcombe, Wolery, and Snyder, 1994).

Statistical analysis findings helped supplement visual analysis, and lead to further discussion of the intervention findings. Statistical findings further support a medium intervention effect for Matt and Adam; however, intervention produced only a small effect for Jill. Statistical analyses indicate that the intervention’s effect on Jill’s final task (i.e., congratulating) had a low Tau-U value (i.e., 0.2656) compared to phase contrasts of Task 1 (0.8516) and 2 (0.7619), which both fell in the medium effect range. Jill’s visual

analysis and statistical data suggest carry-over effects from task two to her final social skills task to learn (i.e., congratulating). These carry-over effects can likely be explained by understanding that “hand clapping” was the key motivator for Jill throughout the intervention, but is also a step of the final “congratulating” social skills task. Furthermore, these same carry-over effects likely influenced the Task 3 Tau-U value as well considering the statistic is a measure of overlap.

Previous research had not yet explored the specific use of simultaneous prompting procedures delivered by peers with DS. Previous research confirmed that typically developing peers have been able to deliver simultaneous prompting procedures to effectively and efficiently teach individuals with ID (Tekin-Iftar, 2003). Our findings build off of previous peer-led interventions demonstrating that peers with DS can also reliably deliver simultaneous prompting instruction. Findings and researcher observations suggest that there should be certain requirements for peer mediators with DS to reliably deliver the intervention. Requirements likely include a greater amount of time in initial training for each skill, and individual refresher trainings before providing simultaneous prompting for a new social skill task. Training and sessions should incorporate visual schedules and cues to facilitate learning. In addition, the presence of a person trained in direct instruction during sessions is likely a need to provide booster sessions for the peer mediators before service delivery and feedback during and immediately after sessions. Future research should collect the number of booster sessions and type and frequency of feedback required, which was estimated to occur to a greater or lesser degree before each instructional session across peer

mediators. Despite booster sessions multiple times a day and visual supports always being available, peer mediators still committed many procedural errors, particularly during instructional sessions when the student participant was learning new skills. Future research should explore the amount of independence the peer mediator can have to reliably deliver the intervention and the amount of booster sessions, feedback sessions, and in session support the peer mediators require to be successful.

Furthermore, future research should consider more careful and detailed analysis of student participant error data. It is hypothesized that student participant non-response errors were at a higher frequency while teaching the first social skill task for each student participant, and that errors in response were more common in later instructional and post-instruction maintenance sessions. Student participants seemed to show difficulties at times distinguishing and executing the correct steps once multiple tasks had been taught. For example, once Adam was successfully taught to respond “you’re welcome” to “thank you,” all expectations of saying “thank you” across social skills in the final maintenance sessions were answered with “you’re welcome.”

In addition, there are concerns with high variability in the intervention conditions of the study. At times, sessions were skipped due to availability of the student participants and peer mediators. In addition, two peer mediators were unavailable for a full week at one point, resulting in one peer delivering all sessions to all students. Changing peer mediators for some student participants likely caused more variability, but arguably improved generalization of skills to some extent. Changes in peer mediators might be a source of high variability in the data. In addition, student participants

typically were involved in three sessions per day with many sessions occurring early in the morning (e.g., 8:30am). Anecdotal observation suggests that morning sessions were associated with increased variability in the data due to student participants' and peer mediators' lower energy or willingness to participate or the impact of maintenance of skills overnight.

Published studies of social skills interventions for adults with ID and/or with ASD show that when appropriate techniques are integrated into a study's interventions (e.g., varying peers and settings, fading reinforcement, modeling) the probability of both generalization and maintenance are improved (Krasney, Williams, Provencal, & Ozonoff, 2003; O'Reilly et al., 2004). One of the natural limitations of all single-subject research is generalizing results to different individuals and settings. This limitation is further supported by this study's findings. Students were not able to consistently show generalization of learned social skills to new settings or new peer mediators, although findings indicated that generalization data consistently exceeded baseline scores. Continued practice in new settings and with new people would be required to improve these generalization scores. In addition, puzzles were the only materials used for the intervention, and future research should include other materials to facilitate generalization (e.g., different games or potentially food). Interestingly, Adam, who notably had the most consistency having the same peer mediator for instruction and probe sessions throughout the intervention, showed the best efficiency results; however, he arguably had the poorest long-term maintenance and generalization session data. Though Adam learned the skills with the best efficiency, he did ultimately have the fewest total number of instructional sessions and, thus, opportunities to practice each skill.

The current study reveals that the intervention was effective for the three student participants; however, maintenance data was not favorable in supporting long-term maintenance of skills. It is suspected that had the current research methodology required continued intervention until the instructional phases showed stability in the instruction phase, both intervention effectiveness measures (e.g., Tau-U) would have improved as well as long-term maintenance data. Single-subject guidelines suggest that interventionists should teach skills until there is stability in the final 3-5 data points of the instructional phase before moving on for purposes of long-term maintenance (Gast & Spriggs, 2010). Future research should certainly follow this guideline. Also of note, Jill's data "carry-over" effects suggest future research may consider teaching the "congratulating" social skill task first to avoid these effects.

Future researchers should consider extending simultaneous prompting and peer-led intervention evidence-base by including multiple types of instructors with and without disabilities. Though there is strong evidence for the use of simultaneous prompting procedures for individuals with intellectual or developmental disabilities when teachers or researchers are providing instruction, more research is needed particularly for determining whether individuals with disabilities can deliver instruction with fidelity. Furthermore, future research should continue to explore the evidence-base for interventions effective in teaching adults with disabilities, and, specifically, those with a dual diagnosis of DS and ASD.

Study Significance

Findings of this study provide important information regarding the effectiveness of peer-mediated direct instruction using simultaneous prompting procedures to teach social skills to individuals with DS-ASD. Results obtained inform professionals' practices regarding promising intervention strategies for the DS-ASD population, particularly adults with DS-ASD. These findings also provide implications for professionals regarding the possibility of individuals with DS serving as models and peer-mediators in the classroom using direct instruction procedures. Findings also guide future research regarding effective strategies for teaching individuals with DS-ASD. Previous evidence suggests that no studies of interventions with individuals DS-ASD have the methodological rigor to be considered an evidence-based or promising intervention, and ASD-specific interventions for individuals with genetic syndromes are not well established (Moss & Howlin, 2009). There is little guidance for practitioners regarding treatment planning for individuals with DS-ASD at this time. This study meets the methodological rigor required for evidence-based interventions, though more studies matching the purposes, goals, and design of this study must follow in order to generalize findings. In addition, social validity data further highlights the value and effectiveness of simultaneous prompting as a procedure that can be implemented by and for individuals with developmental disabilities. As expected teachers rated the intervention as important, practical, and cost-effective. In addition, peer mediator completed social validity surveys further support that simultaneous prompting is an effective and easy to implement evidence-based instructional procedure (Head, Collins, Schuster, and Ault, 2011). Further social validity data suggests that peer mediators benefited from participation.

Teachers suggested that “self-confidence” improved and that the individuals felt proud of their work. Peer mediators also felt they met their goals and enjoyed teaching and helping.

Limitations

Beyond the limitations already noted, the researcher is aware of single-subject designs typically having poor external validity without replication of studies across different researchers, several different participants, and in different geographical areas. It was the intention of the researcher to provide as much detail as possible regarding participant characteristics, intervention procedures, and experimental design in order for other researchers to replicate findings. In addition, the use of a multiple probe design has inherent limitations (e.g., a greater likelihood for behavioral co-variation) though this was only observed minimally. Also, a multiple probe design is considered “weaker,” as compared to an A-B-A-B design, for concluding a cause and effect relationship. This consideration is due in part to the multiple probe design’s inability to allow intra-subject replication. Future research should likely incorporate a combined design that allows identifying a functional relation across both behaviors and participants. Finally, researcher bias is a concern considering personal expectations of the researcher regarding the results of the study, though reliability data suggests that this is not a significant concern.

Appendix B

Initial Letter Invitation to Administrators

To School Administrator:

My name is Cody Davis and I am a doctoral candidate in the school psychology program at the University of Kentucky. I am currently working on my dissertation research project under the supervision of my doctoral chair, Dr. Jonathan M. Campbell. I want to share a research opportunity for students in your school. I am hoping that you would be willing to contact select legally authorized representatives of students in your school with diagnoses of Down syndrome and those with a dual diagnosis of Down syndrome and autism spectrum disorder. In addition, with legally authorized representatives' consents to participate, I am hoping to conduct a peer-mediated social skills intervention involving the students of interest previously mentioned at your school. I would be happy to meet in person or over the phone to discuss the specifics of the intervention and any questions you may have

I realize you are busy and therefore appreciate you taking the time to consider these requests. Please take a moment to respond to this letter by indicating whether you would like to speak further regarding this opportunity, whether you are willing to allow me to contact legally authorized representatives, and whether I will be able to conduct the intervention at your school.

Thank you for your consideration,

Cody Davis, M.S.

Doctoral Candidate

Department of Educational, School, and Counseling Psychology

University of Kentucky

Appendix C

Recruitment Email to Legally Authorized Representative

Dear Stewart Home School Parent and/or Guardian:

My name is Cody Davis and I am a doctoral candidate in the school psychology program at the University of Kentucky. I am currently working on my dissertation research project under the supervision of my doctoral chair, Dr. Jonathan M. Campbell. I want to share a research participation opportunity for you and your SHS student. I am hoping you are willing to participate in a study that is exploring the effect of peer-mediated social skills training delivered by individuals with a diagnosis of Down syndrome to individuals with a dual diagnosis of Down syndrome and autism spectrum disorder. If you are interested, please contact me via email (matthewcody.davis@uky.edu) or over the phone (502-352-0575) to discuss the specifics of the intervention and any questions you may have.

In order for your SHS student to participate, the student's legally authorized representative will need to sign an informed consent form. A brochure describing what a legally authorized representative is can be accessed at this website:

<http://www.research.uky.edu/ori/ORIForms/88-Form-T-NonMED-brochure.pdf>. If you are interested, I will mail you an informed consent form for you to read, sign, and mail back to Stewart Home School. If you, at any time, have a question regarding the informed consent form please do not hesitate to contact me.

Thank you for your consideration,

Cody Davis, M.S.

Doctoral Candidate

Department of Educational, School, and Counseling Psychology

University of Kentucky

One Week Follow-Up Script

Hello Mr./Mrs _____:

My name is Cody Davis and I am a doctoral candidate in the school psychology program at the University of Kentucky. You contacted me via (email or phone) expressing your interest in participating in my study that is exploring the effect of peer-mediated social skills training delivered by individuals with a diagnosis of Down syndrome to individuals with a dual diagnosis of Down syndrome and autism spectrum disorder. I sent you an informed consent form for you to read, sign, and mail back to Stewart Home School using the pre-paid envelope I enclosed. I want to check to ensure you received the form, and I want to ask whether you have any questions regarding the form.

.... (Answer questions)

If you are still interested and fully understand your and your student's involvement in the study, please complete the form at the earliest convenience.

Thank you for your time and I look forward to beginning the study with you and your student.

Bye

Appendix D

Consent to Participate in a Research Study

Teaching Social Skills to Individuals with Comorbid Down syndrome and Autism Spectrum Disorder: A Single-Subject Design Study

WHY ARE YOU BEING INVITED TO TAKE PART IN THIS RESEARCH?

You are the teacher of a student being invited to take part in a research study about the impact of a peer-mediated social skills intervention provided by individuals with Down syndrome to individuals with a dual diagnosis of Down syndrome and autism spectrum disorder. Your student is being invited to take part in this research study because he or she is a student at Stewart Home School who meets the diagnosis or diagnoses required for the study. If you volunteer to take part in this study, you will be one of 32 people (i.e., 8 Stewart Home School students, 8 legally authorized representatives and/or on-campus caregivers, and 8 teachers) to do so.

WHO IS DOING THE STUDY?

The person in charge of this study is Cody Davis, a student in the University of Kentucky Department of Educational, School, and Counseling Psychology. He is being guided in this research by Dr. Jonathan Campbell. There may be other people on the research team assisting at different times during the study.

WHAT IS THE PURPOSE OF THIS STUDY?

By doing this study, we hope to learn more about individuals with Down syndrome with and without autism spectrum disorder, as well as intervention strategies that may be effective in improving social skills.

ARE THERE REASONS WHY YOU SHOULD NOT TAKE PART IN THIS STUDY?

Teacher participants should not take part in this study if they cannot dedicate approximately 5 non-consecutive total hours completing forms regarding your student over the course of the study.

WHERE IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?

The research procedures will be conducted at Stewart Home School. You will be asked to fill out various forms regarding your student's adaptive and social skills. It is estimated that completing all forms will take approximately 2 hours, but no longer than 5 hours.

WHAT WILL YOU BE ASKED TO DO?

You will be asked to complete a social skills and other assessment scales for your student at the beginning of the study and social validity scale at the end of the study.

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?

To the best of our knowledge, the things you will be doing have no more risk of harm than you would experience in everyday life.

WILL YOU BENEFIT FROM TAKING PART IN THIS STUDY?

There is no guarantee that your student will get any benefit from taking part in this study, but we think taking part will result in better social skills for a student participant or skills for teaching social skills as a peer mediator. Your willingness to take part may, in the future, help society as a whole better understand how to improve social skills of individuals with DS-ASD.

DO YOU HAVE TO TAKE PART IN THE STUDY?

If you decide to take part in the study, it should be because you really want to volunteer. You will not lose any benefits or rights you would normally have if you choose not to volunteer. You can stop at any time during the study and still keep the benefits and rights you had before volunteering. If you decide not to take part in this study, your decision will have no effect on the quality of care or services you receive.

IF YOU DON'T WANT TO TAKE PART IN THE STUDY, ARE THERE OTHER CHOICES?

If you do not want to be in the study, there are no other choices except not to take part in the study.

WHAT WILL IT COST YOU TO PARTICIPATE?

There are no costs associated with taking part in the study.

WILL YOU RECEIVE ANY REWARDS FOR TAKING PART IN THIS STUDY?

You will not receive any rewards or payment for taking part in the study.

WHO WILL SEE THE INFORMATION THAT YOU GIVE?

We will make every effort to keep confidential all research records that identify you and your student to the extent allowed by law. We may be required to show information which identifies you to people who need to be sure we have done the research correctly; these would be people from such organizations as the University of Kentucky.

Your student's information will be combined with information from other people taking part in the study. When we write about the study to share it with other researchers, we will write about the combined information we have gathered. Your student will not be personally identified in these written materials. We may publish the results of this study; however, we will keep names and other identifying information private.

We will make every effort to prevent anyone who is not on the research team from knowing that you gave us information, or what that information is. All data will be kept on a personal password protected computer or external hard drive, with reported identifiable data (e.g., participant names) stored separately from other data in an encrypted password protected file. Paper records will be kept in a locked filing cabinet and destroyed once data is transferred to the computer database.

CAN YOUR TAKING PART IN THE STUDY END EARLY?

The individuals conducting the study may need to withdraw you from the study. This may occur if you are not completing the scales indicated. If at any time you wish to withdrawal from the study, you can request your withdrawal.

WHAT ELSE DO YOU NEED TO KNOW?

There is a possibility that the data collected from you may be shared with other investigators in the future. If that is the case the data will not contain information that can identify you unless you give your consent or the UK Institutional Review Board (IRB) approves the research. The IRB is a committee that reviews ethical issues, according to federal, state and local regulations on research with human subjects, to make sure the study complies with these before approval of a research study is issued.

WHAT IF YOU HAVE QUESTIONS, SUGGESTIONS, CONCERNS, OR COMPLAINTS?

Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions, suggestions, concerns, or complaints about the study, you can contact the investigator, Cody Davis, at matthewcody.davis@uky.edu or the faculty advisor, Dr. Jonathan Campbell, at jmca244@uky.edu. If you have any questions about your rights as a volunteer in this research, contact the staff in the Office of Research Integrity at the University of Kentucky between the

business hours of 8am and 5pm EST, Mon-Fri. at 859-257-9428 or toll free at 1-866-400-9428.
We will give you a signed copy of this consent form to take with you.

Signature of person agreeing to take part in the study

Date

Printed name of person agreeing to take part in the study

Name of (authorized) person obtaining informed consent

Date

Assent Form to Participate in Research Study

Teaching Social Skills to Individuals with Comorbid Down syndrome and Autism Spectrum Disorder: A Single-Subject Design Study

Hi! My name is Cody. We're going to do some activities together and learn some new things like how to play games or have more fun with people. We're going to be together for a little while almost every day. Your family knows that you are with me. If something makes you feel bad while you are with me, please let me know.

What questions do you have?

If you want to do some activities with me, please write your name here. No one will be mad if you do not want to do these activities.

Your Name

Date

Name of [Authorized] Person Obtaining Informed Assent

Date

Appendix E

Puzzles used as multiple exemplars during social skills instruction



Appendix F

Reinforcement fidget toy used for Jill



Appendix G

Fidelity checklist for training

Social Skill _____ Peer Mediator(s) _____

1. Explanation of the baseline and instructional procedure is provided Y N

2. Show peer-mediator the task analysis Y N

2. Examples and non-examples given Y N

3. Role-playing session Y N

4. Advice for handling challenges given Y N

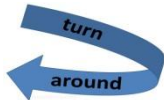
Appendix H

Instructional Session Visual Schedule/Outline for Peer Mediators

Requesting More

You say: “TIME TO PRACTICE ASKING FOR MORE.”

1. Teach to turn towards me



CONGRATULATE!!

2. Teach him/her to ask for more



CONGRATULATE!!

3. Teach him/her to take item



CONGRATULATE!!

4. Says thank you or signs thank you



CONGRATULATE!!

5. Teach him/her to use item




CONGRATULATE!!

Respond When Invited to Join Activity



You say: "You want to play?"

1. Turn towards me 



CONGRATULATE!!

2. Come to me 



CONGRATULATE!!

3. Says or signs YES or NO  

CONGRATULATE!!

4. Sign or say thank you  

CONGRATULATE!!

5. Play with me (if said yes) or go back to seat (if said no)  or 

CONGRATULATE!!

Offer Assistance When Someone Needs Help

You say: "I need help."

1. Teach to ask if I'm okay



CONGRATULATE!!

2. Teach to wait for 5 seconds

CONGRATULATE!!

You say: "I need that"

3. Teach him to give it to you



CONGRATULATE!!

4. Teach to say or sign "you're welcome"



CONGRATULATE!!

5. Teach turn to his activity



CONGRATULATE!!

Congratulate Others on a Good Job

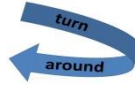
You say: "I DID IT!"

1. Teach her to stop the activity



CONGRATULATE!!

2. Teach to turn towards me



CONGRATULATE!!

3. Teach Jenny to clap for Angela



CONGRATULATE!!

4. Teach Jenny to wait for Angela to say thank you (5 sec). **You say: "THANK YOU"**

CONGRATULATE!!

5. Teach her to say you're welcome or signs you're welcome



CONGRATULATE!!

Appendix I

Data collection sheets used for student responses, procedure fidelity, and IOA recordings.

Name: _____ Skill: Requesting More

Date: _____ Instructor: _____ Setting: _____ Time: _____

Materials Ready: _____ Attentional Cue: _____ Task Direction: _____

<i>Steps</i>	<i>Sd</i>	<i>Response Interval (10s)</i>	<i>Probe Trial (Student Response)</i>	<i>Consequence (None)</i>	<i>Sd</i>	<i>Instructional Trial (Student Response)</i>	<i>Consequence (e.g., Praise)</i>
1. Turns towards me							
2. Asks for more							
3. Takes item							
4. Says thank you or signs thank you							
5. Uses item							
Number/% correct							
Number/% incorrect							

Key: Check (✓) indicates correct; (X) sign indicates incorrect or no response.

Name: _____ Skill: Respond When Invited to Join Activity

Date: _____ Instructor: _____ Setting: _____ Time: _____

Materials Ready: _____ Attentional Cue: _____ Task Direction: _____

<i>Steps</i>	<i>Sd</i>	<i>Response Interval (10s)</i>	<i>Probe Trial (Student Response)</i>	<i>Consequence (None)</i>	<i>Sd</i>	<i>Instructional Trial (Student Response)</i>	<i>Consequence (e.g., Praise)</i>
1. Turns towards me							
2. Comes to me							
3. Responds to invitation like saying "yes" or "no" or shaking head							
4. Says thank you or signs thank you							
5. Joins you (said yes) or goes back to seat (said no)							
Number/% correct							
Number/% incorrect							

Key: Check (√) indicates correct; (X) sign indicates incorrect or no response.

Name: _____ Skill: Offer Assistance When Someone Needs Help

Date: _____ Instructor: _____ Setting: _____ Time: _____

Materials Ready: _____ Attentional Cue: _____ Task Direction: _____

<i>Steps</i>	<i>Sd</i>	<i>Response Interval (10s)</i>	<i>Probe Trial (Student Response)</i>	<i>Consequence (None)</i>	<i>Sd</i>	<i>Instructional Trial (Student Response)</i>	<i>Consequence (e.g., Praise)</i>
1. Ask if I'm okay							
2. Waits for me to say thank you (5 seconds)							
3. Provide help							
4. Responds "you're welcome" to "thank you"							
5. Returns to previous activity							
Number/% correct							
Number/% incorrect							

Key: Check (√) indicates correct; (X) sign indicates incorrect or no response.

Name: _____ Skill: Congratulate Others on a Good Job

Date: _____ Instructor: _____ Setting: _____ Time: _____

Materials Ready: _____ Attentional Cue: _____ Task Direction: _____

<i>Steps</i>	<i>Sd</i>	<i>Response Interval (10s)</i>	<i>Probe Trial (Student Response)</i>	<i>Consequence (None)</i>	<i>Sd</i>	<i>Instructional Trial (Student Response)</i>	<i>Consequence (e.g., Praise)</i>
1. Stops Activity							
2. Turns towards me							
3. Congratulates!							
4. Waits for me to say thank you (5s)							
5. Says "you're welcome" or signs "you're welcome"							
Number/% correct							
Number/% incorrect							

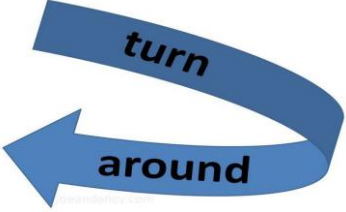
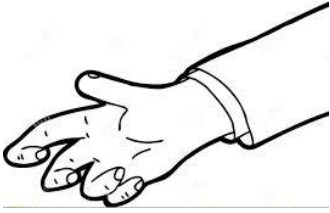



Key: Check (√) indicates correct; (X) sign indicates incorrect or no response.

Appendix J

Peer Mediator visual schedules and collection sheets used for probe sessions.

Name: _____ Skill: Requesting More

Date: _____ Time: _____ Peer-mediator: _____ Setting: _____

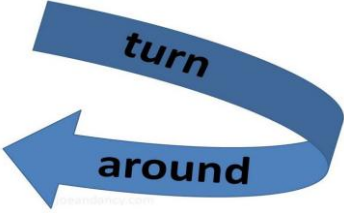




	Step	Circle Yes or No	
	1. Turns towards me.	YES	NO
	2. Asks for more.	YES	NO
	3. Takes item.	YES	NO
	4. Says thank you or signs thank you.	YES	NO
	5. Uses item.	YES	NO

Name: _____

Skill: Respond When Invited to Join Activity

Date: _____ Time: _____ Peer-mediator: _____

Setting: _____






	Step	Circle Yes or No	
	1. Turns towards me.	YES	NO
	2. Comes to me.	YES	NO
	3. Responds to invitation like saying "yes" or "no" or shaking head.	YES	NO
	4. Says thank you or signs thank you.	YES	NO
	5. Joins you (said yes) or goes back to seat (said no).	YES	NO

Name: _____

Skill: Offer Assistance When Someone Needs Help

Date: _____ Time: _____ Peer-mediator: _____

Setting: _____


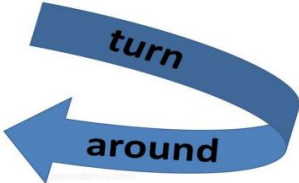



	Step	Circle Yes or No
	1. Ask if I'm okay.	<p style="text-align: center;">YES NO</p>
	2. Waits for me to say thank you (5 seconds).	<p style="text-align: center;">YES NO</p>
	3. Provide help.	<p style="text-align: center;">YES NO</p>
	4. Respond "you're welcome" to "thank you"	<p style="text-align: center;">YES NO</p>
	5. Return to previous activity.	<p style="text-align: center;">YES NO</p>

Name: _____

Skill: Congratulate Others on a Good Job

Date: _____ Time: _____ Peer-mediator: _____

Setting: _____

	Step	Circle Yes or No
	1. Stops activity.	YES NO
	2. Turns towards me.	YES NO
	3. Congratulates!	YES NO
	4. Waits for me to say thank you (5 seconds)	YES NO
	5. Says you're welcome or signs you're welcome.	YES NO

Appendix K

Peer Mediator Social Validity Questionnaire

Name _____ Date _____

Please circle your response based on the following scale:

- 1- strongly disagree**
- 2- disagree**
- 3- neither agree nor disagree**
- 4- agree**
- 5- strongly agree**

1. Knowing how to respond to others is important.

1 2 3 4 5

2. Teaching people how to respond to others is important.

1 2 3 4 5

3. Teaching people the way we did it was easy.

1 2 3 4 5

4. I understand the way we were teaching.

1 2 3 4 5

5. I believe that what we taught helped.

1 2 3 4 5

6. The student I taught learned something new.

1 2 3 4 5

7. I like teaching students something new.

1 2 3 4 5

8. Please list any other comments/feedback you would like to share about your participation in this study: _____

Appendix L

Professional Teacher Questionnaire

Please circle your response based on the following scale:

1- strongly disagree

2- disagree

3- neither agree nor disagree

4- agree

5- strongly agree

1. I think teaching social skills to students with disabilities is important.

1 2 3 4 5

2. I think simultaneous prompting is an effective instructional strategy.

1 2 3 4 5

3. The intervention used in this study was effective.

1 2 3 4 5

4. I believe using peer mediators with disabilities in interventions is meaningful.

1 2 3 4 5

5. The intervention used in this study was practical and cost effective.

1 2 3 4 5

6. The intervention used in this study is worth replicating with other activities and/or other students.

1 2 3 4 5

7. The intervention improved target behaviors.

1 2 3 4 5

8. The intervention used in this study should be used in the future.

1 2 3 4 5

Please list any other comments/feedback you would like to share about your involvement, perceptions, etc. with this study on the back

Appendix M

Instructional Procedures

Respond When Invited to Join Activity

Behavioral Objective

When invited by the peer mediator, Student will perform the steps of the task analysis for responding to an invitation with 100% accuracy for 3 probe trials. The task analysis will consist of the following steps:

1. Turns towards me
2. Move to area being invited
3. Respond to invitation (e.g., “yes” or “no”)
4. Indicates thank you verbally or non-verbally
5. Join in with activity or go back to previous area

Instructional Context

Three times a day (Monday-Friday), Student’s peer mediator will work with him/her to systematically teach responding to an invitation.

Instructional Materials

The peer mediator will need an activity or materials that the student enjoys to start the session as well as reinforcement materials, if applicable.

Instructional Procedures

Each instructional trial will proceed as follows.

Attentional Cue: The peer mediator will give the general attention cue of stating Student’s name to get attention before the trial starts.

Natural Occurring Event: When teaching social skills, a task direction is often not warranted. For example, in this case teaching responding to an invitation allows the peer mediator’s interaction with the student to be a natural occurring event providing direction.

Simultaneous Prompting Procedures: The peer mediator will deliver the task direction, or in this case discriminative stimulus (e.g., “Do you want to play with me?”), first as a probe session. The peer mediator will say, “What’s next?” as necessary, and wait 10 seconds for Student to initiate each step of the task

analysis. If Student fails to initiate a step, the peer mediator will end the trial.

One instructional session using a 0-second time delay interval will occur immediately following the probe session. During this instructional session, the peer mediator immediately will use a controlling prompt to assist Student in performing the correct response.

Consequence: During probe sessions, the peer mediator will not give any feedback on performance. During the instructional sessions, the peer mediator will give the selected reinforcement (e.g., descriptive praise).

Non-targeted Information

The peer mediators' names will be used in the consequent stages of the instructional session with verbal, descriptive praise ("Carol is so proud of you!").

Data Collection

The peer mediator will collect data during the probe sessions that occur once a day. On the data sheet, the peer mediator will circle YES for a correct response or a NO for incorrect response. The researcher will also collect data during probe and instructional sessions to be used for Student participant progress monitoring, procedural reliability, and IOA.

Maintenance

Once Student has met the criterion of 100% correct responses for 1 probe trial, reinforcement will be thinned to the end of the successfully completed task (fixed ratio of 5, or FR5). Student response to an invitation skill will continue to be monitored for the remainder of the sessions following the successful completion of each social skill and in a final maintenance probe one week following the final generalization probe.

Generalization

The peer mediators will facilitate generalization by having Students perform sessions in different settings and with different materials. Once Student has mastered all social skill tasks, a probe session in his/her residence hall and another probe session with a different peer mediator will be conducted.

Behavior Management

The peer mediator and researcher will periodically praise Student for how hard he/she is working (e.g., "You are really working hard. Your correspondent will be so proud!")

Congratulate Others on a Good Job

Behavioral Objective

When hearing the peer mediator say he/she did a good job, Student will perform the steps of the task analysis for responding to the comment with 100% accuracy for 3 probe trials. The task analysis will consist of the following steps:

1. Stops activity
2. Turns towards me
3. Indicates a non-verbal (“claps hands”) congratulations
4. Waits approximately 5 seconds for my response (e.g., thank you)
5. Returns to activity

Instructional Context

Three times a day (Monday-Friday), Student’s peer mediator will work with him/her to systematically teach congratulating others on a good job.

Instructional Materials

The peer mediator will need two activities or sets of materials that the student enjoys to start the session as well as reinforcement materials, if applicable.

Instructional Procedures

Each instructional trial will proceed as follows.

Attentional Cue: The peer mediator will give the general attention cue of stating Student’s name to get attention before the trial starts.

Natural Occurring Event: When teaching social skills, a task direction is often not warranted. For example, in this case, teaching how to congratulate others allows the peer mediator’s interaction with the student to be a natural occurring event providing direction.

Simultaneous Prompting Procedure: The peer mediator will deliver the task direction, or in this case discriminative stimulus (e.g., “I did it!” or “I did a good job!”) first as a probe session. The peer mediator will say, “What’s next?” and appropriate statements (e.g., “thank you”) as necessary and wait 10 seconds for Student to initiate each step of the task analysis. If Student fails to initiate a step, the peer mediator will end the trial.

One instructional session using a 0-second time delay interval will occur

immediately following the probe. During this instructional session, the peer mediator immediately will use a controlling prompt to assist Student in performing the correct response.

Consequence: During probe sessions, the peer mediator will not give any feedback on performance. During the instructional sessions, the peer mediator will give the selected reinforcement (e.g., descriptive praise).

Non-targeted Information

The peer mediators' names will be used in the consequent stages of the instructional session with verbal, descriptive praise ("Carol is so proud of you!").

Data Collection

The peer mediator will collect data during the probe sessions that occur once a day. On the data sheet, the peer mediator will circle YES for a correct response or a NO for incorrect response. The researcher will also collect data during probe and instructional sessions to be used for Student participant progress monitoring, procedural reliability, and IOA.

Maintenance

Once Student has met the criterion of 100% correct responses for 1 probe trial, reinforcement will be thinned to the end of the successfully completed task (fixed ratio of 5, or FR5). Student congratulating skills will continue to be monitored for the remainder of the sessions following the successful completion of each social skill and in a final maintenance probe one week following the final generalization probe.

Generalization

The peer mediators will facilitate generalization by having Students perform sessions in different settings and with different materials. Once Student has mastered all social skill tasks, a probe session in his/her residence hall and another probe session with a different peer mediator will be conducted.

Behavior Management

The peer mediator and researcher will periodically praise Student for how hard he/she is working (e.g., "You are really working hard. Your correspondent will be so proud!")

Requesting Something or Requesting More

Behavioral Objective

When an opportunity to request something is presented by the peer mediator, Student will perform the steps of the task analysis for responding to the comment with 100% accuracy for 3 probe trials. The task analysis will consist of the following steps:

1. Turns toward me
2. Asks for more (e.g., puzzle piece) by pointing, verbally asking, or putting hand on object.
3. Takes item from peer mediator
4. Indicates thank you verbally or non-verbally
5. Uses requested item

Instructional Context

Three times a day (Monday-Friday), Student's peer mediator will work with him/her to systematically teach how to appropriately request something.

Instructional Materials

The peer mediator will need one activity or set of materials that the student enjoys to start the session as well as reinforcement materials, if applicable.

Instructional Procedures

Each instructional trial will proceed as follows.

Attentional Cue: The peer mediator will give the general attention cue of stating Student's name to get attention before the trial starts.

Natural Occurring Event: When teaching social skills, a task direction is often not warranted. For example, in this case, teaching how to request something may allow the peer mediator's interaction with the student to be a natural occurring event providing direction.

Simultaneous Prompting Procedure: The peer mediator will deliver the task direction (i.e., "It's time to practice asking for more") first as a probe session. The peer mediator will say, "What's next?" and wait 10 seconds for Student to initiate each step of the task analysis. If Student fails to initiate a step, the peer mediator will end the trial.

One instructional session using a 0-second time delay interval will occur following the probe. During this instructional session, the peer mediator

immediately will use a controlling prompt to assist Student in performing the correct response.

Consequence: During probe sessions, the peer mediator will not give any feedback on performance. During the instructional sessions, the peer mediator will give the selected reinforcement (e.g., descriptive praise).

Non-targeted Information

The peer mediators' names will be used in the consequent stages of the instructional session with verbal, descriptive praise ("Carol is so proud of you!").

Data Collection

The peer mediator will collect data during the probe sessions that occur once a day. On the data sheet, the peer mediator will circle YES for a correct response or a NO for incorrect response. The researcher will also collect data during probe and instructional sessions to be used for Student participant progress monitoring, procedural reliability, and IOA.

Maintenance

Once Student has met the criterion of 100% correct responses for 1 probe trial, reinforcement will be thinned to the end of the successfully completed task (fixed ratio of 5, or FR5). Student requesting skills will continue to be monitored for the remainder of the sessions following the successful completion of each social skill and in a final maintenance probe one week following the final generalization probe.

Generalization

The peer mediators will facilitate generalization by having Students perform sessions in different settings and with different materials. Once Student has mastered all social skill tasks, a probe session in his/her residence hall and another probe session with a different peer mediator will be conducted.

Behavior Management

The peer mediator and researcher will periodically praise Student for how hard he/she is working (e.g., "You are really working hard. Your correspondent will be so proud!")

Offer to Assist When Someone Needs Help

Behavioral Objective

When an opportunity to assist the peer mediator is presented, Student will perform the steps of the task analysis for responding to the comment with 100% accuracy for 3 probe trials. The task analysis will consist of the following steps:

1. Asking if the peer mediator is okay
2. Waiting approximately five seconds for response
3. Provide needed assistance
4. Respond “your welcome” to “thank you”
5. Return to previous activity

Instructional Context

Three times a day (Monday-Friday), Student’s peer mediator will work with him/her to systematically teach how to offer assistance when someone needs help.

Instructional Materials

The peer mediator will need one activity or set of materials that the student enjoys to start the session as well as reinforcement materials, if applicable.

Instructional Procedures

Each instructional trial will proceed as follows.

Attentional Cue: The peer mediator will give the general attention cue of stating Student’s name to get attention before the trial starts.

Natural Occurring Event: When teaching social skills, a task direction is often not warranted. For example, in this case, teaching how to help others allows the peer mediator’s interaction with the student to be a natural occurring event providing direction.

Simultaneous Prompting Procedure: The peer mediator will deliver the task direction, or in this case discriminative stimulus (e.g., “I need help!”), first as the probe session. The peer mediator will say, “What’s next” or provide appropriate statements (e.g., “I need that”) and wait 10 seconds for Student to initiate each step of the task analysis. If Student fails to initiate a step, the peer-mediator will end the trial.

One instructional session using a 0-second time delay interval will occur

following the probe. During this instructional session, the peer mediator immediately will use a controlling prompt to assist Student in performing the correct response.

Consequence: During probe sessions, the peer mediator will not give any feedback on performance. During the instructional sessions, the peer mediator will give the selected reinforcement (e.g., descriptive praise).

Non-targeted Information

The peer mediators' names will be used in the consequent stages of the instructional session with verbal, descriptive praise ("Carol is so proud of you!").

Data Collection

The peer mediator will collect data during the probe sessions that occur once a day. On the data sheet, the peer mediator will circle YES for a correct response or a NO for incorrect response. The researcher will also collect data during probe and instructional sessions to be used for Student participant progress monitoring, procedural reliability, and IOA.

Maintenance

Once Student has met the criterion of 100% correct responses for 1 probe trial, reinforcement will be thinned to the end of the successfully completed task (fixed ratio of 5, or FR5). Student helping skills will continue to be monitored for the remainder of the sessions following the successful completion of each social skill and in a final maintenance probe one week following the final generalization probe.

Generalization

The peer mediators will facilitate generalization by having Students perform sessions in different settings and with different materials. Once Student has mastered all social skill tasks, a probe session in his/her residence hall and another probe session with a different peer mediator will be conducted.

Behavior Management

The peer mediator and researcher will periodically praise Student for how hard he/she is working (e.g., "You are really working hard. Your correspondent will be so proud!")

Appendix N

Test of Non-Targeted Information (i.e., my peers)

Point to Janie _____



Point to Carol _____



Point to Emily _____



A plus (+) indicates correct identification and a minus (-) indicates incorrect identification or no response.

Appendix O

Tau-U data for Jill

	<u>id</u>	<u>Label</u>	<u>S</u>	<u>PAIRS</u>	<u>TAU</u>	<u>TAUb</u>	<u>VARs</u>	<u>SD</u>	<u>SDtau</u>	<u>Z</u>	<u>P Value</u>	<u>CI 85%</u>	<u>CI 90%</u>
<u>Baseline trend contrasts:</u>													
	0	P1 BT1 vs P1 BT1	-4	10	-0.4	-0.5714	16.6667	4.0825	0.4082	-0.9798	0.3272	-0.988<>0.188	-1<>0.272
	1	P1 BT2 vs P1 BT2	0	10	0	0	16.6667	4.0825	0.4082	0	1	-0.588<>0.588	-0.672<>0.672
	2	P1 BT3 vs P1 BT3	-8	28	-0.2857	-0.4	65.3333	8.0829	0.2887	-0.9897	0.3223	-0.701<>0.13	-0.761<>0.189
<u>Phase contrasts:</u>													
	3	P1 BT1 vs P1 IT1	66	85	0.7765	0.8516	651.6667	25.5278	0.3003	2.5854	0.0097	0.344<>1	0.282<>1
	4	P1 BT2 vs P1 IT2	80	120	0.6667	0.7619	1200	34.641	0.2887	2.3094	0.0209	0.251<>1	0.192<>1
	5	P1 BT3 vs P1 IT3	34	128	0.2656	0.3178	1066.6667	32.6599	0.2552	1.041	0.2979	-0.102<>0.633	-0.154<>0.685
<u>Weighted Average</u>													
		<u>Label</u>	<u>Tau</u>	<u>Var-Tau</u>	<u>Z</u>	<u>P-Value</u>	<u>CI 85%</u>	<u>CI 90%</u>				<u>CI 95%</u>	
		#3+#4+#5	0.5541	0.1628	3.4027	0.0007	0.3196<>0.7886	0.2862<>0.8219				0.2349<>0.8732	

Appendix P

Tau-U data for Matt

	<u>id</u>	<u>Label</u>	<u>S</u>	<u>PAIRS</u>	<u>TAU</u>	<u>TAUb</u>	<u>VARs</u>	<u>SD</u>	<u>SDtau</u>	<u>Z</u>	<u>P Value</u>	<u>CI 85%</u>	<u>CI 90%</u>
<u>Baseline trend contrasts:</u>													
	0	P2 BT1 vs P2 BT1	0	10	0	0	16.6667	4.0825	0.4082	0	1	-0.588<>0.588	-0.672<>0.672
	1	P2 BT2 vs P2 BT2	0	10	0	0	16.6667	4.0825	0.4082	0	1	-0.588<>0.588	-0.672<>0.672
	2	P2 BT3 vs P2 BT3	0	10	0	0	16.6667	4.0825	0.4082	0	1	-0.588<>0.588	-0.672<>0.672
<u>Phase Contrasts:</u>													
	3	P2 BT1 vs P2 IT1	40	45	0.8889	0.9412	225	15	0.3333	2.6667	0.0077	0.409<>1	0.341<>1
	4	P2 BT2 vs P2 IT2	75	100	0.75	0.8571	866.6667	29.4392	0.2944	2.5476	0.0108	0.326<>1	0.266<>1
	5	P2 BT3 vs P2 IT3	30	50	0.6	0.75	266.6667	16.3299	0.3266	1.8371	0.0662	0.130<>1	0.063<>1
<u>Weighted Average</u>													
	<u>Label</u>	<u>Tau</u>	<u>Var-Tau</u>	<u>Z</u>	<u>P-Value</u>	<u>CI 85%</u>	<u>CI 90%</u>	<u>CI 95%</u>					
	#3+#4+#5	0.7455	0.1839	4.0533	0.0001	0.4806<>1	0.4429<>1	0.3850<>1					

Appendix Q

Tau-U analysis data for Adam

	<u>id</u>	<u>Label</u>	<u>S</u>	<u>PAIRS</u>	<u>TAU</u>	<u>TAU_b</u>	<u>VARs</u>	<u>SD</u>	<u>SD_{tau}</u>	<u>Z</u>	<u>P Value</u>	<u>CI 85%</u>	<u>CI 90%</u>
<u>Baseline trend contrasts:</u>													
	0	P3 BT1 vs P3 BT1	2	21	0.0952	0.1481	44.3333	6.6583	0.3171	0.3004	0.7639	-0.361<>0.552	-0.426<>0.617
	1	P3 BT2 vs P3 BT2	15	28	0.5357	0.6667	65.3333	8.0829	0.2887	1.8558	0.0635	0.120<>0.951	0.061<>1
	2	P3 BT3 vs P3 BT3	0	10	0	0	16.6667	4.0825	0.4082	0	1	-0.588<>0.588	-0.672<>0.672
<u>Phase contrasts:</u>													
	3	P3 BT1 vs P3 IT1	46	56	0.8214	0.8846	298.6667	17.282	0.3086	2.6617	0.0078	0.377<>1	0.314<>1
	4	P3 BT2 vs P3 IT2	48	64	0.75	0.7869	362.6667	19.0438	0.2976	2.5205	0.0117	0.322<>1	0.261<>1
	5	P3 BT3 vs P3 IT3	50	75	0.6667	0.8	525	22.9129	0.3055	2.1822	0.0291	0.227<>1	0.164<>1
<u>Weighted Average</u>													
	<u>Label</u>	<u>Tau</u>	<u>Var-Tau</u>	<u>Z</u>	<u>P-Value</u>	<u>CI 85%</u>	<u>CI 90%</u>	<u>CI 95%</u>					
	#3+#4+#5	0.7458	0.1755	4.2503	<.0001	0.4931<>0.9985	0.4572<>1	0.4019<>1					

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VITA

Matthew A. Cody Davis, Ed.S., NCSP

I. Academic History

Education:

August 2016	Ed.S. in School Psychology	University of Kentucky Lexington, Kentucky
December 2013	M.S. in Education (School Psychology)	University of Kentucky Lexington, Kentucky
May 2011	M.S. in Education (Educational Psychology)	University of Kentucky Lexington, Kentucky
May 2009	B.A. in Psychology (3.8 GPA)	Hanover College Hanover, Indiana

Professional Experiences:

Assistant Superintendent, Stewart Home & School

July 2016 – Present

School Psychology Intern, Mercer County Schools

July 2015 – July 2016

Teaching Assistant, University of Kentucky

August 2014 – May 2016

Advanced Practicum, University of Kentucky PACER/CASPER Clinic, Lexington, KY

August 2014 – Present

Research Assistant, University of Kentucky

August 2013 – May 2014

Practicum, Anderson County Schools, Lawrenceburg, Kentucky

September 2013- May 2014

Instructor, University of Kentucky

August 2012 – May 2013

United States Peace Corps Volunteer, Struga, Macedonia

November 2011 – July 2012

Robinson Scholars Program Graduate Assistant, University of Kentucky

August 2009 – 2011

Intern for Family Counseling Services, Lexington, Kentucky

Summer 2008

Special Olympics Coach, Stewart Home School, Frankfort, Kentucky

2004 – 2011

Recreational Leader/Substitute Teacher, Stewart Home School, Frankfort, Kentucky

2004 – 2011

II. Scholarly Activities

Publications

(* - Peer reviewed)

Journal articles.

*Fedewa, A. L., Ahn, S., Reese, R. J., Suarez, M. M., Macquoid, A., Davis, M. C., & Prout, H. T. (2016). Does psychotherapy work with school-aged youth? A meta-analytic examination of moderator variables that influence therapeutic outcomes. *Journal of school psychology, 56*, 59-87.

*Fedewa AL, Davis MC. How food as a reward is detrimental to children's health, learning, and behavior. *J Sch Health. 2015; 85: 648-658.*

*Fedewa, A., Davis, M. A. C., & Ahn, S. (2015). Effects of stability balls on children's on-task behavior, academic achievement, and discipline referrals: A randomized controlled trial. *American Journal of Occupational Therapy, 69*, 6902220020. <http://dx.doi.org/10.5014/ajot.2015.014829>

*Fedewa, A., Ahn, S., Erwin, H., & Davis, M. C. (2014). A randomized controlled design investigating the effects of classroom-based physical activity on children's fluid intelligence and achievement. *School Psychology International.*

ix. Works submitted but not yet accepted (includes works in progress).

Davis, M. C., Toland, M. D., Campbell, J. M., Murphy, L., & Gardner, L. (2016). An item response theory analysis of the Childhood Autism Rating Scale, second edition (CARS-2): A social justice perspective. *Manuscript in preparation.*

Davis, M. C., & Fedewa, A. (2016). Comorbid autism spectrum disorders in individuals with Down syndrome: A review of the literature. *Manuscript in preparation.*

Recognitions and outstanding achievements.

Student Travel Award, International Society for Autism Research, 2015

Leslie L. Martin Endowed Fellowship, University of Kentucky, Department of Educational, School, and Counseling Psychology, 2012 & 2015

Departmental Psychology Award, Hanover College, 2009

Areas in which research is done.

1. Behavioral treatments for developmental disabilities.
2. Psychometrics of autism spectrum disorder assessment instrumentation.
3. Comorbidity in autism spectrum disorders.
4. Influence of physical activity on academic and behavioral outcomes in children.

Editorship or editorial board member of journal or other learned publications.

Ad Hoc Reviewer:

Focus on Autism and Other Developmental Disabilities

Ad Hoc Reviewer, 2014-2016

Convention papers.

- i. International and National (Presentation proposals under review).

Davis, M. C., Toland, M. D., Campbell, J. M., Murphy, L., & Gardner, L. (2015). *An item response theory analysis of the Childhood Autism Rating Scale, second edition (CARS-2).* Poster presentation at the annual convention of the International Meeting for Autism Research, Salt Lake City, UT.

Scheil, K., Bowers-Campbell, J., Campbell, J., **Davis, M. C.**, Caldwell, B., & Jacobs, R. (2015). *Students' Evaluation of an Autism Peer Education Program: Initial Impressions of the KIT for Kids*. Oral presentation at the annual convention of the International Meeting for Autism Research, Salt Lake City, UT.

ii. Regional.

Davis, M. C., & Fedewa, A. (2014, April). *Identification and treatment of autism spectrum disorders in Down syndrome*. Poster presentation at the Spring Research Conference, Cincinnati, OH.

Coskunpinar, A., & **Davis, M. C.** (2009). *Psychological health of parents of children with autism spectrum disorders*. Oral presentation at the 2009 Butler Undergraduate Research Conference, Indianapolis, IN.

iii. State.

Fedewa, A., Ahn, S., Erwin, H., & **Davis, M. C.** (2014). *A randomized controlled design investigating the effects of classroom-based physical activity on children's fluid intelligence*. Oral presentation at the 2014 Kentucky Association for Psychology in the Schools, Louisville, KY.

iv. Local.

Davis, M.C., & Fedewa, A. (2015, April). *Candy as reinforcement for good behavior: How food as a reward is detrimental to children's health, learning, and behavior*. Oral presentation at the Interdisciplinary Graduate Student Conference for Research on Children at Risk Submission, Lexington, KY.

Davis, M.C., & Fedewa, A. (2014, April). *Progress in the identification and treatment of autism spectrum disorders in Down syndrome*. Poster presented at the Interdisciplinary Graduate Student Conference for Research on Children at Risk Submission, Lexington, KY.

Service

Service to program

University of Kentucky:

School Psychology Student Senate, Cohort Representative, Fall 2012 –Spring 2015

Student Affiliates of School Psychology, Board Member, Fall 2013 – Spring 2015

Service to community:

Board Member – The ARC of Central Kentucky – January 2017-Present

Miscellaneous:

Jessamine County School District Data Analyst, Spring 2013 and Spring 2014

VI. Professional Affiliations

National Association of School Psychologists, Nationally Certified School Psychologist

Kentucky Association of Psychology in the Schools, Member

International Society for Autism Research (INSAR), Member

VII. Professional Development

Title	Type	Length	Description
Suicide Prevention Training	Didactic	2 hours	District level – how to assess and respond to students showing at-risk behaviors for suicide
ARC Chairperson Training	Didactic	6 hours	CKEC with Marti Ginter
ARC Chairperson Training II	Didactic/Record Review Practice	6 hours	CKEC
SWIS Training	Didactic	3 hours	District level – how to enter data and run reports
IEP Training	Didactic	2 hours	University of Kentucky – Marti Ginter

KAPS	Didactic	12 hours	Professional conference
Cyberbullying	Didactic	3 hours	Boyle County Presentation – Dr. Dan Florell
Safe Schools	Presentation	3 hours	Safe-T Sources
Progress Monitoring for IEP goals	Didactic/Progress Monitoring Practice	3 hours	CKEC