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Group Social Skills Interventions for Children with Aspergers: The Effects of Parent-Guided Social Skills Software

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DEDICATION

I would like to dedicate this manuscript to my mother, Shelley McElhanon, who has loved and supported me unconditionally throughout my life, and to my wife, Allie, who for some reason still laughs at my jokes. Al, thank you for constantly reminding me of my strengths, even when my weaknesses are glaring, and for giving me two wonderful KBs,

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ABSTRACT

Asperger's syndrome (AS) has recently become controversial as a unique pervasive developmental disorder. Although it is apparently different than low-functioning autism, it has been deemed too similar to high-functioning autism (HFA) to be considered a distinct diagnosis in the DSM-5 classification system. However, despite the removal of AS from the DSM-5, research shows that both AS and HFA are significantly different than autism with cognitive impairment (intelligence quotient <= 70), and therefore have different treatment needs. These needs primarily include specialized social skills training. Youth with AS/HFA who obtain sufficient social skills often report greater levels of quality of life and lower levels of anxiety and depression. Their parents also report less parental stress. Although a growing number of evidence-based social skill interventions exist, few use an experimental design and incorporate special interest areas (i.e., the pervasive interests of children with AS), generalization techniques (e.g., different settings, parent inclusion) or computer mediation, which research suggests is needed. Using an experimental design, this study investigated the incremental benefits of parent-guided social skills software (i.e., Social Express) in improving social, emotional and behavioral functioning in the child, as well as reduce parental-stress in the parent. Thirty youths with AS/HFA enrolled in a 9-week social skills group at a clinic participated in this study, as well as their parents. Half were randomly assigned to receive Social Express. Results indicated that the treatment group showed significant

improvements in social motivation compared to the control group. No significant main effects were found in regards to other social skills, internalizing problems, adaptive skills, parental stress, or life satisfaction; however, it should be noted that this study is limited by a small sample size. Other significant effects may exist, and should be investigated in the future with a larger sample size.

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CHAPTER 1

INTRODUCTION

Asperger's Syndrome (AS) is no longer recognized as a diagnosis in the DSM-5. Instead, it is now recognized indistinctly as a higher functioning form of autism on the autism spectrum (i.e., Autism Spectrum Disorders). However, research does suggest that it continues to be a distinct construct regardless of classification, which may need to be considered when creating and implementing interventions. The purpose of this study is reconsider this research in this regard (whether the label necessarily matters in informing intervention), to review current social skills interventions for youths with AS, and to review potential effects of a new, specialized social skills intervention that includes parent-guided social skills software. This introduction will begin with a review of the research on the nature of AS, and will continue with a thorough review of current, specialized social skills interventions of AS groups and the beneficial components within them.

Autism Spectrum Disorder

Autism Spectrum Disorder (autism) is an increasingly common diagnosis among today's youth, and is characterized by deficits in social interaction and pragmatic communication, as well as high rates of repetitive behavior (American Psychiatric Association [APA], 2000). Autism refers to those "low functioning" children and adolescents (intelligence quotient <= 70) who also exhibit severe autistic symptoms, such

as limited to no verbal abilities or self-injurious behaviors. These severe symptoms are often consistent across circumstances. Notably, these youth only comprise about 38 percent of children diagnosed with an Austim Spectrum Disorder (ASD). ASD may be a more preferable and comprehensive term that includes other diagnoses that fall on the "high-functioning" end of the spectrum. These diagnoses include Asperger's Disorder (Asperger's Syndrome or AS) and Pervasive Developmental Disorder Not Otherwise Specified (PDDNOS). Recent studies show that approximately 1 in 88 children are affected by an ASD. This statistic represents an increase in the estimated ASD prevalence of 78 percent since 2002 (1 in 150 children) and 23 percent since 2006 (1 in 110 children) (Autism and Developmental Disabilities Monitoring [ADDM] Network, 2008). Reflecting on these estimated prevalence rates, it's not surprising that ASD is considered by some to be an "epidemic"; however, it is not very likely that these numbers represent a true increase in incidence. Although unclear, it is more likely the result of greater recognition due to increased ASD awareness among lay people and professionals, the use of labeling to establish educational service eligibility through the Individuals with Disabilities Education Improvement Act (IDEIA, 2004), and the inclusion of higher-functioning forms of ASD (e.g., Asperger's Syndrome) in the fourth addition of the Diagnostic and Statistical Manual of Mental Disorders (APA, 2000). Regarding the latter factor, there is a debate in the scientific community of whether or not Asperger's Syndrome (AS) should be identified as a distinct or needed diagnosis. However, current professional practices favor inclusion for the sake of needed intervention services for these youth – services that some studies suggest are exclusively effective for these higher-functioning individuals (Rao, Beidel, & Murray, 2008). With this in mind, it is

important to understand the nature of AS (e.g., prevalence rates, diagnostic criterion) and how it might demand unique intervention strategies beyond general ASD interventions.

Asperger's Syndrome

Asperger's syndrome was first identified by Hans Asperger in his account, *Autistic Psychopathy in Childhood,* in 1944. This was one year after Leo Kanner identified autism in his landmark paper, *Autistic Disturbances of Affective Contact.* In his account, Asperger describes the same deficits of social interaction and stereotyped behavior that Kanner described. Asperger noted impairments in creating and maintaining real world relationships, a limited capacity for social and/or emotional reciprocity, and abnormal preoccupations with objects. However, unlike Kanner, he did not observe qualitative impairments in communication in his target sample; in fact, Asperger reported some superior mathematic abilities and relative strengths in communication (e.g., adult-like speech) (Sanders, 2009). Prior to the DSM-5, impairment in communication (e.g., language delay) was the distinguishing factor between AS and autism, in addition to significant cognitive impairment among those with lower-functioning autism. This can be observed in the fourth edition of the DSM-IV (APA, 2000). According to DSM-IV diagnostic criteria, a child with AS must exhibit two of four qualitative impairments in social interaction: (1) marked impairments in the use of multiple nonverbal behaviors, (2) failure to develop appropriate peer relationships, (3) a lack of spontaneous seeking to share enjoyment, interest of achievements with other people, (4) lack of social/emotional reciprocity and one of four manifestations of restricted, repetitive and stereotyped patterns of behavior, interests and activities (i.e., (a) encompassing, abnormal preoccupation with a stereotyped and restricted pattern of interest, (b) inflexible

adherence to specific, nonfunctional routines or rituals, (c) stereotyped and repetitive motor mannerisms, (d) persistence preoccupation with parts of objects). Furthermore, these disturbances must cause clinically significant impairments in social, occupational, or other important areas of functioning. This is the same diagnostic criterion for autism; however, children with AS cannot have a significant delay in cognitive development, language (a requirement for autism) or adaptive behavior.

There is a great deal of variability in prevalence estimates for AS. According to a review of epidemiological studies, the average prevalence rate is approximately 1 in 300 children. This figure suggests that the ratio of AS to autism is roughly 1 to 5. Similar to autism, it appears that males are more at risk of being affected by AS, with a male to female ration of 6 to 1 (10 to 1 for autism) (Frombonne, 2007). Comorbidity rates with other psychiatric conditions are reportedly high (Mazzone, Ruta, & Reale, 2012). Specifically, these comorbidity rates are 53% with mood disorders (Hofvander et al., 2009), 43% with anxiety (Sukhodolsky et al., 2008), 28% with ADHD and ODD (Simonoff et al., 2008), 7% with OCD (Lugnegard et al., 2011), and 26% with tic disorders (Mattila et al., 2010). Such high comoribidity with other psychiatric conditions makes ASD diagnosis difficult, and results in children with ASD requiring multiple types of interventions (e.g., cognitive, behavioral, pharmacological). These issues emphasize the importance of pursuing more valid and distinct ASD classifications, within and outside of the autism spectrum (Mazzone, Ruta, & Reale, 2012).

Asperger's Syndrome Versus Low-Functioning Autism

There are a few differences that can be observed between children with AS and children with autism. First, they differ in manifestations of stereotypy (i.e., inappropriate,

repetitive behaviors or restrictive, pervasive interests). Children with AS often exhibit persistent preoccupations with "special interest areas" (e.g., trains, technology, video games, animals) moreso than repetitive motor mannerisms, which is more typical of children with autism (Attwood, 2003; Winter-Messier, 2007). Second, children with AS often have relative strengths in verbal abilities and demonstrate motivation to socialize, while children with autism are defined by a weakness in language and are more likely to be socially indifferent (Planche & Lemonnier, 2011). Although children with AS may appear isolated, their lack of social interaction is often due to repeated failure of initiating and maintaining social interactions (Winter-Messier, 2007; Drinkwater-Connolly, 2010). This failure is likely due to their odd, pedantic speech and difficulty escaping their special interest areas (Winter-Messier, 2007; Drinkwater-Connolly, 2010). Third, while children with autism exhibit more deficits in sensory functioning, children with AS are more likely to appear clumsy and uncoordinated (Gilberg & Gilberg, 1989; Ghanizadeh, 2011). Although the differences between Asperger's and autism are notable, many argue that this distinction becomes less evident as children with autism move toward the higher-functioning end of the spectrum.

Asperger's Syndrome versus High Functioning Autism

There is a clear difference between AS and low-functioning autism; however, the AS controversy (i.e., whether or not it is a valid diagnosis) lies in the distinction, or perhaps lack thereof, between AS and high-functioning autism (HFA). Although HFA is not technically a DSM-IV, DSM-5 or ICD-10 diagnosis, it is a commonly accepted term for a diagnosis of autism without the presence of a severe cognitive impairment. Before the DSM-5, HFA fell under the diagnostic umbrella of "autism" and required a

significant language delay, which a diagnosis of AS did not. There are a number of reasons why it's important to determine whether or not AS is distinct from HFA. First, it's important to understand and improve upon the reliability and validity of clinical classification systems, both for the sake of research and best practices (Szatmari, 1998). Second, if children with AS have qualitatively different impairments (e.g., language delay) and/or strengths (e.g., cognitive profiles) compared to those with HFA, they will also have different needs and assets as they relate to intervention design (Zwaigenbaum & Szatmari, 1999; Klin et al., 2000). Inversely, if AS and HFA are essentially the same construct, then children with AS may benefit equally from the plethora of empirically supported ASD interventions (see Smith, 2008 for a review). Last, if AS and HFA are distinct, there are likely etiological differences between them that may hold implications for early assessment, neurological development, preventative treatments and likely prognoses (Szatmari, 1998; Szatmari et al., 1986; Szatmari, Bartolucci, & Bremner, 1989).

To date, it remains unclear as to whether or not AS is a valid, unique disorder. There is research to both support and refute AS as a diagnosis distinct from HFA. For instance, children with AS have been found to demonstrate different cognitive profiles than children with HFA. They often exhibit greater verbal IQ in the form of vocabulary, comprehension, arithmetic and information, while exhibiting similar performance IQ in the form of object assembly and block design. In some studies, their full scale IQ is also superior to children with HFA, falling within the average to superior range (Ghaziuddin & MountainKimchi, 2004; Planch & Lammonier, 2011). However, other studies have found full scale IQs to be similar, and have also found few differences in verbal and

social abilities in the form of structural language, outward emotional expression, cooperation, assertion, responsibility and self-control (Bennett et al., 2008; Ghaziuddin & MountainKimchi, 2004; Barbaro & Dissanayake, 2007; Macintosh & Dissanayake, 2006a). Regarding early language delays, some studies suggest that these differences are not necessarily predictive of variance in autistic symptoms, and often diminish with age (Bennet et al., 2008; Howlin, 2003; Szatmari et al., 2000). Similarities of comorbidity rates with psychiatric conditions have been found, suggesting that children with HFA and children with AS share a similar risk of comorbidity (Macintosh & Dissanayake, 2006). At face-value, children with AS are often described as active but odd, while children with HFA are described as aloof and passive. Similarly, children with AS have been found to demonstrate increased social motivation and increased expressive language compared to children with HFA (Ghaziuddin, 2008). Other studies suggest that this is the result of personality differences instead of autistic symptoms– that children with HFA tend to be more introverted than children with AS (Macintosh and Dissanayake, 2006b). Overall, there seems to be two arguments; that (1) there is a need for a revision of AS criteria rather than a combination of the two subgroups (Planche & Lemonnier, 2011), and that (2) it "may be more accurate to think about patients with Asperger's as patients with autism that are precocious and/or verbally gifted relative to other patients with autism" (Sanders, 2009, p. 1565). Either way, both children with AS and children with HFA require social skills interventions, and although they demonstrate different strengths and weaknesses profiles, current interventions do not target either population exclusively. The following review consists of evidence-based social skill interventions designed for both children with AS and children with HFA (AS/HFA).

Social Skills

Social skills can be defined as specific behaviors that result in positive social interactions (Elliott & Gresham, 1987; Gresham, 1986) and encompass both verbal and nonverbal behaviors necessary for effective interpersonal communication (Rao et al., 2008). Youths with sufficient social skills are more likely to receive peer acceptance, achieve academic success, and maintain positive mental health (Hartup, 1989). Inversely, youths with social skill deficits often have related impairments in functioning that can decrease their quality of life and increase anxiety and/or depression (Attwood, 2007). Rieske, Matson, May and Kozlowski (2012) found that social deficits can be a significant moderator in predicting levels of anxiety in those with AS. Furthermore, limited social ability has been found to interfere with developmental milestones and positive peer and family relationships (Krasny, Williams, Provencal & Ozonoff, 2003). Youths with AS/HFA often face such outcomes due to their unique deficits in social functioning.

In general, youth with AS/HFA demonstrate social deficits through their lack of orientation towards social stimuli, inadequate use of eye contact, difficulties initiating and sharing conversations and social interactions, difficulty interpreting verbal and nonverbal social cues, difficulties regulating their emotions, and a limited ability to take on someone else's perspective and understand their thoughts and feelings, otherwise known as "theory of mind" (Bauminger, 2007; Weiss & Harris, 2001; Gutstein & Whitney, 2002). Often times, these youth have trouble joining children at play (Attwood, 1998; Bauminger, 2007), behaving appropriately as a play-date host (Attwood, 1998), requesting information from teachers/peers, listening and responding to teachers/peers,

interacting in basic games and other activities (Swaggart et al., 1995), and making friends (Attwood, 1998). Regarding the latter, research suggests that making best friends is most important for the later adjustment of children and adolescents, as it acts as a buffer towards stressful life events (Miller & Ingham, 1976), correlates positively with self-esteem, and correlates negatively with anxiety and depressive symptoms (Buhrmester, 1990). These problems typically start in preschool, become notably problematic in elementary school, and ultimately lead to rejection in adolescence (Church, Alisanski, Amanullah, 2000). Like those around them (e.g., parents), youth with AS/HFA have a general awareness of their poor social functioning and often report low social competence (Knott, Dunlop & McKay, 2006). Unfortunately, these youth typically do not "outgrow" these problems and instead face negative outcomes, such as difficulty maintaining employment and meaningful adult relationships (Szatmari, Bartolucci & Bremmer, 1989; Venter, Lord & Schopler, 1992). Therefore, social skill interventions appear to be necessary for this population.

There are a number of intervention options for youths with ASD that are used in common practice. These interventions vary in design and supporting evidence, including (1) unresearched, alternative forms of treatment (e.g., animal therapy, art therapy), (2) under-researched interventions (e.g., Treatment and Education of Autistic and related Communication-Handicapped Children, Sensory Integrative Therapy), (3) supported interventions such as applied behavior analysis (ABA) (Goldstein, 2002; Odom et al., 2003; McConnell, 2002; Horner et al., 2002) and psychotropic medications (McCracken et al., 2002), and (4) interventions that are shown to be ineffective, such as psychoanalytic and humanistic play therapy (Cantwell & Baker, 1984) and Secretin

administration (i.e., intestinal hormones) (Williams, Wray, and Wheeler, 2005) (refer to Smith, 2008, for a full review). However, not all general ASD interventions are well-suited for higher functioning individuals (Cragar & Horvath, 2003); so, more specialized intervention guidelines and evidence-based social skills training methods should be considered. According to Woodbury-Smith and Volkmar (2009), interventions should be designed to develop social skills, encourage adaptive problem-solving strategies and teach more effective communication styles. Furthermore, they should (1) be tailored to youths with AS/HFA, (2) include rote verbal learning of social rules, (3) take a "parts-to-whole" approach (i.e., progressive steps), (4) explicitly teach social skills via scheduling, practice and rehearsal, and (5) be delivered in the form of a group, allowing individuals to practice their learned skills in varied, naturalistic contexts for generalization and maintenance. These same emphases were included in the social skills intervention tested in this study, in addition to other empirically supported methods such as (1) traditional social skills training, (2) social skills training groups, (3) the inclusion of parents in social skills groups, and (4) incorporating special interest areas (SIAs) into AS interventions.

Traditional Social Skill Training

Social skills have been taught individually (e.g., psychotherapy) (Gena et al., 1996; Kamps et al., 2002; Morrison et al., 2001; Schreibman, 1995, 1997) and in a group format (Bauminger, 2002; Hadwin et al., 1996; MacKay et al., 2007; Marriage et al., 1995; Ozonoff & Miller, 1995). Traditional social skill programs often include evidence-based methods such as peer mediation, role-playing, Social Stories (Gray, 2000) and video modeling. Peer mediation involves pairing a youth with AS/HFA with a neurotypical peer who is taught to elicit, prompt and reinforce positive social behavior.

This approach has been found effective, but is often time consuming, complex, and primarily used with preschoolers (Lord & Magill-Evans, 1995; Rogers, 2000; Strain et al., 1979). Role-playing (e.g., rehearsing a mock social situation in a controlled environment with a trained aid) is another common method of social skill training (Rao et al., 2008).

Research suggests that AS/HFA benefit more from social-learning when it is done in a more direct and explicit way. For this reason, role-playing is often a component of social skills interventions. Additionally, it's important to provide a set of guidelines to implement and progress through role-playing based interventions (Rao et al., 2008). Two role-playing based interventions are often cited in research. The first intervention comes from a study by Webb and colleagues (2004), in which a commercialized social skills training program was implemented over six-and-a-half weeks (60 minute sessions twice a week). Participants included 10 boys (ages 12-17). For this intervention, children engaged in role-play exercises and games to learn and practice basic social skills, including (1) sharing ideas, (2) compliments, (3) offering help, (4) recommending changes, and (5) exercising self-control. Teachers and parents were trained so that they could help with role-playing. At post-treatment, the boys were rated higher on four out of the five social skills, and displayed a greater understanding of when to use the correct skill (Webb et al. 2004).

A similar study was conducted by Tse and colleagues (2007) on a group of 46 adolescents (age 13-18) with AS/FHA, and was based on role-playing techniques (in addition to direct social skills training and other forms of practice). The participants were placed into groups of seven or eight, led by one trained social worker and one trained

psychologist, in a clinical setting. The groups met for 12 consecutive weeks (90 minutes per session). Target social skills included (1) eye contact and greetings, (2) emotional expression/awareness, (3) non-verbal communication recognition, (4) manners and etiquette, (5) listening, (6) conversational skills and (7) dealing with bullying. The children and their parents rated this program favorably. Results revealed significant improvements in parental ratings of social competence and problem behavior in children following the intervention, further supporting the inclusion of role-playing in social skills interventions (Tse et al., 2007).

Social Stories incorporate similar principles of social learning, and compared to peer mediation, are considered to be more accessible and easier to implement (Delano & Snell, 2006; Lorimer et al., 2002; Reynhout & Carter, 2006; Swaggart et al., 1995). Social stories are written short stories that provide the child with AS/HFA social information that is otherwise not obtained in real-time social interactions. These stories are based around an event or activity, and provide a description of the possible reactions of others, as well as direction as to the responses he or she is expected to provide (Gray, 2000). Research shows that the use of Social Stories can decrease disruptive behaviors (e.g., tantrums) and inappropriate social interactions (Kuttler, Myles, & Carlson, 1998; Scattone, Wilczynski, Edwards & Rabian, 2002) and increase appropriate play (Barry & Burlew, 2004), frequency of social communication behaviors (Thieman & Goldstein, 2001), and appropriate social behaviors (e.g., greeting people appropriately, sharing toys; (Swaggart et al., 1995).

Another common approach to social skills training is video modeling. Video modeling involves video recording the child with AS/HFA or an adult model to review

and practice social skills, especially those nonverbal skills that are difficult to learn due to deficits in social referencing and co-regulation skills. Video modeling has been found to improve conversational speech and generalize these improvements to other settings (Charlop & Milstein, 1989), increase perspective talking (Charlop-Christy & Daneshvar, 2003; LeBlanc et al., 2003), improve play sequences (D'Ateno, Mangiapanello & Taylor, 2003) and increase social initiations (Nikopoulos & Keenan, 2003; Wert & Neisworth, 2003). Furthermore, video modeling has been found to reduce tantrum behaviors and reduce anxiety and fear in specific situations (Schreibman, Whalen & Stahmer, 2000; Luscre & Center, 1996). One study found the combined use of Social Stories and video modeling to be beneficial (see next).

In her study, Scattone (2008) combined video modeling and social stories to enhance the conversational skills of a boy with AS (age 9). Treatment consisted of (1) observation of videotaped social stories that included two adults modeling targeted conversational skills and (2) 5-minute social interactions. Three social stories were developed according to Gray's (1998) format that focused on eye contact, smiling and initiating conversation. The video displayed the text of the social stories (accompanied by narration), followed by adults acting the story out. Afterwards, the boy was required to answer questions related to the material from the video. In the evenings, the boy would view the video and discuss the social situation with his mother. The results of this study indicated drastic improvement in the boy's nonverbal behavior (i.e., eye contact and smiling), but little to no improvement his ability to initiate conversations frequently or correctly. These results may suggest incremental benefits of using a media-form presentation.

These traditional social skills training methods are commonly used in interventions, and are well supported for youth with HFA/AS. As previously mentioned, they can be used in an individual or group setting. Group social skills interventions have been found to be particularly successful at yielding positive outcomes, and have lead to formalized programs that professionals may consider (Rao et al., 2008).

Evidence Based Social Skill Training Groups (SSTG)

Currently, there is some empirical support for social skills intervention groups. These interventions come from studies that consist of (1) youths with AS/HFA under 18 years of age, (2) direct intervention to the child, (3) use an experimental research design, a single case design, or an open clinical trial, and (4) include a direct measure of change in social skills (criterion proposed by Rao et al., 2008). Kamps and colleagues (1992) implemented a classroom-wide social skills training intervention for three first graders (age 7). There were four assessment phases: baseline, social skills training (SST), feedback, and follow-up. During baseline, the children with AS/HFA were assigned to groups of four with three other typically developing students. Data on social skills were collected via a coded computer assessment during non-directed activities (e.g., free play). During the SST phase, 10-minute training sessions were conducted four times per week for nine months. These sessions focused on a number of basic social skills, including (1) greetings, (2) initiating and responding to interactions, (3) maintaining interactions, (4) giving and receiving compliments, (5) taking turns and (6) sharing. More generally, this phase focused on shared enjoyment, relationship maintenance and repair, social referencing and co-regulation (e.g., mirroring). During the feedback phase, the children engaged in 20-minutes of free-play with their peers with a reminder to use their learned

social skills. A social skills trainer observed the free-play and reinforced the children for using their skills by placing a star next to their names. During follow-up, a computerized assessment was done during the children's free-play, including coded ratings of the frequency and duration of their learned social skills. Results of the study showed that all of the children with HFA/AS increased the frequency, duration and time in which they engaged in social interactions throughout the school year.

Bauminger (2007) evaluated a cognitive behavioral grounded SSTG program among 26 children with ASD. The program consisted of 50 sessions over 7 months, with a minimum of 1 hour per week. Trained teachers at the children's schools implemented the program. SSTGs consisted of two neurotypical peers and 1-3 children with ASD (who also received one-on-one meetings with the teacher to practice skills learned in group). The lessons focused on (1) prerequisite concepts for group interaction, (2) affect-focused education, (3) group conversation skills, (4) cooperation and (5) double message issues (e.g., irony, idioms, communication that has multiple meanings). Cooperative social group activities and role-play were used as teaching techniques. Children with ASD showed improvements in measures of mutual planning, cooperation, sharing, and social and emotional understanding. They also showed improvements in theory of mind (i.e., taking on another's perspective) and social problem solving skills.

Evidence-based Social Skills Training Group with Parent Component (SSTG-P). An important goal of social skills training for children with AS/HFA is achieving generalizability. Research shows that without continuity across settings, positive intervention outcomes may not be sustained or generalize outside of the intervention setting (Rao, et al., 2008; White, Keonig, & Scahill, 2007). Although SSTGs can be

effective in clinical and school settings (Kamps et al., 1992), intervention benefits may not generalize to the home without proactive attempts to include family members (Rao et al., 2008). In light of this, it is important to consider social skills interventions across settings, including the home (i.e., having parents help with the intervention). Parents may affect their child's ability to develop and maintain relationships through direct instruction, supervision, and helping their child build a peer network (Frankel & Myatt, 2003). Notably, parents of youth with ASD tend to report higher levels of parental stress compared to parents of neurotypical children, and have been found to benefit from their child's progress within a social skills intervention (Elder, Carterino & Virdon, 2004). Therefore, it is important to consider evidence based SSTGs that include a parent component.

Barry et al. (2003) examined an 8-week SSTG program among four children aged 6-9 years with AS/HFA (2-hours a week). Targeted social skills included initiating and responding to greetings, practicing conversation skills, initiating play time with others, and responding to invitations to play from others. The program also included play time with a neurotypical peer during each session for the sake of assessment. At the end of each session, target skills were demonstrated to parents via role-play and parents received worksheets that outlined the target skill, as well as suggestions for support and practice at home. These youths indicated significant improvements in greeting skills, play skills and conversation skills; however, these findings were true only through observations, not parent report. This suggests that generalization from the clinic to the home may not have occurred.

Solomon and colleagues (2004) investigated a 20-week SSTG program for

children with ASD ages 8-12 years (1.5 hours a week). 18 children received treatment, while 18 remained in a waitlist control group. Parents received psychoeducational sessions concurrently. The curriculum was designed to target three core areas: (1) emotion recognition and understanding, (2) theory of mind, and (3) executive functioning. To develop skills across these areas, visual templates, games, and role-play carried out through a routine agenda were used. Targeted skills included understanding gradations of simple and complex emotions, receptive and expressive body language, self-awareness of emotions, basic conversation skills, friendship, teasing, bullying and problem-solving skills. The boys from the intervention group displayed increases on measures of facial expression recognition and problem solving, while the boys in the wait-list control group did not.

Evidence-based Social Skills Training Group with Special Interest Area (SIA). In addition to being evidence-based, research suggests that AS/HFA interventions should include AS special interest areas to achieve buy-in and foster social skills development. Special interest areas (SIA) include information or activities that children with AS/HFA are typically preoccupied with. SIAs are common among youths with AS/HFA. In fact, about 90% have at least one (Attwood, 2003). The most common SIAs include technology (e.g., computers), transportation (e.g., trains), video games (e.g., Minecraft, LEGO games), collectibles (e.g., playing cards) and TV/movies (e.g., Star Wars). Although SIAs can be problematic (e.g., a child pervasively interested in trains may have significant difficulty discussing alternative interests of others), they have also been shown to foster better social skills, such as better fluidity, fluency, body language, eye contact, attention and sensitivity to certain social cues (Baker, Koegel & Koegel. 1998; Quill,

1995; Keeling, Myles, Gagnon & Simpson, 2003). Furthermore, they may help these youths have more positive emotions and cope with negative ones (See Winter-Messiers, 2007, for a full review). Along these same lines, research suggests that naturally reinforcing materials and settings can improve generalization and increase motivation to learn (De'Prato, 2001; Kohler et al., 1997; Attwood, 1998).

One special interest area of children with AS is LEGOs (i.e., sets of plastic blocks that go together to make an object, such as a spaceship) (Winter-Messiers, 2007; Attwood, 2003). One study by Owens and colleagues (2008) took advantage of this in creating a social skills intervention for 6-11 year old with AS/HFA. In this study, children (n=31) were matched on age, IQ, and autistic symptoms before being randomly assigned to LEGO or SULP (Social Use of Language Programme), the latter of which includes a series of multisensory activity sequences using interactive stories, modeling, talking pictures, games and "takeaway" practices. Therapy occurred for 1 hour a week over 18 weeks. A no-intervention control group was also assessed. During the LEGO intervention, children worked on a number of social skills, including joint attention, joint problem solving, shared enjoyment, and general teamwork skills. They were paired up into groups of three and each given a role to play while constructing a LEGO project given by a social skills trainer. These roles included an "engineer" (who was only allowed to read the LEGO instructions and relay them to the "supplier"), a "supplier" (who was only allowed to manage the LEGO pieces and supply them to the "builder"), and a "builder" (who was only allowed to put the pieces together). The teams were supervised by a social skills trainer, who would guide, prompt and provide social skills feedback to the children. Once a project was completed, the group would earn an

achievement, and the members would switch roles. As the teams progressed through LEGO projects and social skill development (e.g., requiring fewer prompts from the trainer), they would earn certificates and privileges, ultimately allowing them to work together, unsupervised, on a LEGO project of their choice. The children were given very specific social rules to follow during sessions.

Results showed that the LEGO therapy group improved more than the other groups on autism specific social interaction scores (i.e., Gilliams Autism Rating Scale, GARS). Both the LEGO groups and the SULP groups demonstrated significant decreases in maladaptive behaviors compared to the no-treatment control group. Last, there was a non-significant trend for the SULP and LEGO groups to improve more than the no-intervention control group in communication and socialization skills. Although the authors report a number of methodological limitations, their intervention replicates previous findings that LEGO therapy is beneficial to children with AS/HFA. They also suggest that LEGO therapy is a readily available intervention, and can be effectively used in educational and clinical settings (Owens, Granader, Humphrey, & Baron-Cohen, 2008).

Other interventions have taken advantage of computerized plans as a general learning platform and as a unique benefit to AS/HFA intervention. Similar to LEGOs, computer and technology is another common special interest of children with HFA/AS (Winter-Messiers, 2007). Gray (1998) recommends the use of computers in modern AS/HFA interventions, in that they allow for self-paced learning, immediate feedback, and minimize the need for real life social interactions to better acquire and generalize learned skills. Many children with ASD find computers to be intrinsically motivating and

preferable to learning from a teacher (Sansosti & Powell-Smith, 2008; Heimann, Nelson, Tjus & Gillberg, 1995). To date, the use of computerized treatment for children with AS/HFA has yielded positive outcomes in the form of helping children successfully remove false beliefs, learn vocabulary words, recognize simple emotions from static photographs and cartoons, decrease inappropriate behaviors, identify complex emotions from facial expressions, improve prosody of speech, and improve basic social skills (Beaumont & Sofronoff, 2008; Swettenham, 1996; Bolte et al, 2002; Golan & Baron-Cohen, 2006; Chen & Bernard-Opitz, 1993; Bernard-Opitz, Sriran & Nakhoda-Sapuan, 2001). Overall, computerized treatments show a great deal of promise and warrant further investigation into the efficacy and use of computer technology in AS/HFA social skill interventions.

The Current Study

Prevalence rates of ASD have risen significantly over the last few years, and may continue to rise. Higher-functioning forms of autism like HFA and AS are also becoming more common. It is unclear whether or not HFA and AS are distinct from one another, but research does show that their intervention needs differ relative to their lower functioning peers. The primary intervention needed for these youths is social skills training. Those who struggle with social skill deficits often report lower quality of life and higher anxiety and depression, and their parents often report higher parental stress (Attwood, 2007; Krasny, Williams, Provencal & Ozonoff, 2003). Those who receive social skills training, on the other hand, are more likely to see increases in peer acceptance, academic success and positive mental health (Hartup, 1989).

Evidence-based social skills interventions exist for home, school and clinical settings. As discussed and cited above, research suggests that positive intervention outcomes can be achieved through social interactions guided by mental health professionals, as well as teachers, parents and peers. Promising intervention techniques include direct social skills training, guided practice with positive reinforcement for frequent and correct social skill use, peer mediation, role playing, social stories and video modeling. However, research on social skills programs is still in its infancy (Rao et al., 2008; Tse et al., 2007; Webb et al., 2004; Kamps et al., 1992; Scattone, 2008; Beaumont & Strotonoff, 2008). Rao and colleagues discuss the need for (1) more AS/HFA specific social skill groups, (2) experimental designs used to measure change (3) increased emphasis on training for and assessing generalization and (4) manualized forms of treatment to be used in other settings (e.g., beyond clinical setting, such as schools and home). Aforementioned research elaborates on these needs, suggesting that social skills groups should also (1) incorporate special interest areas of youths with AS to yield incremental benefits (Owen et al., 2008; Winter-Messiers, 2007; Attwood, 2003; Gray, 1998;), (2) involve parents to help generalization (McConnell, 2002; Beaumont & Strotonoff, 2008) and (3) include commercialized, easy-to-implement treatments (Webb et al., 2004). Regarding the latter, evidence based, commercialized forms of treatment that are widely available, user-friendly and affordable for at home settings are seriously lacking. This study will attempt to meet these needs.

Using a experimental design, this study used a novel social skills intervention called Social Express (Zimmerman et al., 2012), which is commercialized intervention that includes an original computer mediated component (social learning computer game

according to special interest) and family involvement (simultaneous coaching/guidance from parent). As presented, research suggests that the use of computers increases the efficacy of social skills training as a medium of instruction and possibly as a SIA (Scattone, 2008; Owens et al., 2008). According to research, the inclusion of parents as trainers assists in improving the generalizability of positive outcomes (i.e., seeing improvements at home, not just the clinic). (Rao, et al., 2008; White, Keonig, & Scahill, 2007). In addition, because the parent training is relatively easy, guided and done in a way that the children find intrinsically motivating (i.e., computer-mediated), a synergistic effect may occur whereby the training is more enjoyable and effective.

The purpose of this study is to examine the effects of traditional, semi-structured social skills groups, as well as the potential additive benefits of computer mediation (e.g., improved efficacy) and family involvement (e.g., improved generalizability) in group social skills interventions for children with HFA/AS. This study compared the effects of a standard social skills group based on evidence-based components with the effects of social-skills group *and* Social Express. Specifically, the study examined if integrating a parent-guided, computer mediated social skills training to group-based social-skills training : (1) reduced AS symptoms and improved social skills, (2) reduced internalizing problems and improved adaptive skills and life satisfaction, and (3) reduced parental stress. As discussed in the review above, these variables are important to measure as they have been measured in previous research and have been linked to positive outcomes of social skill interventions among youths with AS/HFA.

CHAPTER 2

METHODS

Participants

The target sample included HFA/AS participants at two time periods. At time 1 (May, 2013), 18 male youths age 8-14 were grouped according to age range (8-11, 12-14) and were given the social skills intervention. Half of these youths also received Social Express. At time 2 (September, 2013), 12 male youths age 8-14 were grouped according to age range (8-11, 12-14) and received the social skills intervention. Half of these youths also received Social Express. Participants are recruited from North Carolina and South Carolina via a psychology clinic's advertisement for their social skills group. Advertisements include the clinic website, twitter and eblast announcements, the Autism Speaks network and the Autism Society newsletter.

Measures

General Records. Information regarding student grade level, sex, race, ethnicity, and age were obtained from clinical records by authorized personnel. All identifying information was removed from client data by using client identification numbers.

Behavioral Assessment Children for Children – II Parent Rating Scale (BASC-II PRS). The Behavior Assessment System for Children – II Parent Rating Scale (BASC-II PRS) is used to measure both adaptive and problem behaviors in the community and home setting. Depending on the child's age, the PRS contains 134-160 items and uses a four-choice response format. This scale has moderate to good reliability and validity

(Reynolds & Kamphaus, 2004). Specific subscales used for this study included the Internalizing Problems subscale and the Adaptive Skills subscale. Both of these scales demonstrated good internal consistency in this study, with Cronbach alphas of .87 and .84, respectively.

Behavioral Assessment Children for Children – II Self-Report of Personality (BASC-II SRP). The Behavior Assessment System for Children – II Self-Report of Personality (BASC-II SRP) is a subjective measure of the child's thoughts and feelings. This scale has moderate to good reliability and validity (Reynolds & Kamphaus, 2004). Depending on the child's age, the SRP contains 139-176 items, with some items formatted with a four choice response and others with true or false. Specific subscales used for this study included the Internalizing Problems subscale and the Personal Adjustment subscale. Both of these scales demonstrated good internal consistency in this study, with Cronbach alphas of .84 and .81, respectively.

Parent Stress Index – Short Form (PSI-SF). The Parent Stress Index – Short Form is a 36 item test that is a brief screening measure of parent stress, specifically stress in the parent-child system (Reitman, Currier, & Stickle, 2002). This measure was normed for use with children ranging in age from 1 month to 14 years. Parents respond on a 5-point Likert scale of "strongly disagree" to "strongly agree" after reading a variety of statements about themselves, their children and their relationship with their child. The PSI-SF yields a Total Stress score, which is the sum of the Parental Distress subscale, the Difficult Child subscale, and the Parent-Child Dysfunctional Interaction subscale. The Parental Distress subscale measures parents' perception of their own behavior, including perceived competence, marital conflict, social support, and limitations experiences in

their life as a result of parenting demands. The Difficult Child subscale indicates that parent's perception of their child's temperament, noncompliance, demandingness, and defiance. The Parent-Child Dysfunctional Interaction subscale measures the degree to which parents perceive their children as not meeting expectations and view their interactions with their child as not reinforcing. The test-retest reliability for this form ranges from .84-.91 for the Total Stress score. It further has been show to correlate with a variety of stress and distress measures. While the PSI- short form does not currently possess validity literature on its own, its Total Stress score has correlation of .95 with the Total Stress score on the longer format. This suggests that the short form very likely possesses a similar validity score as the long format (Abidin, 1995). The PSI Total score was used for this study, and demonstrated good internal consistency with a Cronbach alpha of .87.

Asperger Syndrome Diagnostic Scale (ASDS). The Asperger Syndrome Diagnostic Scale is a 50-item measure with each item rated as observed (1) or not observed (0). These items are divided into 5 subscales: (1) Language, (2) Social, (3) Maladaptive, (4) Cognitive, and (5) sensorimotor. The form is intended to be filled out by the parents. This scale is appropriate for children ages 5 to 18. Reliability is high for the scale as a whole, but the subscales demonstrate only moderate reliability. The content is derived from the DSM-IV, the ICD-10, AS literature on ERIC and Psychinfo databases (1975-1999), and Asperger's 1944 research. Discriminant analyses have shown good accuracy of correct classification (85%) (Mirenda, P., 2003). The ASDS Total score was used for this study, and demonstrated good internal consistency with a Cronbach alpha of .87.

The Social Responsiveness Scale II. The Social Responsiveness Scale II (SRS-2; Constantino and Gruber 2005) is a standardized 65-item rating scale that measures social impairments across five domains: social awareness, social cognition, social communication, social motivation, and autistic mannerisms. Each youth's parent/guardian completed the SRS-2 pre- and post-intervention with respect to social abilities in the home environment. Items are rated on a 4-point Likert scale and are summed together to form subscales. Constantino and Gruber (2005) report good internal consistency and validity with AS populations. In addition to the SRS-2 Total score, specific subscales used in this study include the Communication subscale (Com), Social Motivation subscale (Mot), Social Communication/Interaction subscale (SCI), and the Restrictive Interests and Repetetive Behaviors subscale (RBB). The Total score, Com, and SCI subscales demonstrated good internal consistency with Cronbach alpha scores of .86, .79, and .85, respectively. The Mot and RBB subscales demonstrated moderate internal consistency with Cronbach alpha scores of .64 and .56, respectively.

The Children's Perceived Self-Efficacy Scale (CPSES). The Social subscale of the Children's Perceived Self-Efficacy Scales (CPSES; Bandura, 1990) is a 4-item rating scale that measures the child's social self-efficacy. Validation studies have shown this scale to have good validity and reliability (Miller, et al. 1999). Four AS-specific items were added to this scale. This subscale was completed by each youth, and showed moderate internal consistency with a Cronbach alpha score of .67. As a note, self-efficacy was measured in some of the aforementioned studies using similar scales, such as the self-esteem scale from the GARS and SRS-2. The author included this scale in attempt to more precisely measure the participants' confidence in their social abilities.

The Multidimensional Student Life Satisfaction Survey (MSLSS). The Multidimensional Student Life Satisfaction Survey (MSLSS; Huebner, 1994) is a 40-item survey administered to children and adolescents. Validation studies have shown the MSLSS to have good reliability and validity (Huebner, 1994). Each youth completed the Family and Peer subscales of the MSLSS. Together, these subscales includes 16 items (e.g., my parents and I do fun things together; I have enough friends) that are to be rated on a 6-point Likert scale (i.e., *1=strongly disagree, 2 = moderately disagree, 3 = mildly disagree, 4 = mildly agree, 5 = moderately agree, 6 = strongly agree*). Both of these subscales demonstrated good internal consistency with Cronbach alpha scores of .88 and .80, respectively.

Pilot Study Information. Because this is a pilot study, the examiners will also collect information from the participants regarding their experiences with the Social Express software (e.g., interests, likes, dislikes, suggestions). Because this intervention is meant to be naturally interesting to the participants by using computers (a common SIA) as suggested by some of the aforementioned studies, it is important to assess whether or not the participants actually enjoyed and were interested in how the intervention was implemented and the material within it. This information may also inform future, similar interventions on how to make the treatment more interesting and specialized to this population. In addition to the youths' interest, parent report of the stress and enjoyment they experienced in relation to the software is also important, given that a goal of the intervention is to provide a relatively pleasant and relaxing option for parents to help their child learn social skills.

Procedure

Data Collection Procedures. Site authorization for the study was attained through the clinic's research committee. Parents were given an informed consent form upon voluntarily registering for the interventions, which included information describing procedures, confidentiality and responsibilities of participants. Consent forms were handed out to the parents and their child a week prior to the intervention on site, overviewed with a staff member, and returned with or without a signature. All parents and youth consented to the study. Data collection was done through a packet with the measures and a survey information sheet. At both time points (see below), the intervention leader and staff completed pretest data collection one week before the intervention began and posttest data collection one week after the intervention ended. The second wave of data collection was completed one week after the social skills group intervention (July). At each wave, the survey was completed on site with the children and parents and will be administered using paper copies. In the case of children or parents missing on survey days, packets were sent home. The participants reported their client ID number on the response sheet. Students' identifiable information was removed and their ID numbers were replaced by random codes. The clinic will keep the original paper copies of the survey with students' identifiable information. The clinic will also keep the link between the identifiable information and random codes. The collected data was inputted by clinic interns via an Excel sheet. USC research staff will only have access to the coded data in the (data file) for data analysis. None of the USC research staff work for the clinic.

Intervention Procedures. The first intervention began in May, 2013, and ended 9 weeks later in July. The second intervention began in August, 2013 and ended in

October. At both times, there were two groups of eight children ages 9-11, and one group of eight children ages 12-14. As a part of the clinic's skills group, both interventions included 9 sessions focused on evidence-based intervention techniques for children with HFA/AS, (1) including parent psychoeducation, (2) communication basics, (3) child psychoeducation and neuro-feedback skills, (4) lessons on bullying, (5) social manners and etiquette, (6) teamwork, (7) "advanced" conversation skills, (8) goal-setting, and (9) a family wrap-up session. Parenting group sessions ran concurrently for both the treatment and control group, and focused on improving parenting skills and allow for discussion. Furthermore, as a part of the research interest, half of the youths in each group received Social Express software lessons. These computer-mediated lessons were done twice a week for roughly 10-20 minutes at home with a parent (roughly the time it takes to complete the assigned lessons). Fidelity of these treatments was ensured by a parent training session prior to the intervention, weekly meetings with the parents and children (10-20 minutes) that tested their knowledge and experience with that weeks lesson, and a fidelity program through Social Express that records the amount of time that the child spends using the software and the successes made therein. In cases where the parent and child did not show up for the weekly feedback session, they were called by a staff member and provided feedback over the phone. This was required on two occasions for separate participants. The missed social skills group was not made up. As a note, both of these cases were eventually removed, as the parents did not provide post-test data. All other sessions were attended. Treatment assignment (i.e., who also receives Social Express) was based on stratified random assignment using age and degree of symptomology as measured by the ASDS Total Quotient Score. As a note, all of the

participants' scores indicated they were "very likely" to have Asperger's Syndrome. For compensation, each participant received the Social Express software and a signed copy of Max Gamer, a graphic novel for children with HFA/AS.

Data Analyses

Prior to analyses, assumptions of regression were checked for violations. Descriptive statistics for predictors and criterion variables were analyzed and chi-square tests were run to see if significant differences exist between treatment and control groups. Given that groups were randomly assigned after stratifying using age and symptomology, there weren't expectations of significant differences across groups. Multiple linear regression models were conducted to determine if the treatment group (those receiving Social Express) and control group (those receiving only the social skills group) differ with respect to self- and parent-reported ratings of life satisfaction (family/peer domains), social functioning (e.g., social self-efficacy), behavioral function (e.g., internalizing problems), AS-related symptoms and parental stress. Multiple linear regression (MLR) is a statistical technique that uses several explanatory variables to predict the outcome of a response variable. The goal of MLR is to model the relationship between the explanatory and response variables; in this case, as it depends on type of treatment received. For each model, the baseline score of a variable and treatment group served as the predictors with the post-test score of a variable as the outcome. Standardized beta coefficients demonstrate the effect size of each finding. Age was entered as a predictor variable to control for age-related effect differences. A priori power analyses for a two tailed test with an alpha of .05 indicated that a sample of 196 is needed to detect a small effect, a sample of 49 is needed to detect a medium effect, and a sample of 13 is needed to detect a

large effect. Given the sample size of 30, this study is sufficiently powered to find a large effect, slightly under-powered to find a medium effect, and lacks the power to accurately find a small effect.

CHAPTER 3

RESULTS

Preliminary Analyses

Before addressing the research questions, preliminary analyses were run to test regression assumptions, assess the quality of the data and identify possible baseline differences between groups. The intended sample size was 36; however, the final sample size was 27. Three cases were removed due to excessive missing data, as the parents did not show up for post-test evaluation and did not return the packets sent home. Six students who participated in the first cohort continued to participate in the intervention during the second cohort. Because this study was designed to test the effects of social express over a 9-week period, data were not collected or analyzed for these students when they participated in the social skills training the second time it was offered.

A Chi-square test and descriptive statistics (i.e., means and standard deviations) of demographic and predictor variables indicated that there were no significant differences between the treatment group and control group at baseline. Refer to table 3.1 for group means and standard deviations. Further distribution analyses indicated the skewness and kurtosis of the variables were within the cut-offs for normal distribution as suggested by Curran, West, and Finch (1996) – that absolute values for skew and kurtosis were below 2 and 7, respectively – except for the MSLSS Peer scale, which had a skewness value of -2.21. Plots of outcome residuals demonstrated that errors were reasonably independent of each other (i.e., normally distributed); therefore, the distribution assumption was not

seriously violated. Because of this, data was not transformed, as to maintain integrity of interpretation.

Cronbach's alphas were obtained for each of the scales at pre- and post-test. These have been provided in the methods section for each scale and subscale. A bivariate correlation matrix was rendered to provide a greater understanding of the demographic and predictor variables pre-and post-intervention. Refer to Table 3.2 and 3.3 for correlations.

Table 3.1. Demographic and Predictor Variables at Baseline

	Control Group (n = 13)		**Treatment Group (n-14)**	
Predictor Variables	***M***	***SD***	***M***	***SD***
Age	10.69	1.932	10.79	1.578
Ethnicity	2.85	.555	3.00	.000
Indiv Therapy	.46	.519	.57	.514
Prvs Groups	.62	.506	.64	.497
Time Wave	1.23	.439	1.43	5.14
ASDS Total	107.23	11.122	105.07	15.608
MSLSS Family	34.08	5.908	33.86	7.124
MSLSS Peer	42.92	8.902	45.64	10.066
CSES Total	515.00	155.395	525.93	132.649
PSI Total	94.08	14.151	100.29	17.108
SRS Com	75.31	8.118	73.64	7.948
SRS Mot	67.38	10.437	67.21	10.686
SRS SCI	74.38	7.252	75.14	7.037
SRS RRB	73.92	8.301	78.64	8.924
SRS Total	74.85	7.010	75.29	8.071
PRS Internal	61.31	10.331	61.14	16.580
PRS Adaptive	33.38	5.268	33.29	6.438
SRP Internal	53.23	11.344	53.71	12.406
SRP Adjust	48.31	12.678	46.14	12.508

Table 3.2. Correlation Matrix of Demographic and Predictor Variables at Pre-test

		Age	Ethnic	Time Wave	ASDS Total	MSLSS Fam	MSLSS Peer	CSES	PSI Total	SRS Com	SRS Mot	SRS SCI	SRS RRB	SRS Total	PRS Int	PRS Adp	SRP Int
Age	Corr.	1															
	Sig.																
Ethnic	Corr.	.202	1														
	Sig.	.313															
Time Wave	Corr.	-.077	.139	1													
	Sig.	.701	.490														
ASDS	Corr.	.066	.046	-.131	1												
	Sig.	.743	.819	.514													
MSLSS Fam	Corr.	.027	.154	.191	-.403*	1											
	Sig.	.894	.443	.341	.037												
MSLSS Peer	Corr.	-.127	.261	.458*	-.120	.526**	1										
	Sig.	.528	.188	.016	.552	.005											
CSES	Corr.	-.345	.270	.126	-.249	.422*	.525**	1									
	Sig.	.078	.174	.530	.210	.029	.005										
PSI	Corr.	.153	.105	-.338	.135	-.238	-.062	-.115	1								
	Sig.	.446	.602	.084	.502	.233	.759	.566									
SRS Com	Corr.	-.169	-.140	.121	-.449*	-.314	-.009	-.146	.153	1							
	Sig.	.400	.486	.547	.019	.111	.963	.468	.447								
SRS Mot	Corr.	.076	-.110	-.252	.503**	-.401*	-.166	-.391*	.444*	.525**	1						
	Sig.	.708	.585	.204	.007	.038	.409	.044	.020	.005							
SRS SCI	Corr.	-.072	-.149	.008	.434*	-.176	-.083	-.325	.303	.699**	.843**	1					
	Sig.	.722	.459	.901	.024	.379	.680	.098	.124	.000	.000						
SRS RRB	Corr.	-.237	-.082	-.158	.187	-.186	-.130	.061	.356	.372	.465*	.537**	1				
	Sig.	.234	.683	.432	.350	.352	.519	.761	.069	.056	.015	.004					
SRS Total	Corr.	-.034	-.159	.025	.516**	-.287	-.171	-.321	.255	.850**	.692**	.837**	.561**	1			
	Sig.	.864	.428	.901	.006	.147	.393	.103	.200	.000	.000	.000	.002				
PRS Int	Corr.	.334	-.202	-.371	-.304*	-.224	-.402*	-.501**	.350	.254	.572**	.524**	.273	.453*	1		
	Sig.	.088	.313	.059	.048	.261	.038	.008	.073	.202	.002	.005	.169	.018			
PRS AdpSkil	Corr.	.094	-.368	.028	-.451*	.353	.023	-.020	-.529**	-.446*	-.469*	-.382*	-.434*	-.462*	-.080	1	
	Sig.	.642	.059	.891	.018	.071	.909	.919	.005	.020	.014	.059	.024	.015	.693		
SRP Int	Corr.	.351	-.077	-.194	.384*	-.466	-.542**	-.515**	.338	.314	.397*	.321	.231	.442*	.684**	-.229	1
	Sig.	.073	.701	.332	.048	.014	.003	.006	.085	.111	.041	.102	.246	.021	.000	.251	
SRP PersAdj	Corr.	-.154	.503**	.248	-.451*	-.466*	.583**	.554**	-.464*	-.484*	-.539**	-.534**	-.473*	-.637**	-.591**	.267	-.704**
	Sig.	.442	.008	.213	.018	.014	.001	.003	.015	.011	.004	.004	.013	.000	.001	.178	.000

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

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

Table 3.3. Correlation Matrix of Demographic and Predictor Variables at Post-test

		Age	Ethnic	Time Wave	ASDS Total	MSLSS Fam	MSLSS Peer	CSES	PSI Total	SRS Com	SRS Mot	SRS SCI	SRS RRB	SRS Total	PRS Int	PRS Adp	SRP Int
Age	Corr.	1															
	Sig.																
Ethnic	Corr.	.202	1														
	Sig.	.313															
Time Wave	Corr.	-.077	.139	1													
	Sig.	.701	.490														
ASDS	Corr.	.091	.087	-.139	1												
	Sig.	.650	.665	.491													
MSLSS Fam	Corr.	.134	.180	.189	-.294	1											
	Sig.	.504	.369	.346	.136												
MSLSS Peer	Corr.	-.104	-.019	.204	-.288	.520**	1										
	Sig.	.606	.927	.306	.145	.005											
CSES	Corr.	-.236	.041	.030	-.503**	.432*	.549**	1									
	Sig.	.235	.840	.881	.008	.025	.003										
PSI	Corr.	.116	.030	-.456*	.121	-.383*	-.299	-.249	1								
	Sig.	.564	.882	.017	.548	.049	.129	.210									
SRS Com	Corr.	-.097	-.082	-.047	.229	-.233	-.369	-.125	.225	1							
	Sig.	.631	.683	.816	.250	.243	.058	.534	.259								
SRS Mot	Corr.	.068	-.203	-.386*	.446*	-.102	-.295	-.180	.446*	.487*	1						
	Sig.	.735	.310	.047	.020	.613	.135	.368	.020	.010							
SRS SCI	Corr.	-.018	-.168	-.282	.320	-.199	-.394*	-.172	.504**	.822**	.759**	1					
	Sig.	.930	.402	.155	.103	.320	.042	.391	.007	.000	.000						
SRS RRB	Corr.	-.155	-.024	-254	-.016	-.412*	-.260	-.081	.536**	.514**	.130	.534**	1				
	Sig.	.440	.907	.200	.938	.033	.191	.687	.004	.006	.517	.004					
SRS Total	Corr.	-.032	-.156	-.206	.254	-.254	-.383*	-.177	.404*	.888**	.582**	.916**	.663**	1			
	Sig.	.874	.437	.303	.201	.201	.049	.377	.037	.000	.001	.000	.000				
PRS Int	Corr.	.287	-1.45	-.356	.329	-.118	-.409*	-.430*	.508**	.250	.522**	.510**	.280	.426*	1		
	Sig.	.147	.470	.069	.093	.556	.034	.025	.007	.208	.005	.007	.157	.027			
PRS AdpSkil	Corr.	.163	-.196	-.030	-.329	.361	.539**	.255	-.490**	-.691**	-.442*	-.669**	-.563**	-.648**	-.197	1	
	Sig.	.416	.327	.882	.094	.064	.004	.200	.010	.000	.021	.000	.002	.000	.325		
SRP Int	Corr.	.364	-.114	-.131	.261	-.419*	-.604**	-.478*	.328	.415*	.225	.362	.381	.447*	.619**	-.319	1
	Sig.	.062	.572	.514	.189	.030	.001	.012	.095	.032	.259	.064	.050	.019	.001	.105	
SRP PersAdj	Corr.	-.153	.444*	.213	-.030	.482*	.541**	.339	-.560**	-.379	-.282	-.459*	-.534**	-.472*	-.562**	.413*	-.727**
	Sig.	.445	.020	.285	.881	.011	.004	.084	.002	.051	.154	.016	.004	.013	.002	.032	.000

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

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

Treatment Effects as Measured by the ASDS

Table 3.4. Predictors of Change for the Treatment Group on ASDS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-18.712	12.476		-1.500	.147
	ASDS_Total	1.100	.094	.902	11.675	.000
	Treatment	-4.936	2.479	-.153	-1.991	.058
	Age	.342	.732	.036	.467	.645

a. Dependent Variable: 2ASDS_Total

When controlling for age, MLR analysis did not indicate a significant effect of the computer-mediated, parent guided treatment compared to the standard social skills group in terms of AS symptoms as measured by the Asperger Syndrome Diagnostic Scale (ASDS) Total Score, B=-.153, t=-1.991, p=.058. As shown in Figure 3.1, both the treatment and control group reported lower levels of AS symptoms post-test compared to baseline scores; however, it should be noted that the treatment group demonstrated a greater change in mean scores, and that the intervention effects nearly met significance.

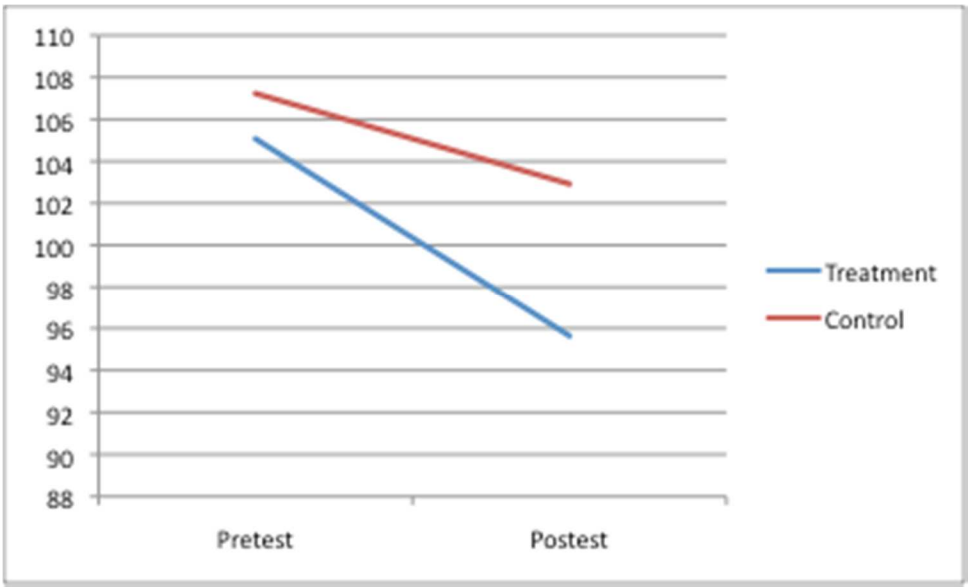

Figure 3.1. *Group mean differences of ASDS from pre- to post-test*

Treatment Effects as Measured by the MSLSS Family

Table 3.5. Predictors of Change for the Treatment Group on MSLSS Family

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-7.526	5.300		-1.420	.169
	Age	.370	.374	.086	.991	.332
	Treatment	-1.287	1.303	-.085	-.988	.334
	MSLSS_Fam	1.068	.103	.897	10.360	.000

a. Dependent Variable: 2MSLSS_Fam

When controlling for age, MLR analysis did not indicate a significant effect of the computer-mediated, parent guided treatment compared to the standard social skills group in terms of family satisfaction as measured by the Multidimensional Student Life Satisfaction Survey (MSLSS), B=-.085, t= -.988, p=.334.. As shown in Figure 3.2, both the treatment and control group reported similar family satisfaction scores at pre- and post-test, and demonstrated a slight decrease after the intervention.

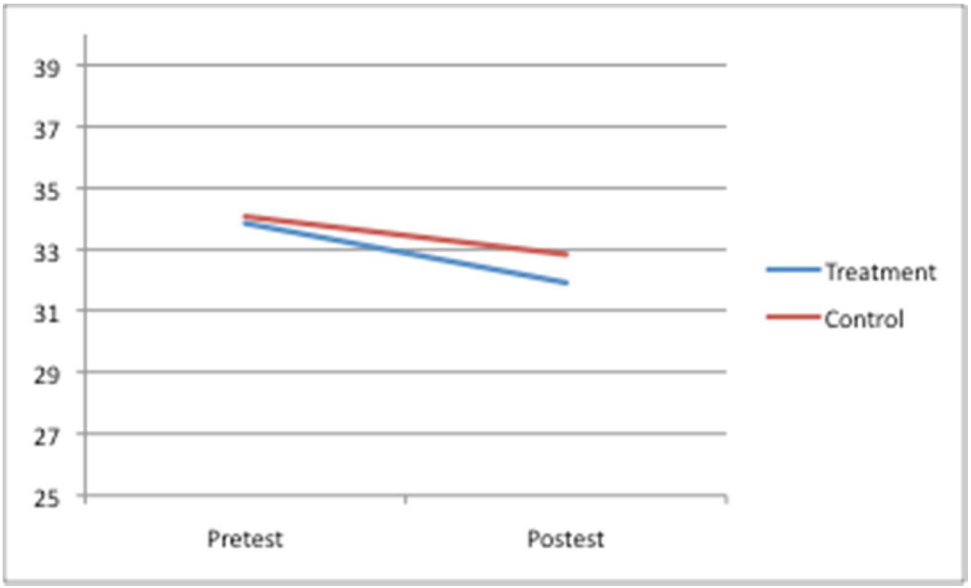

Figure 3.2. *Group mean differences of MSLSS Family from pre- to post-test*

Treatment Effects as Measured by the MSLSS Peers

Table 3.6. Predictors of Change for the Treatment Group on MSLSS Peers

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.926	9.289		.530	.601
	Age	.019	.649	.003	.029	.977
	Treatment	-2.822	2.282	-.142	-1.237	.229
	MSLSS_Peer	.906	.123	.847	7.336	.000

a. Dependent Variable: 2MSLSS_Peer

When controlling for age, MLR analyses did not indicate a significant effect of the computer-mediated treatment compared to the standard social skills group in terms of peer satisfaction (i.e., being satisfied with the amount, quality and interactions with friends) as measured by MSLSS B=-.142, t= -1.237, p=.229. As shown in Figure 3.3, both the treatment and control group reported similar peer satisfaction scores at pre- and post-test.

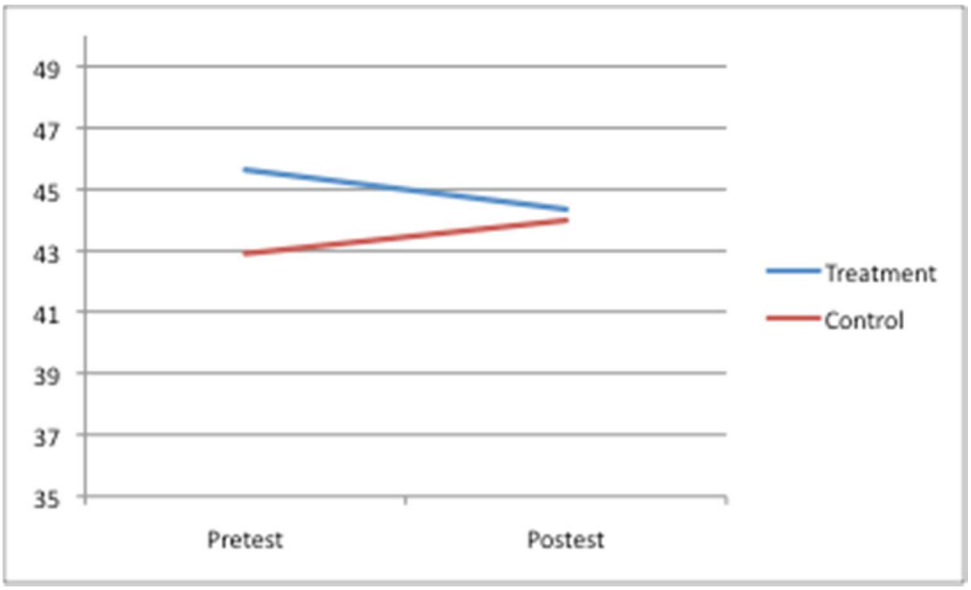

Figure 3.3. *Group mean differences of MSLSS Peers from pre- to post-test*

Treatment Effects as Measured by the CSES

Table 3.7. Predictors of Change for the Treatment Group on CSES

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-122.828	151.905		-.809	.427
	Age	7.944	10.595	.079	.750	.461
	Treatment	-15.439	35.307	-.044	-.437	.666
	CSES_Total	1.142	.133	.899	8.568	.000

a. Dependent Variable: 2CSES_Total

When controlling for age, MLR analysis did not indicate a significant effect of the computer-mediated treatment compared to the standard social skills group in terms of social self-efficacy as measured by the social scale of the Children's Self-Efficacy Scale (CSES), B=-.044, t= -.437, p=.666. As shown in Figure 3.4, both the treatment and control group reported a similar increase in social self-efficacy after intervention.

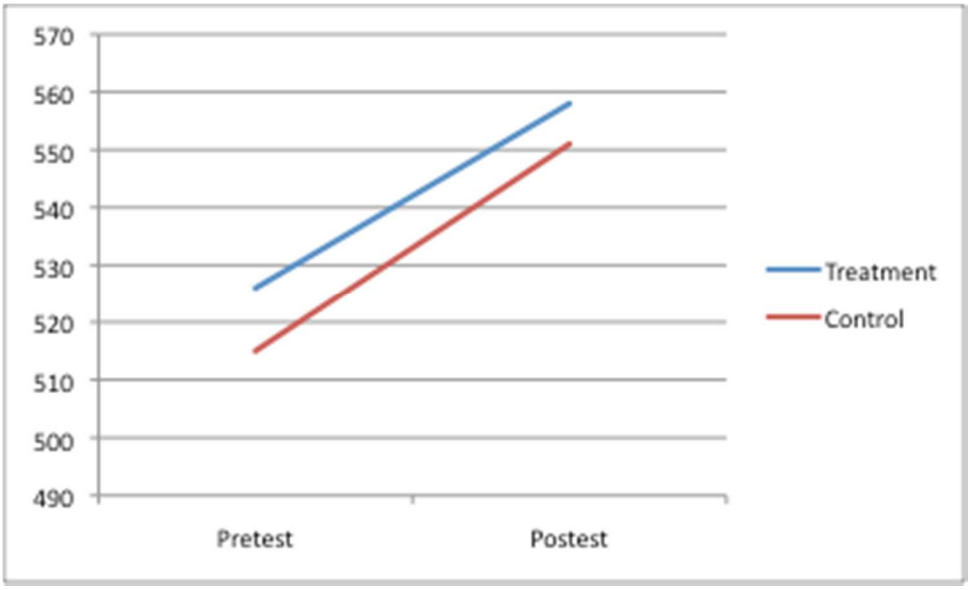

Figure 3.4. *Group mean differences of CSES from pre- to post-test*

Treatment Effects as Measure by PSI Total Score

Table 3.8. Predictors of Change for the Treatment Group on PSI

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.810	20.272		-.188	.853
	Age	-.201	1.419	-.018	-.142	.888
	Treatment	.329	4.994	.008	.066	.948
	PSI_Total	1.037	.163	.808	6.357	.000

a. Dependent Variable: 2PSI_Total

When controlling for age, MLR analysis did not indicate a significant effect of the computer-mediated treatment compared to the standard social skills group in terms of parental stress as measured by the Parent Stress Index (PSI) Total Score, B=.008, *t*= -.066, *p*=.948. As shown in Figure 3.5, both the treatment and control group reported similar parental stress scores at pre- and post-test, and demonstrated a slight decrease in parental stress.

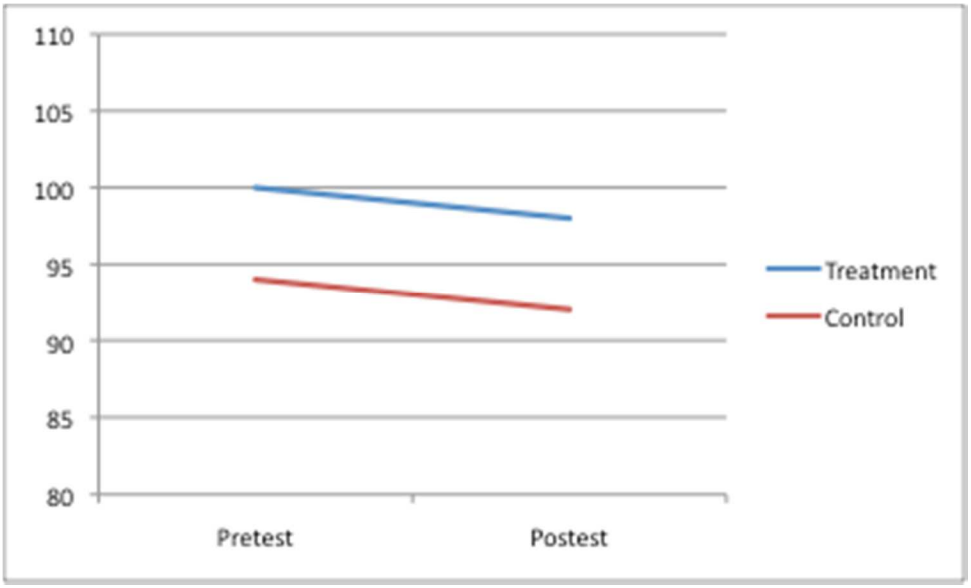

Figure 3.5. *Group mean differences of PSI from pre- to post-test*

Treatment Effects as Measured by the SRS Communication

Table 3.9. Predictors of Change for the Treatment Group on SRS Com

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.111	28.222		-.004	.997
	Age	-.132	1.294	-.018	-.102	.920
	Treatment	3.914	4.466	.153	.876	.390
	SRS_Com	.902	.292	.548	3.090	.005

a. Dependent Variable: 2SRS_Com

When controlling for age, MLR analysis did not indicate a significant effect of the computer-mediated treatment compared to the standard social skills group in terms of communication skills as measured by the Communication subscale of the Social Responsiveness Scale (SRS Com), B=.153, t= -.876, p=.390. As shown in Figure 3.6, both the treatment and control group reported similar communication scores at pre- and post-test, and demonstrated a notable improvement after intervention.

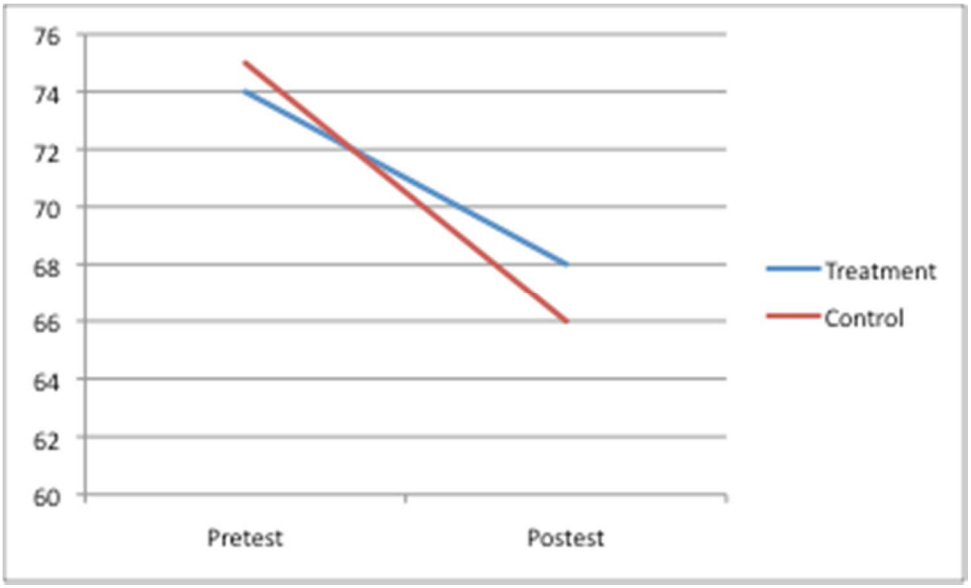

Figure 3.6. *Group mean differences of SRS Com from pre- to post-test*

Treatment Effects as Measured by the SRS Motivation

Table 3.10. Predictors of Change for the Treatment Group on SRS Mot

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.612	17.260		.267	.792
	Age	.132	1.110	.017	.119	.906
	Treatment	-8.077	3.867	-.295	-2.089	.048
	SRS_Mot	.906	.190	.672	4.761	.000

a. Dependent Variable: 2SRS_Mot

When controlling for age, MLR analysis showed a significant effect of the intervention, B=-.295, t=-2.089, p<.05, indicating a -.295 relative advantage for the treatment group on the standardized unit scale of social motivation, as measured by the Social Motivation subscale of the Social Responsiveness Scale (SRS Mot). As shown in Figure 3.7, the control group did not report a change in social motivation while the treatment group reported a significant improvement in scores. As a note, lower scores suggest better social motivation.

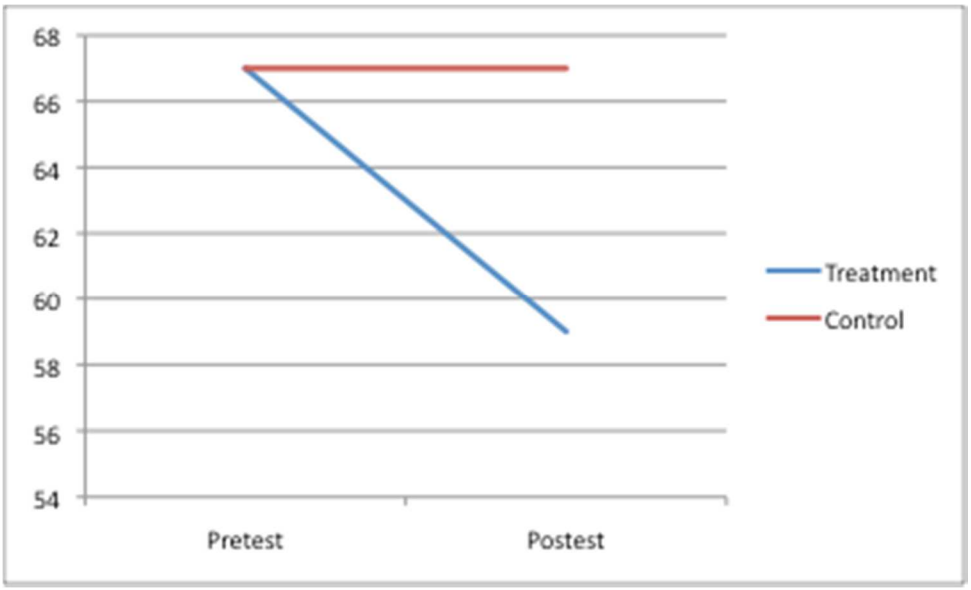

Figure 3.7. *Group mean differences of SRS Mot from pre- to post-test*

Treatment Effects as Measured by the SRS SCI

Table 3.11. Predictors of Change for the Treatment Group on SRS SCI

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-6.594	29.854		-.221	.827
	Age	.069	1.315	.009	.053	.958
	Treatment	1.325	4.577	.051	.290	.775
	SRS_SCI	.991	.334	.527	2.970	.007

a. Dependent Variable: 2SRS_SCI

When controlling for age, MLR analysis did not indicate a significant effect of the computer-mediated treatment compared to the standard social skills group in terms of social interaction skills as measured by the Social Communication/Interaction subscale of the Social Responsiveness Scale (SRS SCI), B=.051, t= .290, p=.775. As shown in Figure 3.8, both the treatment and control group reported similar social interaction scores at pre- and post-test, and demonstrated an improvement in SCI mean scores (as a note, lower scores indicate better skills).

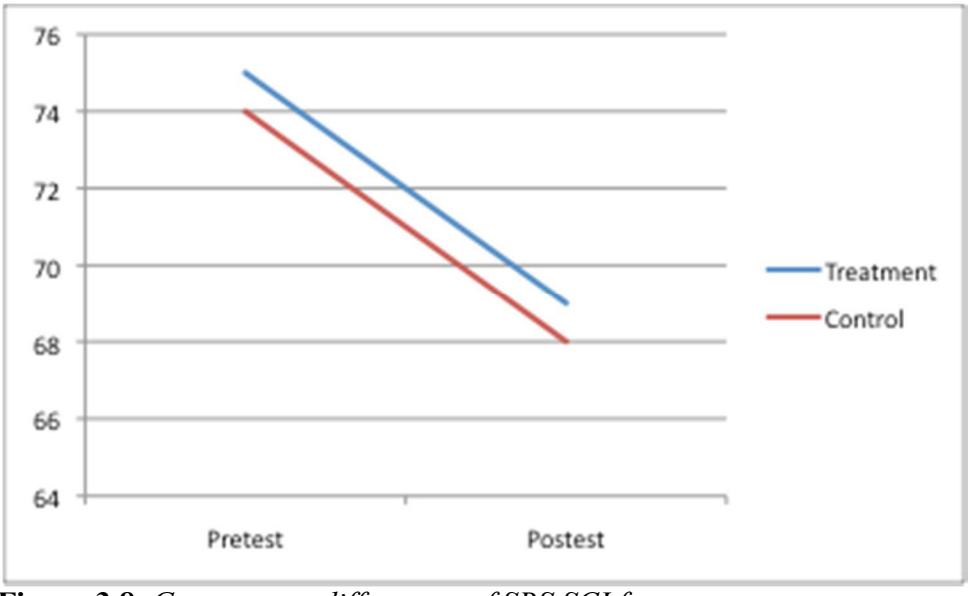

Figure 3.8. *Group mean differences of SRS SCI from pre- to post-test*

Treatment Effects as Measured by the SRS RBB

Table 3.12. Predictors of Change for the Treatment Group on SRS RBB

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-39.735	15.256		-2.605	.016
	Age	.554	.719	.074	.771	.449
	Treatment	.313	2.527	.012	.124	.902
	SRS_RRB	1.362	.151	.907	9.031	.000

a. Dependent Variable: 2SRS_RRB

When controlling for age, MLR analysis did not indicate a significant effect of the computer-mediated treatment compared to the standard social skills group in terms of repetitive interests and behaviors as measured by the Restricted Interests and Repetitive Behaviors subscale of the Social Responsiveness Scale (SRS RBB), B=.012, t= .124, p=.902. As shown in Figure 3.9, both the treatment and control group reported similar repetitive interests and behaviors scores at pre- and post-test, and demonstrated an improvement in SRS RBB mean scores (lower scores indicate better skills).

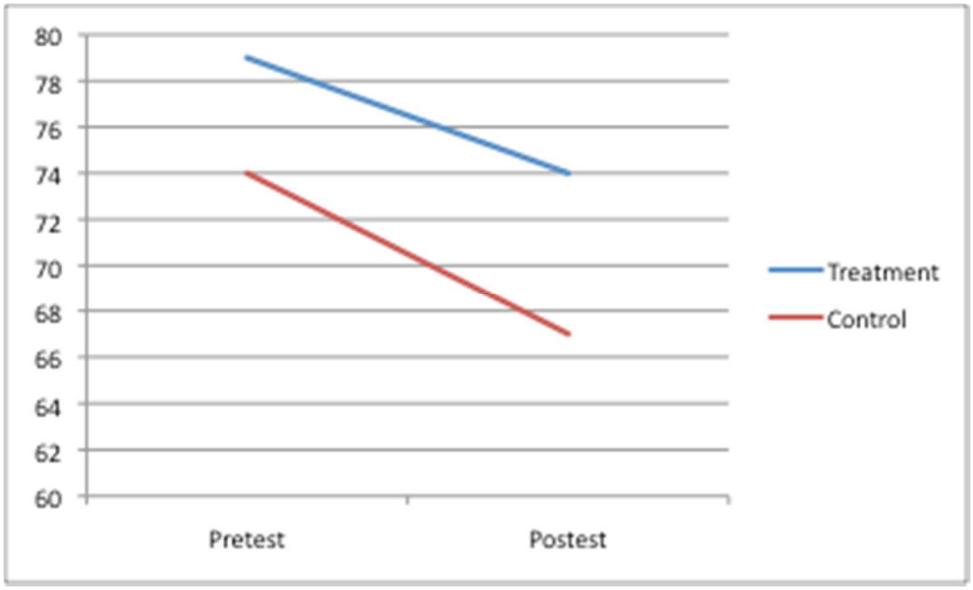

Figure 3.9. *Group mean differences of SRS RBB from pre- to post-test*

Treatment Effects as Measured by SRS Total Score

Table 3.13. Predictors of Change for the Treatment Group on SRS Total

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.631	22.320		-.208	.837
	Age	-.145	1.039	-.022	-.139	.891
	Treatment	3.071	3.624	.134	.847	.406
	SRS_Tot	.992	.248	.633	3.995	.001

a. Dependent Variable: 2SRS_Tot

When controlling for age, MLR analysis did not indicate a significant effect of the computer-mediated treatment compared to the standard social skills group in terms of overall social skills as measured by the Social Responsiveness Scale (SRS) Total Score, B=.134, t= .847, p=.406. As shown in Figure 3.10, both the treatment and control group reported similar social skills scores at pre- and post-test, and demonstrated an improvement in SRS Total mean scores (lower scores indicate better skills).

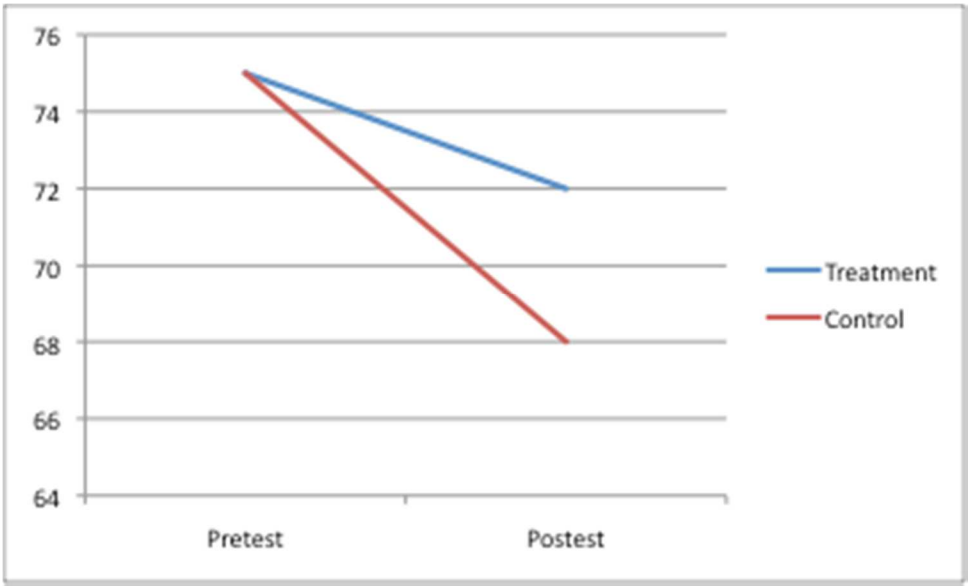

Figure 3.10. *Group mean differences of SRS Total from pre- to post-test*

Treatment Effects as Measured by BASC-PRS Internalizing Problems

Table 3.14. Predictors of Change for the Treatment Group on BASC-PRS Internalizing

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.121	4.660		.026	.979
	PRSA_Intern	.977	.052	.978	18.945	.000
	Age	-.282	.397	-.037	-.710	.485
	Treatment	2.257	1.331	.084	1.696	.103

a. Dependent Variable: 2PRSA_Intern

When controlling for age, MLR analysis did not indicate a significant effect of the computer-mediated treatment compared to the standard social skills group in terms of internalizing problems as measured by the Internalizing Problems subscale of the Behavior Assessment System for Children, Parent Rating Scales (BASC-PRS), B=.084, t= 1.696, p=.485. As shown in Figure 3.11, both the treatment and control group reported similar internalizing scores at pre- and post-test, and reported a slight decrease in internalizing problems.

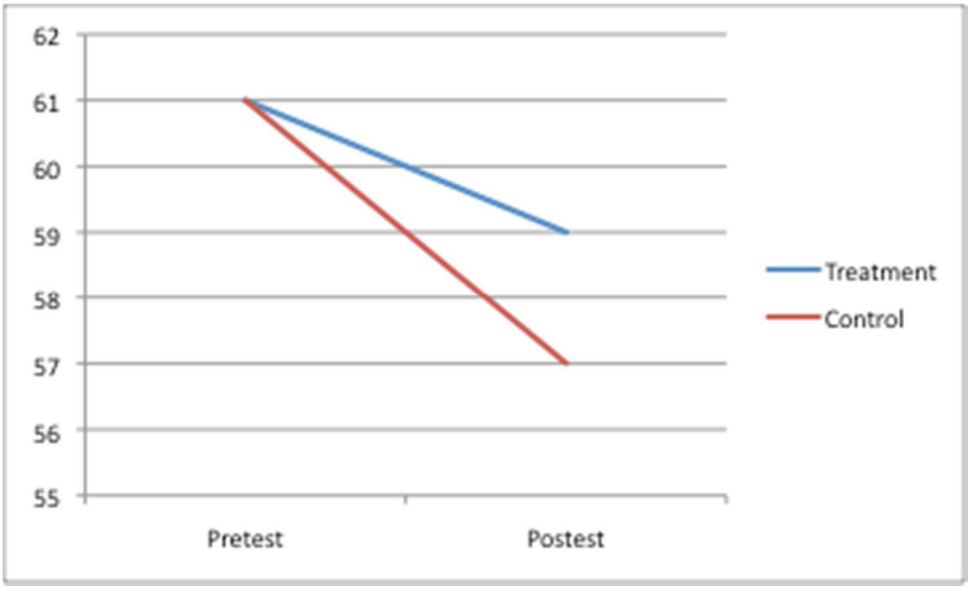

Figure 3.11. *Group mean differences of BASC-PRS Internalizing from pre- to post-test*

Treatment Effects as Measured by the BASC-PRS Adaptive Skills

Table 3.15. Predictors of Change for the Treatment Group on BASC-PRS Adaptive Skills

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-7.362	7.055		-1.044	.308
	Age	.355	.491	.078	.723	.477
	Treatment	-.740	1.705	-.047	-.434	.669
	PRSA_AdpSkill	1.171	.151	.843	7.777	.000

a. Dependent Variable: 2PRSA_AdpSkill

When controlling for age, MLR analysis did not indicate a significant effect of the computer-mediated treatment compared to the standard social skills group in terms of adaptive skills as measured by the Adaptive Skills subscale of the Behavior Assessment System for Children, Parent Rating Scales (BASC-PRS), B=-.047, t= -.434, p=.669. As shown in Figure 3.12, both the treatment and control group reported similar adaptive skills scores at pre- and post-test, and reported a slight increase in adaptive skills.

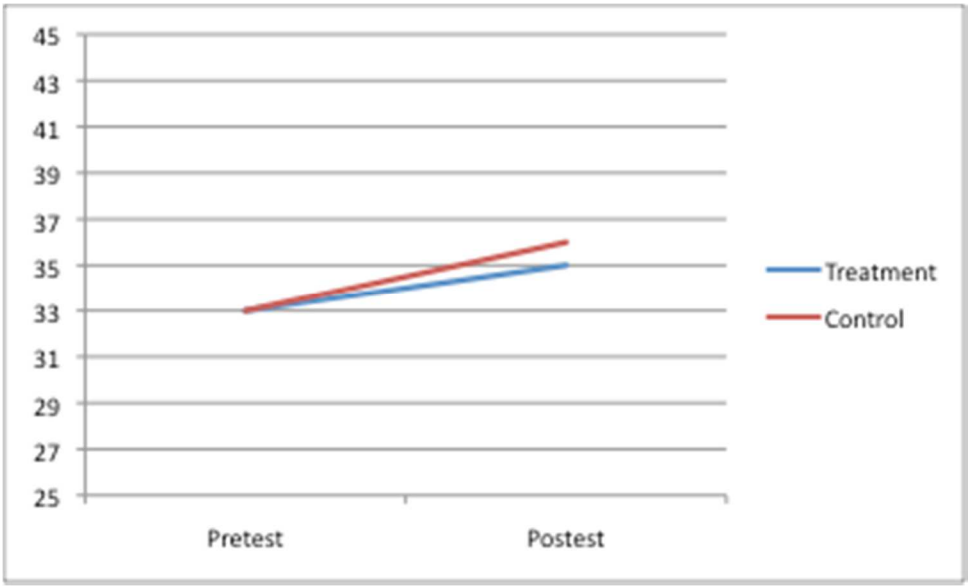

Figure 3.12. *Group mean differences of BASC-PRS Adaptive Skills from pre- to post-test*

Treatment Effects as Measured by the BASC-SRP Internalizing Problems
Table 3.16. Predictors of Change for the Treatment Group on BASC-SRP Internalizing Problems

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.303	4.400		.751	.460
	Age	-.195	.392	-.030	-.497	.624
	Treatment	1.748	1.282	.078	1.364	.186
	SRPA_Intern	.943	.060	.967	15.804	.000

a. Dependent Variable: 2SRPA_Intern

When controlling for age, MLR analysis did not indicate a significant effect of the computer-mediated treatment compared to the standard social skills group in terms of internalizing problems as measured by the Internalizing Problems subscale of the Behavior Assessment System for Children, Self-Report of Personality (BASC-SRP), B=-.078, t= 1.364, p=.186. As shown in Figure 3.13, both the treatment and control group reported similar internalizing problems scores at pre- and post-test.

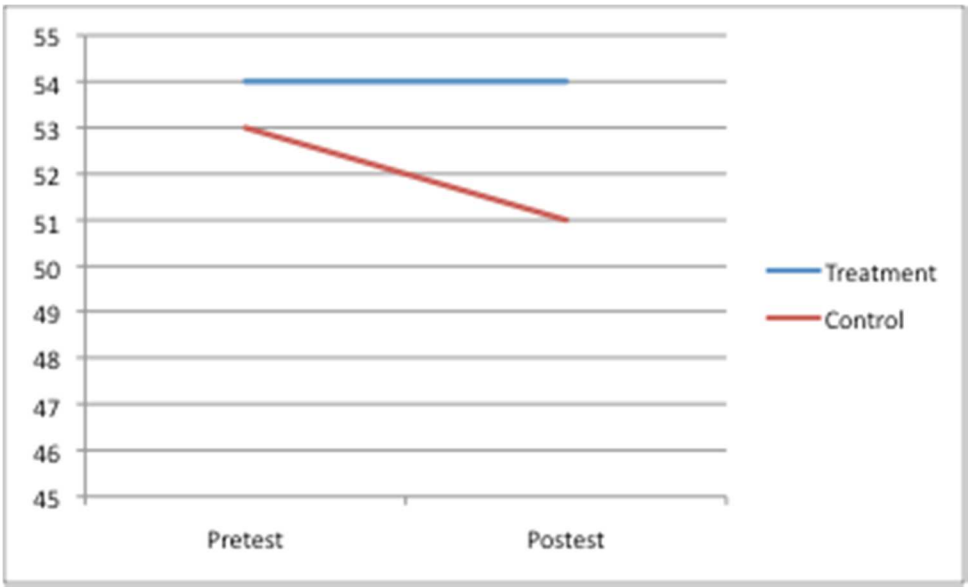

Figure 3.13. *Group mean differences of BASC-SRP Internalizing Problems from pre- to post-test*

Treatment Effects as Measured by the BASC-SRP Personal Adjustment
Table 3.17. Predictors of Change for the Treatment Group on BASC-SRP Personal Adjustment

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.210	4.842		.456	.652
	Age	-.049	.350	-.007	-.141	.889
	Treatment	-.755	1.216	-.030	-.621	.541
	SRPA_PersAdj	.997	.050	.969	19.775	.000

a. Dependent Variable: 2SRPA_PersAdj

When controlling for age, MLR analysis did not indicate a significant effect of the computer-mediated treatment compared to the standard social skills group in terms of personal adjustment as measured by the Personal Adjustment subscale of the Behavior Assessment System for Children, Self-Report of Personality (BASC-SRP), B=-.030, t= -.621, p=.541. As shown in Figure 3.14, both the treatment and control group reported similar personal adjustment scores at pre- and post-test.

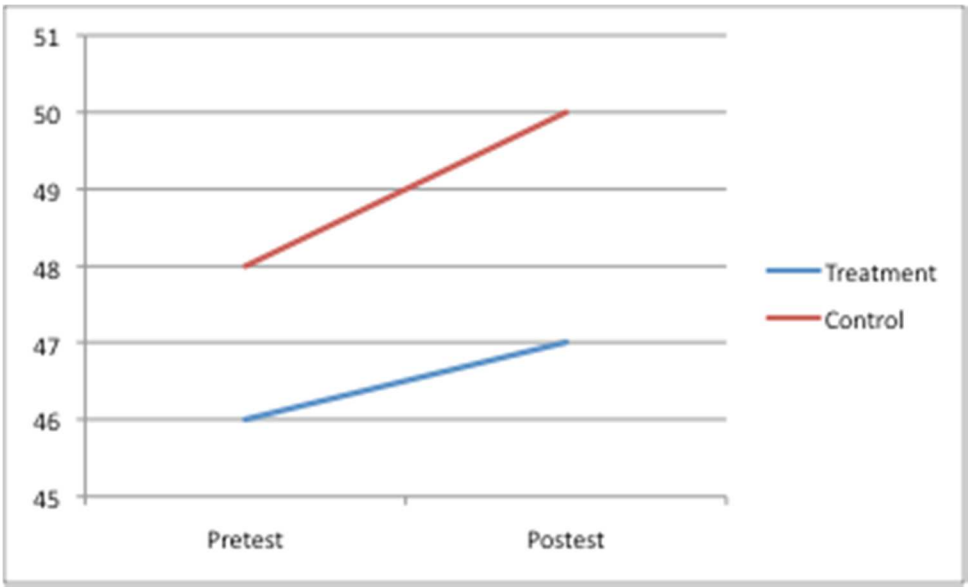

Figure 3.14. *Group mean differences of BASC-SRP Personal Adjustment from pre- to post-test*

Pilot Information

Pilot information was collected regarding the treatment group's experience with the social skills software to ensure that the participants found it interesting, enjoyable and helpful, and their parents found it relatively relaxing, helpful and pleasant. Pilot information was also collected to better inform similar interventions in the future. The children and their parents rated their experiences by answering a number of questions. Six questions were based on a Likert scale from 1-6, ranging from 1=*Strongly Disagree* to 6=*Strongly Agree*. The youths and their parents were also asked a few qualitative questions, and reported an estimate of how much time they spent engaging in the computer mediated social skills lessons each week. The latter estimate was made by selecting 1 (0-10 minutes), 2 (10-20 minutes), 3 (20-30 minutes), 4 (30-40 minutes) or 5 (40+ minutes).

Means of the children's scaled questions indicated that all of the children strongly agree that computers represent a special interest area of theirs (M=6), moderately agree that they enjoyed using the computer to learn (M=4.71), mildly agree that they enjoyed having a parent help them learn social skills (M=4.14), mildly agree that the lessons helped them learn social skills (M=4.14), mildly agree that they had fun using the software (M=3.93), and moderately agree that the software will help other children with AS improve their social skills (M=4.86).

The children also reported that, on average, they spent just over 10-20 minutes a week using the software (M=2.21). Qualitative reports from the children indicated that they liked the software because it was on the computer, it had good graphics, it was fun and interactive, it was like a video game, they could solve problems and discuss their

issues with a parent more easily, and they liked being taught specific skills (e.g., how to calm down). What they generally disliked about the software was that it was sometimes too easy, it didn't have enough "perks", or they did not have anything they disliked about it.

Means of the parent's scaled questions indicated that they moderately agree that their child enjoyed using the software (M=4.50), mildly agree that they enjoyed using the software with their child (M=4.43), mildly agree that the software helped their child learn social skills (M=3.64), moderately agreed that they did not feel stressed while working with their child on the social skills lessons (M=5.43), moderately agree that they felt competent instructing their child through the use of the software (M=5.45) and mildly agree that they believe the software can help other children with AS (M=4.20). The parents also reported that, on average, they spent over 10-20 minutes a week using the software. Qualitative reports from the parent's indicated that they liked the software because they felt pleased with it, they enjoyed the vignettes, it prompted discussion with their child on how to apply the skills in the real world, they enjoyed having something structured to help them teach their child social skills in a fun way, and it gave their child an "electronic" way to discuss their feelings and problems. What they generally did not like about the software was that it was sometimes too easy, that their needed to be more advanced lessons, that it seems useful for mostly younger kids, and that the lessons were not readily applicable to real life.

CHAPTER 4

CONCLUSION

This study was the first study to investigate potential treatment effects of a parent-guided, computer mediated social skills training. As current research and evidence-based interventions suggest, novel social skills interventions should be tested using quasi-experimental and experimental designs, have effects that generalize outside of the clinical setting, provide a structured program that is commercially available and affordable, include the participation of parents and that revolve around special interest areas of children with AS.

First, this study examined the added benefit of a parent-guided, computer mediated social skills training designed to reduce AS symptoms and improve social skills in 8-14 year-old youths above and beyond a standard social skills group. MLR analyses were used to investigate these outcomes using the ASDS, SRS-2 and CSES scales. Results indicated one significant main effect is the Social Motivation subscale of the SRS-2, as well as a nearly significant main effect in the ASDS Total Score. There was not a significant main effect with other social skills or social self-efficacy. These results indicate that although the youths' social skills did not improve overall relative to the control group, they did become generally more motivated to engage in social-interpersonal behavior. Previous studies have found that video modeling (a non-interactive form of what Social Express offers) reduces fear and anxiety in certain

situations (Schreibman, Whalen & Stahmer, 2000; Luscre & Center, 1996). Additionally, role-playing (as done virtually in the Social Express lessons) has been shown to increase the frequency of social communication behaviors (Thieman & Goldstein, 2007). Paired with the potential benefit of learning via an interesting, comfortable medium of instruction (i.e., computers), it may be that the increased social motivation represents a greater sense of comfort and self-confidence in some social situations. This finding is not supported by MLR analysis of the Children's Self-Efficacy Scale; however, this may be due to low sample size or because of lower validity and/or reliability of the customized CSES.

Regarding AS symptoms, although the MLR analysis did not indicate a statistically significant main effect, the value was close to significance (p=.058) and their was a greater decrease in ASDS mean scores in the treatment group as compared to the control group. Previous studies have shown that the components of Social Express (e.g., parent-guided, includes SIA, role-playing, modeling, etc.) can be effective in reducing AS symptomology (Rao et al., 2008; Tse et al., 2007; Webb et al., 2004; Kamps et al., 1992; Scattone, 2008; Beaumont & Strotonoff, 2008). The decrease in ASDS mean scores might reflect this; however, this is the first study to use parent-guided social skills software in addition to a typical social skills training group. It is possible that the additional benefits may not be powerful enough to improve upon the standard intervention in this regard.

The second research question was if integrating parent-guided, computer mediated social skills training reduced internalizing problems or improved adaptive skills and life satisfaction. MLR analyses were used to investigate these outcomes using the

BASC-2 Self-Report and Parent-Report Internalizing Problems subscale, the BASC-2 Parent-Report Adaptive Skills subscale, the BASC-2 Self-Report Personal Adjustment subscale and the MSLSS family and peer domain. The results did not indicate a significant main effect for any of these variables. Previous research has shown that social skill difficulties are often accompanied by lower life satisfaction and greater depression and anxiety, while improvements in social skills can yield improvements in mental health (Attwood, 2007; Rieske, Matson, May and Kozlowski, 2012; Hartup, 1989) Because social skills generally did not improve more than the standard social skills group, this is not something we would expect to see. We would not expect that internalizing problems, adaptive skills or life satisfaction would change either; however, again, it should be noted that this study is subject to low power, and may not be detecting otherwise significant findings.

The third research question was if integrating parent-guided, computer mediated social skills training reduced parental stress. MLR analyses were used to investigate these outcomes using the PSI. The results did not indicate a significant main effect for this variable. Similar to the mental health findings above, this may be because the treatment group did not improve greater in social skills compared to their peers, which would not lead to greater decreases in parental stress as suggested by past studies (Elder, Carterino & Virdon, 2004). However, it should be noted that the parents moderately agreed that helping their child with social skills via the software was not stressful. This may suggest that, although the software does not cause lasting decreases in parental stress more so than the control group, it does provide a structured, stress-free means for the parents to help their child learn social skills.

Limitations and Future Directions

This study was subject to a number of limitations. Perhaps the most notable was low power due to a smaller sample size. G-power analyses indicated that to detect a moderate effect, the sample size needed to be 49. Because of an unexpected change in enrollment protocol and missing data, the intended sample of 36 decreased to 27. Although this sample was sufficient in detecting a large effect and found a significant effect in improved social motivation, other treatment effects may have occurred that were not observed. Future studies should replicate this study with a larger sample size to investigate potential effects that might have been subject to Type II error, and to confirm significant effects that were found.

The second limitation of this study is in regards to not controlling for experimentwise error. Because this was a pilot study on a new type of intervention, multiple variables were studied and multiple comparisons were made. Although potentially informative, this may cast some speculative doubt on the significance of the findings (i.e., improvements in social motivation), as they may be a result of chance and multiple comparisons.

The third limitation to this study was that the parents and the students were not blind to the treatment. Although this is difficult to avoid, it is possible that simply knowing they were receiving additional treatment influenced their ratings (i.e., placebo effect). Future studies may attempt to avoid this by neglecting to inform the participants which group qualified as treatment and which group qualified as control. One method that may be used, and might also make the study more rigorous, is to have the control

group also receive social skills training at home that does not include the parent or computer mediated techniques, such as social stories.

The fourth limitation of this study was that the extra weekly sessions that the parents and children received to discuss their experiences and troubleshooting with the software may have been therapeutic in itself. Similar to the recommendation` above, future studies may consider providing the control group with similar extra sessions, but that do not involve computer mediation with parent guidance.

The fifth limitation is that this study included primarily white, male youth with middle to upper SES. This is certainly a threat to the external validity of the findings. Future studies should aim to include females, youth with a lower SES, other ethnic and racial groups, and different geographic regions.

An additional limitation is that this study only included white males who lived in middle to upper class family income levels; therefore, the results may not readily be generalized to a broader sample. Future studies should include females and strive to include participants of varying socioeconomic status and race.

Further, treatment effects were only measured directly after the intervention occurred. Although this may demonstrate short-term intervention benefits, it does not necessarily indicate lasting effects. Future studies should consider analyzing potential long-term benefits 3-6 months out.

Finally, the study did not use observational measures of social skills. Although the successes and improvement of the child's social skills can be observed through software's server database, it was unavailable for this study. Future studies should aim to measure improvements in social skills through observational strategies.

In conclusion, the results of this study can be interpreted to mean that including Social Express software (i.e., computer-mediated, parent guided social skills training) into traditional AS social skills groups can better improve social motivation among young males, as well as possible reduce AS symptomology in general. Although the current study does have notable limitations (e.g., low power), the findings provide direction for further research on the benefits of computer assisted social skill training programs for students with ASD or HFA.

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