ONLINE DELIVERY OF A SOCIAL SKILLS INTERVENTION WITH VIDEO MODELING FOR ADOLESCENTS WITH AUTISM SPECTRUM DISORDER

By

Carolyn Anne Kuehnel

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ABSTRACT

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As the number of children and adolescents diagnosed with autism spectrum disorder (ASD) increases, researchers and practitioners are faced with the challenge of identifying efficient and effective treatments to meet the needs of a large number of individuals. Various interventions have been used with individuals with ASD to remediate social difficulties, one of the primary areas of impairment for those with ASD. Group and single-case studies have demonstrated positive effects through individual, peer-mediated, and group social skills interventions for various age groups. The research largely focuses on early childhood however, and the majority of interventions take place in a face-to-face context. This study examined the effectiveness of an online video modeling intervention for adolescents in an effort to explore online delivery as a novel medium for the delivery of social skills intervention for individuals with ASD. To gather information about relevant intervention factors, participant feedback was sought and attitudes about the intervention were assessed. In addition, this study examined the relationships between social skills, mental health problems, and academic achievement for adolescents with ASD, as well as the effects of social skill improvement on mental health problems.

Fifty adolescents with ASD in grades 9-12 were included in this randomized controlled study, as well as one parent of each participating adolescent. Adolescents were randomly assigned to either a 6-week online social skills intervention group or a wait-list control group. Data from all participants at pre-test were used to examine the relationships between social,

mental health, and academic variables, whereas changes from pre-test to post-test were compared between groups to examine intervention effects. Additionally, this study examined reporter effects by comparing adolescent and parent measures of social skills within each of the broader research goals.

No significant effects of treatment on social skills were found when examining adolescent and parent reports. A significant treatment effect was found, however, on parent ratings of adolescent problem behavior and parent ratings of ASD symptoms. Parents and adolescents had significantly different reports of social skills at pre-test and post-test, but a comparison of gain scores indicated non-significant differences between groups in parent and adolescent reports of social skills change over time. Perceived competence for learning, interest/enjoyment, and attitudes toward using technology were not predictive of intervention outcomes. Important relationships were found between social, mental health, and academic variables, including significant predictive effects of parent social skills ratings on GPA, grades, depression, and anxiety. Although adolescent social skill ratings had no predictive effects, adolescent problem behavior ratings were predictive of anxiety and depression ratings. Adolescent ratings of social skills change over time were predictive of changes in anxiety ratings over time, but were not predictive of changes in depression ratings over time. This study highlights implications for alternative delivery of interventions and provides a foundation for future research on creatively and effectively serving all students with ASD who face social challenges.

To my beloved Nana, whose love and strength inspired me.

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KEY TO ABBREVIATIONS

AD: Asperger's Disorder

AS: Asperger's Syndrome

ASD: Autism Spectrum Disorder

ASSP: Autism Social Skills Profile

DSM: Diagnostic and Statistical Manual of Mental Disorders

GPA: Grade Point Average

HFA: High Functioning Autism

IAN: Interactive Autism Network

IDEA: Individuals with Disabilities Education Act

IMI: Intrinsic Motivation Inventory

MSPSS: Multidimensional Scale of Perceived Social Support

PDD: Pervasive Developmental Disorder

PDD-NOS: Pervasive Developmental Disorder-Not Otherwise Specified

RADS: Reynolds Adolescent Depression Scale

RCMAS: Revised Children’s Manifest Anxiety Scale

SSIS: Social Skills Improvement System

CHAPTER 1

Introduction

In the United States today, approximately one in 88 children is diagnosed with an autism spectrum disorder (ASD; Center for Disease Control, 2012). In 2010, the Center for Disease Control reported, "Assuming the prevalence rate has been constant over the past two decades, we can estimate that about 730,000 individuals between the ages of 0 to 21 have an ASD." As the number of autism diagnoses has increased, so has the number of children receiving services under the Autism classification in schools. The Individuals with Disabilities Education Act (IDEA) Data Accountability Center reported that 93,660 children ages 3-21 were receiving special education services under the Autism eligibility classification in 2000, and this number climbed to 418,987 by 2010 (Data Accountability Center, 2011). As the diagnosis of ASD becomes increasingly prevalent, there is a critical need to understand more about this disorder and how to provide effective intervention for individuals who have ASD. ASD is a lifelong disorder and there is no cure, so the challenges that individuals with ASD face often continue throughout the lifespan. Therefore, it is important to provide developmentally appropriate services and supports that enhance the quality of life for individuals with ASD.

In discussing the problems and challenges facing individuals with ASD, it is important to clearly define the group of individuals referred to in this dissertation. According to the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (American Psychiatric Association, 2000), ASDs are classified as "Pervasive Developmental Disorders" and consist of five different disorders: Autistic Disorder, Asperger's Disorder, Rett's Disorder, Childhood Disintegrative Disorder, and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS). The DSM-IV diagnostic criteria (see Appendix C) state that children

with different disorders on the spectrum have different symptoms and therefore suggest that these children may have different needs. For example, whereas children with Autistic Disorder may have a general cognitive delay and delayed onset of language, children with Asperger's Disorder must not have had a clinically significant delay in language or in cognitive development. There are however, two common diagnostic criteria across the autism spectrum: 1) a significant impairment in social interaction and 2) restricted, repetitive, and stereotyped patterns of behavior, interests, and activities (American Psychiatric Association, 2000). More specifically, children across the spectrum experience many difficulties with pragmatic language, non-verbal cues, and interpersonal communication.

The recent publication of the fifth edition of the DSM (DSM-V; American Psychiatric Association, 2013) substantially revised the way in which ASD is defined and diagnosed. The DSM-V gathers Autistic Disorder, Asperger's Disorder, Childhood Disintegrative Disorder, and PDD-NOS into one category labeled, "Autism Spectrum Disorder", and Rett's Disorder becomes its own category. The debate surrounding this revision is extensive and reflects the general disagreement in the field regarding differences in diagnostic labels. Some researchers argue that Asperger's Disorder and Autistic Disorder are qualitatively different (see e.g., Neihart, 2000) and others argue that Asperger's Disorder and High Functioning Autism (HFA) are extremely similar and can be studied as one (see e.g., Macinstosh & Dissanayake, 2006). Research has shown that by adolescence those with HFA and Asperger's Disorder have similar behavioral manifestations despite their differences in early language development (Gilchrist et al., 2001). In schools, all children with these disorders who are determined eligible for special education services are given an Autism classification according to IDEA.

With such debate and disagreement surrounding the diagnostic categories, the labels become less informative and a focus on individual needs becomes increasingly important in order to effectively serve this population. Recently, the director of the National Institute of Mental Health announced that it will be "re-orienting its research away from DSM categories" (Insel, 2013). There has been considerable debate about the validity of the recent revision of the DSM-5 and as a result, the director of the National Institute of Mental Health issued the following statement: "Going forward, we will be supporting research projects that look across current categories – or sub-divide current categories – to begin to develop a better system" (Insel, 2013). Due to the shared characteristics of individuals across the autism spectrum, the IDEA classification, the published DSM-5 revisions, and the recent National Institute of Mental Health announcement, this dissertation identifies adolescents with any of the DSM-IV Pervasive Developmental Disorders as "adolescents with ASD" and makes reference to this group as a whole.

Challenges for Adolescents with ASD

Many adolescents with ASD have average to above average cognitive ability and are therefore included in general education classrooms (Barnhill, Hagiwara, Smith Myles, & Simpson, 2000). Although many have the skills to succeed academically, most adolescents with ASD struggle to form positive relationships within the general education classroom and can suffer socially and emotionally. In this setting, individuals with ASD face many difficulties with pragmatic language, non-verbal cues, and interpersonal communication, all of which make positive peer interaction very difficult. Common challenges include making eye contact, accurately interpreting facial expressions and body language, staying on topic, appropriately entering/exiting conversations, making jokes, understanding sarcasm, and differentiating

between language used with peers and with adults (Rao, Beidel, & Murray, 2008). Without the requisite social skills, it becomes difficult for students to work successfully with others, adhere to classroom behavioral expectations, and request help from others. In many high schools, students have multiple teachers for all of their classes, requiring even greater knowledge of how to behave and how to communicate in different contexts. Therefore, it is possible that these social challenges could contribute to low academic achievement and poor mental health outcomes since these students may have great difficulty interacting with others in a classroom setting.

For those adolescents with ASD who struggle socially and emotionally, treatment is available in many different forms, such as school-based programs, intensive summer programs, psychotherapy, or computer-based programs. These services may target various skill deficits depending on the needs of the individual or the needs of a larger group. Many different programs have demonstrated some success, but in many cases, it is difficult to attribute cause to the intervention rather than other external factors, such as increased opportunities for peer interaction, participant buy-in, and parent or teacher bias. Additionally, many programs take a multimodal approach and include numerous intervention components. When social stories, video modeling, parent involvement, and external reinforcement, for example, are all part of an intervention, it becomes difficult to identify which component is responsible for change (Bernad-Ripoll, 2007). There are few randomized-controlled trials that clearly demonstrate the effectiveness of particular social skill treatments for adolescents with ASD and contribute to our knowledge of evidence-based interventions (Solomon, Goodlin-Jones, & Anders, 2004).

One of the social skills intervention programs that is currently showing strong evidence for effectiveness is the UCLA Peers Program (Laugeson & Frankel, 2010). Multiple randomized controlled trials have indicated significant gains for those receiving treatment and a recent study

indicated positive maintenance effects as well (Laugeson, Frankel, Mogil, & Dillon, 2009; Laugeson, Frankel, Gantman, Dillon, & Mogil, 2012). It is important to note, however, that these studies took place outside of a school setting and required significant parent involvement. Families face numerous barriers to accessing services however (Thomas, Ellis, McLaurin, Daniels, & Morrissey, 2007), and therefore schools may be a more appropriate context for providing these interventions to all deserving adolescents. However, there are also many challenges to implementing evidence-based interventions in schools (Kratochwill & Shernoff, 2004) and therefore, many adolescents who could benefit from social skills interventions may not receive them. In sum, many interventions for students with ASD have proven efficacious in the research literature, and some have evidence for effectiveness, but few students may ultimately receive these interventions, likely due to the numerous barriers to intervention implementation.

Historically, there have been sparse data on the social skill challenges and subjective experience of adolescents with ASD, presumably because much of the focus in empirical studies has been on early childhood. Although early childhood research is valuable, research on development beyond this period has been somewhat neglected (Schall & McDonough, 2010). The skills taught to children with ASD in early intervention or elementary programs have not been found to be sufficient to help individuals engage positively with peers in later years (Schall & McDonough, 2010). Until recently, there were few studies that address the social skills that become more relevant for adolescents or adults with ASD as developmental changes occur. Some researchers (e.g., Elizabeth Laugeson, Fred Frankel, and Janine Stichter) have begun addressing this gap and have published important research literature that focuses on this group of

older students. However, there continues to be a need for increased empirical research on the social skills challenges and social experiences of adolescents with ASD.

Adolescence is a unique time of substantial growth and development for all students and at times, it can be difficult and overwhelming to manage the many physical, cognitive, and emotional changes. For adolescents with ASD, this period can be particularly challenging as they become increasingly aware of their differences from neurotypically developing individuals (Barnhill, Hagiwara, Smith Myles, Simpson, Brick et al., 2000). Though many adolescents with ASD continue to show behavioral deficits in adolescence, many also show some improvement in communication skills and increased social interest (Schall & McDonough, 2010). This does not mean increased social success however, and students with ASD may become aware of their rejection from peer groups and their lack of fulfilling friendships (Attwood, 1998). Data from the National Longitudinal Transition Study-2 suggests that adolescents with ASD have less confidence in their ability to make friends than adolescents in any other disability category (Wagner, Newman, Cameto, Levine, & Marder, 2007). Adolescents with ASD are "significantly more likely never to see friends (43.3%), never get called by friends (54.4%), or never be invited to activities (50.4%)" compared to those with mental retardation, speech and language impairment, or learning disabilities (Shattuck, Orsmond, Wagner, & Cooper, 2011, p. 5). Finally, adolescents with ASD are less likely to participate in social activities with friends or participate in community activities with peers than those in other disability categories (Shattuck et al., 2011).

The social difficulties that emerge in adolescence often affect overall mental health for those with ASD, as many go on to develop anxiety and depression (Church, Alisanski, & Amanullah, 2000). Despite the fact that many adolescents with ASD suffer from social and

emotional challenges, only 22 percent receive mental health counseling or social work services in school (Newman, 2007). In many schools, mental health services are a "supplementary item on a school's agenda" and are not well integrated to provide positive supports for students (Adelman & Taylor, 2000, page 171). In middle schools and high schools in particular, the main instructional focus often shifts from educating the whole child to focusing on core academics despite the many developmental changes that are occurring for students. As a result, adolescents with ASD who perform well academically may not receive appropriate services during the school day to prevent or treat mental health problems. It is also possible that adolescents with ASD who have negative social and emotional experiences may suffer academically during adolescence. Creativity and flexibility are needed to serve these individuals, the majority of who attend public schools (Newman, 2007).

The Internet may provide a mode of service delivery that is meaningful, appropriate, and satisfying for students with ASD. In an online survey of 80 adolescents, 74% of respondents reported that they prefer to communicate with others online (Hayter [Kuehnel], Oka, Tran, Kloss, 2012). Additionally, some research suggests, "the use of computers likely creates an environment for learning that appeals to individuals with ASD as less threatening" (Sansosti, Powell-Smith, & Cowan, 2010). Finally, the Internet may provide a mode of service delivery that is more cost-friendly, creating opportunities to serve more individuals. The Center for Disease Control (2008) reported the economic costs associated with ASD are approximately 35 billion dollars per year, but these high costs have not led to appropriate services for all individuals, and particularly adolescents, with ASD. Using the Internet to deliver interventions to adolescents with ASD could potentially be a socially acceptable and cost-effective method.

Purpose of the Study

The primary purposes of this study were 1) to examine if an online social skills intervention can improve perceptions of social skills or mental health problems (i.e. anxiety and depression), 2) to determine how social functioning is related to mental health problems and academic achievement, 3) and to identify differences in parent and adolescent perspectives.

Adelman and Taylor (2000) stated, "If schools are to work effectively on mental health and psychosocial concerns, greater efforts must be made to develop comprehensive, multifaceted, and integrated intervention approaches" (p. 171). It is important to focus on the context in which individuals live and work and provide intervention in a way that best accommodates diversity (Adelman & Taylor, 2000). Understanding the contexts in which particular interventions and treatments are most effective is critical for providing the most appropriate services to individuals. As adolescent Internet use increases exponentially (Gross, 2004), it may be helpful for researchers to consider online platforms as appropriate developmental contexts for providing intervention and support. This study examined the Internet as a novel context, and perhaps a more relevant and meaningful context, for the delivery of social skills intervention services.

The ultimate goal of most social skills interventions is to increase an individual's social competence. There is an assumption inherent in social skills research that increasing social competence is important because increased social competence is related to positive outcomes. Research in developmental psychology has shown that stronger social skills are related to increased social emotional functioning and higher academic achievement for typically developing individuals (see e.g., Durlak et al., 2011; Tolan & Dodge, 2005; Wentzel, 1991), but

it is not clear whether this relationship is similar for adolescents with ASD. This study examined this relationship specifically for adolescents with ASD.

Additionally, there is very little empirical data obtained from individuals with ASD, themselves. The majority of studies rely solely on teacher, parent, or observer report to document behavioral changes. If the ultimate goal is to create a more positive social and emotional experience for the individual with ASD, then it seems vital to understand that experience directly, rather than relying solely on the perceptions of others. This is especially true for adolescents as they become increasingly aware of their disability and how their social skills compare to others. Unlike most other social skills intervention studies, this study investigated the perspectives of adolescents, in addition to parents, to assess similarities and differences in reporting.

The Internet has become a common way of connecting people with common interests and providing opportunities for individuals with ASD to interact online. WrongPlanet (http://www.wrongplanet.net/) is an online community for individuals with ASD and other neurological differences founded by Alex Plank, a young man with ASD. The discussion forums on this website, and other Internet sources, provide a unique opportunity to hear the voices of those with ASD and gain an insider's perspective on the experience of having ASD. Plank has become a major voice for the ASD community and has been featured in many news articles, television programs, and online broadcasts. One of Plank's most publicized and controversial ideas is that ASDs should not be cured and that searching for a cure can be "damaging to people who feel it's part of their identity" (Deardorff, 2008). He does argue, however, that those with ASD can improve and can learn, and that supports should be provided to help them do so. Plank states, "For instance, spending hours trying to help your autistic child learn important life skills

is a good thing. Children with autism need to learn what's socially acceptable and they frequently have a much harder time learning a lot of the things that neurotypical children already understand" (Deardorff, 2008).

Although Plank is just one of many adolescents and young adults with ASD, his perspective is valuable in that it highlights the lack of consensus among those with ASD, parents, teachers, researchers, advocates, and other organizations. For example, when Barnhill et al. (2000a) explored problem and adaptive behaviors in adolescents with Asperger's from the perspective of parents, teachers, and adolescents using the Behavior Assessment System for Children, they found that results differed between parents, teachers, and adolescents. Parents noted more severe behaviors than teachers, and adolescents saw themselves in the Average range on the majority of subscales. The authors highlighted the disagreement among raters and called for more research to investigate differences in perspectives. Additionally, they note that their sample included both children and adolescents with Asperger's and their results did not highlight differences between the two, although adolescents with Asperger's often become more aware of their problems and differences (Barnhill et al., 2000b). This suggests that more research needs to investigate the perceptions of those with ASD. The authors conclude, "Furthermore, an understanding of these perceptions over various developmental ages would be valuable for both professionals and parents. Such information could be used to support the development of appropriate interventions for individuals with Asperger Syndrome, their families, and the professionals who work with them" (Barnhill et al., 2000b, p. 164). This study examined both parent and child perspectives on social skill development and social emotional functioning to gain a more comprehensive understanding of the adolescent experience. Additionally, this study

investigated the utility of an online intervention approach from the perspective of the participants to inform future intervention efforts.

Theoretical Framework

Given the various domains that this dissertation spans (i.e., autism spectrum disorder, adolescent development, education, mental health, and technology), multiple theoretical perspectives were influential in the development of the study. First and foremost, evidence-based practice is an important framework to consider for ASD intervention. Given the large number of individuals with ASD and the diversity within that group, it is important to consider if an intervention is truly effective and under what circumstances an intervention is effective. One intervention strategy that has proven to be effective for teaching skills to individuals with ASD is video modeling. Social learning theories provide theoretical support for video modeling as an intervention strategy, while also providing a rationale for considering individual's history and experiences. Prior research provides support for video modeling as an evidence-based practice for teaching those with ASD. Additionally, social learning theory addresses motivation to learn as an important factor in observational learning, which led to careful consideration of key intervention factors during intervention development (see Social Skills Intervention Development below). Finally, the National Professional Development Center on Autism Spectrum Disorders argues that an ecological systems approach is essential for promoting effective practices for individuals with ASD. Therefore, in this study, Bronfenbrenner and Ceci's (1994) bioecological model provided a foundation for considering the multi-level influences on adolescent's development and the impact of having ASD in multiple contexts. More specifically, adolescents' development in context was considered as study measures were selected in order to more broadly investigate the impact of social skills deficits across multiple

domains. Finally, sociocultural theories influenced the decision to gather data from multiple perspectives. The emphasis in sociocultural theories on examining participant perspectives aligns well with social learning theory's focus on individuals' experiences and with the bioecological model's acknowledgement of personal characteristics. Therefore, it was deemed important to gather data from both adolescents and their parents.

Evidence-based intervention. With the current emphasis on evidence-based interventions in education, it is important to examine the effectiveness of intervention options available to those with ASD. There is a wealth of data on the effectiveness of early behavioral intervention programs for children with autism (e.g., applied behavior analysis), but there is less evidence for social skills interventions at later ages in development. In fact, Bellini, Peters, Benner, and Hopf's (2007) meta-analysis indicated that school-based social skills interventions are only minimally effective for students with ASD. As the diagnosis of ASD becomes increasingly prevalent, however, there is a critical need to understand how to provide effective intervention for adolescents who have ASD. Knowing the context and population for which an intervention is most effective can be a key factor in choosing whether or not to implement it. High-functioning adolescents with ASD (i.e. those with average or above average cognitive ability) comprise one subgroup that needs more critical attention. As stated previously, adolescents with ASD who participate in the general education setting face numerous social and emotional challenges but often do not receive school-based services. When services are offered to adolescents with ASD, the selection of evidence-based interventions is hindered by the limited number of methodologically sound studies that examine intervention effectiveness for adolescents with ASD. Therefore, an evidence-based approach to social skills intervention

research will provide important information regarding intervention selection for adolescents with ASD.

Social learning theories. In line with the evidence-based intervention approach described above, the National Standards Project has identified modeling as an established treatment, and the National Professional Development Center on ASD has identified video modeling, in particular, as an evidence-based practice (National Autism Center, 2009; National Professional Development Center, 2011). The theoretical support for video modeling strategies comes from Bandura's (1971) theory of observational learning, which was based on the premise that individuals can learn through the process of observing others. Imitation of observed behaviors, or performance, is most likely to occur when the behavior is presented in the proper context and/or when reinforcement is provided. According to social learning theory, observational learning can be used to explain the acquisition of many different behaviors, and many successful interventions for children and adolescents with ASD are grounded in social learning theory.

Video-modeling, in particular, is a strategy supported by social learning theory because it provides structured opportunities for those with ASD to observe particular skills or behaviors which they may need to learn. Video modeling is an instructional strategy where individuals view themselves or others engaging in a particular behavior or task in a video. Bellini & Akullian's (2007) meta-analysis of 23 single-subject design studies using video modeling with ASD populations suggested that skills acquired from video modeling are maintained over time and generalized across settings. The authors concluded that video modeling could be considered an evidence-based strategy for teaching social skills. It is important to continue assessing the effectiveness of this strategy for adolescents with ASD however, as only three of the 23 studies

reviewed had adolescent participants. Additionally, all of the studies were conducted in home, school, clinical, and community settings, but none were delivered online. Though the meta-analysis was methodologically sound and it seemed reasonable for the authors to conclude that this strategy can be considered evidence-based, it is important to consider for whom and under what circumstances this intervention is effective. Therefore, with strong theoretical and empirical support, video modeling was chosen as an appropriate instructional strategy for the online social skills intervention in this study.

Like all theoretical approaches, social learning theory has both strengths and limitations. One strength of this approach is that constructs are typically easy to measure, as the behaviors of interest are observable. Due to the specificity and measurability of such behaviors, hypotheses are relatively easy to test. Social learning theory helps to explain the acquisition of new behaviors and has strong practical applications, especially in reducing negative behaviors. The limitations of social learning theory are also important however. First, the theory does not address the issue of developmental constraint and suggests that observational learning functions the same for individuals in various developmental stages and ages. Additionally, the theory does not fully explain individual differences or the role of the individual in what he or she learns. In this particular study, a primary limitation is that individuals' behaviors will not be directly observed and self-report and parent-report will be utilized as outcome measures (see Methods section below).

Contextual development. The evidence-based intervention framework and social learning theory both highlight the importance of development in context. When considering whether or not an intervention is effective, it is important to ask the questions: For whom? According to whom? Under what circumstances? (Ingraham & Oka, 2006). When considering

development from a social learning perspective, it is important to consider past influences, current context, and possible systems of reinforcement and punishment. In general, both approaches force one to acknowledge that learning and development do not happen in isolation and that multiple factors are continuously at play. One way to consider the context of development is through the bioecological model (Bronfenbrenner & Ceci, 1994). This model calls for a consideration of the interaction between individuals and their surrounding environment. In this study, the influence of the bioecological model is seen in the selection of measures to examine potential moderating factors of influence on intervention effectiveness. Another way to consider the contextual influences on development is through sociocultural theories. Sociocultural theories (Daniels, 2005; Daniels, Cole, & Wertsch, 2007; Vygotsky, 1978) call for recognizing social, cultural, institutional, and historical influences. Specifically, these approaches assume that meaning is socially constructed and to the extent that social impairments are inherently a part of ASD, it is likely that individuals living with ASD experience adolescence in a different way than neurotypical individuals. Sociocultural perspectives stress the importance of exploring phenomenon from the perspective of the participants, and the voice of those with ASD is one that is less often included in empirical research. This dissertation addresses this gap by focusing on the voices of participants in order to understand the adolescent experience from the perspective of those with ASD, while also valuing the perspective of their parents. This allows for multiple interpretations of the data based on reporter.

Overall, an evidence-based intervention framework guided the study design, whereas social learning theories guided the selection of an instructional strategy, and theories about individuals' development in context (i.e., bioecological theory and sociocultural theory) guided the selection of study measures.

CHAPTER 2

Review of the Literature

This literature review will frame the goals and questions of this study within the context of current ASD research. First, research on social skill deficits of children and youth with ASD will be reviewed. Next, a review of the research on psychological adjustment outcomes for children and youth with ASD will be presented. Then, a discussion of the intervention research will follow, specifically highlighting the results and effectiveness of previous interventions for social skill problems and psychological adjustment problems. The factors that affect intervention success will be examined and finally, key factors for consideration in intervention development will be reviewed. This section will conclude with the presentation of current research questions and hypotheses.

Social Skills Problems of Individuals with ASD

Whereas the DSM-IV (American Psychiatric Association, 2000) articulates symptom patterns of those diagnosed with Pervasive Developmental Disorders (see Appendix C), numerous studies have attempted to more clearly describe the specific skill deficits of individuals with ASD. Additionally, researchers have tried to identify skill deficits that distinguish those with varying ASD diagnoses. Social skills challenges are typically present for all individuals with ASD, regardless of the diagnosis. The results of such challenges often include socially and emotionally inappropriate behavior, misunderstanding of social cues, inability to develop peer relationships, and impairment in nonverbal communication, for example (Koning & Magill-Evans, 2001). These challenges frequently occur throughout development given that the context of social interaction changes. As individuals grow they must learn new skills and adapt. Although children may be taught to understand social cues in early or middle childhood, they

may not understand social cues in adolescence without additional instruction. The studies reviewed here primarily focus on participant samples that include children and youth with Asperger's Disorder (AD), high-functioning autism (HFA), and pervasive developmental disorder-not otherwise specified (PDD-NOS), as these diagnostic labels most closely match the participant sample for the current study.

Church, Alisanski, and Amanullah (2000) completed a retrospective chart review of forty children diagnosed with AD between 1986 and 1998. This study was valuable in that it highlighted children's challenges across development. In elementary school, children had no reciprocal friendships and only few superficial friendships. Children struggled to converse with others and were often unable to take the perspective of others. Additionally, children's socially inappropriate interactions were thought to cause the alienation of classmates.

Data from 13 adolescents were analyzed to provide a description of social skills challenges during the middle school and high school years. Half of the adolescents were able to identify a best friend, but reported only speaking with this best friend only once or twice a month. Friendships were primarily related to specific interests (e.g., playing Nintendo with a friend). Rigid play was frequently described with adolescents having a difficult time breaking from routine. Adolescents were also described as having difficulty staying on topic and maintaining conversations. Adolescents had difficulty reacting to emotions in real life situations and generally struggled with emotional expression. Finally, an inability to read social cues and frequent peer rejection were also described. Generally, the challenges that exist in childhood were seen to persist in adolescence.

To more specifically identify the social challenges of students with AD in comparison to typically developing peers, Koning & Magill Evans (2001) compared 21 male adolescents with

AD with 21 matched controls on measures of social perception and broad social skills. Results showed that adolescents with AD had lower social perception skills than matched controls, as measured by the Child and Adolescent Social Perception measure (Magill-Evans, Koning, Cameron-Sadava, & Manyk, 1995). There were significant (p = <.001) differences on the total emotion score, as well as significant differences on the body, situation, and voice subscales that comprise the total nonverbal cues score of the Child and Adolescent Social Perception Measure, with typically developing adolescents performing better. The authors also found that the AD group used facial cues more often than other cues (e.g., tone of voice). Broad social skills were also found to be significantly different (p = <.001) between the AD group and controls, as measured by parent-, teacher-, and self-report on the Social Skills Rating Scale (Gresham and Elliot, 1990). On all three measures, the matched control group scored higher on the total social skills variable. The assertion subscale of the Social Skills Rating Scale was also significantly different (p = <.001), with controls scoring higher based on all three-reporters, whereas more variation existed among reporters on the cooperation, self-control, and responsibility subscales. A repeated measures ANOVA was used to test differences between raters and both group and rater differences were significant (p = <.001) with no interaction effect. These results demonstrate that those with AD struggle with social perception and various social skills, although there appears to be some variation on specific domains of social competence and results vary depending on the reporter.

Emotion recognition is another specific challenge that faces many individuals with ASD and can impede their ability to successfully interact with others. Lindner and Rosen (2006) examined the ability of youth with AD to decode emotion based on facial expressions, prosody, and verbal language. Fourteen children and adolescents with AD were compared to 16 typically

developing children and adolescents on a measure of emotion perception (i.e., the Perception of Emotion Test, Egan, 1989). According to Lindner and Rosen (2006), the Perception of Emotion Test presents scenes in videotape format that are shown across multiple modalities using various forms of verbal content, prosody, and facial expressions. Multivariate analyses indicated a significant ($p = <.01$) difference of group by modality. Although there was not a significant difference between groups on emotion perception with verbal content, the AD group scored significantly lower when using facial expressions or prosody to make interpretations of emotion. Overall, this study provides additional evidence that some individuals with ASD, particularly those with an AD diagnosis, have challenges with forms of nonverbal communication.

Other studies have shown differences in the way individuals with ASD use verbal information, however. Loveland, Pearson, Tunali-Kotoski, Ortegon, and Gibbs (2001) investigated adolescents' ability to recognize the appropriateness of social interactions. Nineteen children and adolescents with autism were compared to 19 children and adolescents without autism in their ability to judge the social appropriateness of 24 staged scenes. Half of the scenes contained speech and half did not. After each scene, participants were asked if what they viewed was okay or wrong. If participants believed the interaction was wrong, they were asked to identify what was wrong and why it was wrong. The authors' main finding was that, "Children and adolescents with autism were less accurate in identifying examples of inappropriate social behavior, but not appropriate behavior, than were those without autism, particularly where the inappropriate social behavior was verbal" (Loveland et al., 2001, p. 372).

Other social communication challenges that individuals with ASD often face include "choosing topics appropriate to the setting and the conversational partner, maintaining topics, and indicating a switch to a new topic. They may have difficulty adjusting communication to the

needs of the person with whom they are speaking" (Krasny, Williams, Provencal, & Ozonoff, 2003, p. 107). Rubin and Lenin (2004) identified eight particular capacities for social communication that those with ASD often struggle with: determining the attentional focus, perspective, and intentions of others; perceiving emotional states and considering plausible causal/actors; initiating and maintaining conversational exchanges; recognizing and repairing breakdowns in communicative exchanges; understanding and using more sophisticated language as a means to clarify intentions; understanding and using nonverbal cues; understanding and adhering to social conventions and cultural norms for initiating, exchanging turns, and terminating interactions; using language as a tool for guiding behavior, collaborating with others, and emotional regulation.

Overall, the challenges described above are problematic for those with ASD and are also long lasting. In a study of perceptions of communication skills, typically developing adolescents rated perspective taking and vocal tone comprehension as the two most important communication skills in positive peer relationships (Henry, Reed, & McAllister, 1995). If adolescents with ASD lack the skills that typically developing peers believe are important, they will likely have difficulty developing positive peer relationships. These challenges appear to persist into adulthood and can result in feelings of isolation and longing for intimacy and social connectedness (Muller, Schuler, & Yates, 2008). In describing specific challenges that contributed to difficulties navigating the social world, adults with ASD described difficulties initiating social interactions and also specifically noted, "participating in impromptu and/or unstructured dialogue requiring improvised responses, understanding implicit as well as explicit meanings of messages, drawing social and emotional inferences, and interpreting and using gesture and tone of voice (e.g. sarcasm, irony or innuendo)" (Muller, Schuler, & Yates, 2008, p.

179). Ultimately, these challenges left many adults with ASD craving emotional intimacy, wanting deeper friendships, and desiring romantic relationships.

Psychological Adjustment Problems for Individuals with ASD

Problems with psychological adjustment become most concerning as students with ASD who have average to above average intellectual functioning enter adolescence. Adolescence is a critical time for developing peer relationships and the impairments associated with ASD make social interaction extremely difficult. The core impairments that are characteristic of ASD can also lead to other psychological disorders, such as anxiety and depression (Tantam, 2000).

Many children with ASD diagnoses who do not have diagnosed anxiety disorders experience more anxiety than typical children (Russell & Sofronoff, 2005). Sixty-five children with AD were compared to children with clinical diagnoses of anxiety and typically developing children on the Spence Children's Anxiety Scale (Spence, 1998) and the Social Worries Questionnaire (SWQ; Spence, 1995). According to both parent and child report, children with AD have significantly higher ($p < .01$) overall levels of anxiety than typical children. Parents also indicated that children with AD have significantly higher obsessive-compulsive symptoms and physical injury fears ($p < .05$).

In another study of 29 adolescents with ASD and 30 nonclinical adolescents, Farrugia and Hudson (2006) also found the ASD group to have significantly higher anxiety than the control group ($p < .05$) on the Spence Children's Anxiety Scale. Additionally, the ASD group had significantly higher negative thoughts, behavior problems, and life interference than adolescents with anxiety disorders. Another study, by Kuusikko et al. (2008) found that generalized social anxiety in particular, is higher for adolescents with ASD than typically

developing adolescents, as measured by the Social Anxiety Scale for Children-Revised (La Greca & Stone, 1993).

Recently, Mazurek and Kanne (2010) provided supporting evidence that adolescents with ASD have higher levels of internalizing symptoms, as measured by the Child Behavior Checklist (Achenbach & Rescorla, 2001) than those without ASD. Additionally, they found that those with higher ASD symptoms have lower levels of anxiety and depression, contrary to their hypothesis. It is possible that those with fewer ASD symptoms are more aware of their social difficulties and lack of friendships, and are therefore more likely to experience anxiety and depression. These results are particularly interesting when paired with Barnhill's (2001) previous findings that the higher an adolescent's IQ, the less likely he/she was to attribute social success to task and chance. In Barnhill's (2001) study it was also found that adolescents with more depressive symptoms were more likely to attribute social failure to ability and to the sum of their ability and effort.

Social comparison and perceptions of group membership may also be related to depressive symptoms for adolescents with ASD. Hedley and Young (2006) investigated the relationships between social comparison processes and depression in adolescents with AD. Participants included 36 adolescents who completed the Social Comparison Scale (Allan & Gilbert, 1995; adapted by Dagnan & Sandhu, 1999) and the Children's Depression Inventory (Kovacs, 1992). Though cautious interpretation is warranted due to methodological limitations, the study suggests that adolescents who perceive themselves to be much different from others are more likely to display depressive symptoms ($r = 0.52$, $p = 0.001$).

Adolescents with ASD also experience significantly ($p < .005$) more loneliness that those without ASD based on self-report on the UCLA Loneliness Scale (Lasgaard, Nielsen, Eriksen, &

Goossens, 2010). In the same study, loneliness was also found to negatively correlate with perceived social support from classmates (r = -.52, p = < .005), parents (r = -.43, p = < .01), and a close friend (r = -.40, p = < .05) for adolescent boys with ASD. This suggests that social support may protect against loneliness for this population (Lasgaard et al., 2010).

Numerous studies have demonstrated that feeling part of one's school community, or having a sense of school membership, is positively correlated with academic achievement for typically developing individuals (see e.g., Goodenow, 1993). It is not known if this correlation exists for those with ASD as well. This relationship is important to investigate so that practitioners can monitor whether or not students with ASD feel like they belong in their school communities and maximize opportunities for academic achievement.

Though parents are typically asked to report on their child's social and emotional functioning through parent report forms of standardized rating scales, it is ethically and scientifically important to gain adolescents' perspectives on their social and emotional functioning. The findings reported above have demonstrated some discrepancies in perceptions between parents and adolescents. High functioning adolescents with ASD are capable of providing their perspective and should be included in both clinical and empirical assessment. Preliminary evidence has suggested that adolescents' reports of quality of life are valid and reliable and are also negatively correlated with measures of anxiety (Shipman, Sheldrick, & Perrin, 2011). This suggests that assessing adolescents' perspectives on life experiences, as well as their thoughts and emotions, is important for promoting positive mental health outcomes.

Success of Previous Interventions

As the prevalence of ASD has increased, so too have the number and type of programs available to individuals with ASD diagnoses (Autism Speaks, 2010). Social skills training

programs have been a popular form of intervention to address the social skills challenges that individuals with ASD often face. Various methods of teaching social skills include role-playing, social stories, modeling, computer games, video games, and direct instruction. In addition, the method of instruction often varies between programs and instruction may be delivered individually, in small groups, or in large groups. Finally, social skills curricula may vary both within and between programs depending on the client's skill deficits. Many published articles have focused on the success of social skills programs for individuals with ASD. To review all of them would be excessive for this dissertation, and therefore a sample of articles have been chosen to highlight the range of intervention programs and strategies that can be found in the research literature. General trends among the published studies will be discussed, though it is important to note that this literature review is by no means comprehensive.

Group interventions. Group interventions are often manualized programs where all children in a group are taught the same curriculum and given the same instruction. These programs are meant to offer all children the same opportunities for learning by giving them tools to help each other learn. These interventions are based on the idea that children learn best in context and that social skills should be taught in social situations. A common presupposition of group social skills interventions is that by teaching specific skills and including all members of the learning community (parents, teachers, children), children have the opportunity to succeed both socially and academically.

Barnhill, Cook, Tebbenkamp, & Smith Myles (2002) implemented an 8 week social skills group for 8 participants (7 male, 1 female) with ASD, consisting of direct instruction, role-playing, modeling, and reinforcement through feedback, and focused primarily on teaching paralanguage and facial expressions. At the end of 8 weeks, results suggested no significant

differences on the Diagnostic Assessment of Nonverbal Accuracy 2 scores between pre- and post-tests using the Wilcoxin signed-rank test. Despite the lack of significant findings however, the authors claim that visual examination of the data reveals a slight increase in scores from pre-test to post-test. Parental feedback was also strong: 100% of parents wanted their children to continue in the group, 75% believed their child had developed friendships, and 57% believed their child would call a friend from the group on the phone. The one female participant reported feeling isolated in a group of all boys, but the remaining 7 male participants all reported that they had made friends in the group.

Bauminger (2002) described an intervention program aimed at increasing social-emotional understanding and social interaction among adolescents with ASD. A 7-month, multidimensional program was implemented for 15 children between the ages of 8 and 17 and focused on social cognitive capabilities including social problem solving, emotional understanding, and social interaction abilities. Each participant worked on the intervention curriculum for three hours per week with his or her teacher in class. Additionally, participants met with assigned peers twice per week for peer support, and parents were contacted by teachers on a weekly basis so they could provide support and motivation at home. Social problem solving was measured by an adapted form of the Problem Solving Measure (Lochman & Lampron, 1986), emotional understanding was measured by the Emotion Inventory (Seidner, Stipek, & Feshbach, 1988), and social interaction abilities were measured by researcher observations and the Social Skills Rating Scale—Teacher Version (Gresham & Elliot, 1990). Children showed improvements in social problem solving, emotional understanding, and social interaction abilities across the intervention period and the authors concluded that intervention appeared to be effective, but also acknowledged that it was not possible to make firm conclusions about

causation without a control group. The authors also acknowledged that the design of the study did not enable them to determine which element of multimodal intervention was responsible for participant change. Other factors such as adolescent maturation or the attention and support of a researcher or teacher could be related to participant change.

Lopata, Tomeer, Volker, Nida, and Lee (2008) investigated the benefit of another group intervention program designed specifically for children with ASD. Their study closely explored an intensive summer program for teaching social skills to 54 children (ages 6 to 13) with HFA and AD. In particular, Lopata and colleagues were interested in evaluating the effect of the type of feedback children received during intervention. Children were assigned randomly to either a response-cost feedback group or a feedback group with no behavioral categories or contingencies, and both had manualized instruction from undergraduate and graduate students in psychology and education. The program, Skillstreaming, placed a strong emphasis on teaching, modeling, role-playing, performance feedback, and transfer of learning. Overall program results suggested a significant increase in social skills from pretest to posttest, as measured by the Social Skills index of the Behavior Assessment System for Children, according to both parent (p = .048) and staff report (p = .019). The authors did not find significant differences between the two treatment conditions. Results showed that high rates of performance feedback and reinforcement are significant in promoting effective social skills. The authors also concluded that there is support for the idea that social skills interventions should break behavior down into components and teach skills in part-to-whole sequence while providing feedback. It is important to note that the positive results came from parents and staff and not from the children themselves.

In another study, parent and teacher reports also confirmed positive results using a different, and rather unique, technique to teach social skills in group settings: group

psychotherapy. Tyminski and Moore (2008) investigated the effect of long-term group psychotherapy on the improvement of social skills for 39 children (ages 5 to 16) diagnosed with HFA, AD, or PDD-NOS. The duration of treatment varied depending on the client (i.e. four months to three years) and follow-up assessments were completed at 14 months on average. The children's social development was assessed at home and school, both before and after treatment. Significant improvements were found in both settings and neither was correlated with demographic variables or cognitive development, which according to the authors, implies that the change is due to the intervention. The authors conclude that group psychotherapy is a good way to understand the social skills development and treatment in the many children diagnosed with ASDs.

Another novel study was conducted by Licciardello, Harchik, and Luiselli (2008). Intervention-facilitated social initiation was the focus of the study, as opposed to the more commonly studied social response. Baseline measures were taken and then a social skills intervention, which included pre-teaching, prompting, praise, and reward, was implemented for four students between the ages of 6 and 8 with ASDs. Observations were recorded by the research team and based on their data, the authors concluded that the number of social initiations and responses "meaningfully increased" throughout the intervention. Note that the results are based on researcher report of behavior and therefore reflect the researchers' assumptions about socially appropriate and inappropriate behavior.

More recently, Stichter and colleagues (2010) published a study that examined the effectiveness of a group-based social competence intervention for adolescents (aged 11-14) with HFA and Asperger's. This particular study utilized cognitive behavioral techniques to improve adolescents' skills in perceiving and understanding emotions, theory of mind, and executive

functioning. Over twenty hours of intervention (i.e. one hour group, twice a week after school, for ten weeks), 29 male adolescents made significant improvement in facial expression recognition, theory of mind, and problem solving. Though these results were promising, the authors suggested that this intervention needs further investigation through larger sample sizes and an exploration of generalization through application in naturalistic settings. An initial investigation of generalization revealed some social skill improvement and gains in executive function, based on teacher report, and some improvement in facial recognition based on direct observation (Schmidt, Stichter, Lierheimer, McGhee, & O'Connor, 2011).

To many, randomized controlled trials are considered the gold standard in research practices (Chambless & Hollon, 1998). Beaumont & Sofronoff (2008) researched the effects of a social skills intervention program called The Junior Detective Training Program by randomly assigning 49 elementary-aged children with AD to an intervention or wait-list control condition. The seven-week program had multiple components including computer games, small group session, parent training, and teacher handouts. Through these various modalities, the goal of intervention was to improve skills in emotion recognition, emotion regulation, and social interaction. On a parent-report social skills measure (i.e., the Social Skills Questionnaire-Parent), the intervention group made significant improvements from pre- to post-treatment ($p < .001$) whereas the wait-list controls did not. In addition, the scores improved from the Clinically Significant to Normal range, suggesting clinically meaningful gains. On measures of emotion-recognition, the treatment group did not make greater gains than wait-list controls. On the measure of emotion regulation however, the treatment group improved more than controls and maintained gains at 6-week follow up. Finally, there was not enough teacher-reported data to

determine generalization effects. The authors concluded that the intervention was effective in improving social skills and emotional understanding.

Williams White, Keonig, and Scahill (2006) conducted a review of group-based social skills training programs for school-aged youth with ASD. The studies in Williams White, Keonig, and Scahill's (2006) review varied in method and included pre-post, controlled, and single-subject designs. Overall, the review identified several promising treatments, but also highlighted numerous methodological weaknesses of the reviewed studies. Many studies showed non-significant changes in social skills, differences in outcomes based on reporter, and poorly defined social skills deficits.

In general, the individual studies reviewed here, as well as the results of a comprehensive review (i.e., Williams White, Keonig, and Scahill, 2006) indicate that results vary when teaching social skills in group contexts. Furthermore, there are various ways of teaching social skills: in-school universal programs, intensive targeted summer programs, after-school cognitive behavioral groups, or targeted psychotherapy sessions, for example. With success across programs, it is difficult to draw conclusions about what the critical causal mechanism is for improvements in social skills for children and youth with ASD. Also, since different authors define social competence in multiple ways, it is difficult to determine which social skills are most important for developing positive peer relationships.

Individual interventions. Researchers have also investigated the effects of individualized programs. Individual interventions more specifically address the unique behaviors of individuals rather than generalizing curriculum to large groups of students. This is generally thought to be an effective strategy with individuals who have ASD because there is such great variation in individual behaviors.

For example, Frederickson, Simmonds, Evands, and Soulsby (2007) conducted a study assessing the social and affective outcomes of inclusion. The authors compared three groups of children: those previously attending a special school who had recently transitioned into an inclusive classroom, those with special needs who had always been mainstreamed, and typically developing students. A total of 397 children aged eight to eleven participated, 14 of who had recently transitioned. Twelve of those 14 children had been diagnosed with ASD and were receiving individualized support from an outreach program team. The children were compared on a number of measures, such as social acceptance, belonging, and bullying. Students who were transitioning into an inclusive classroom and had an extensive team to help with this transition experienced positive emotional and affective outcomes and reported feeling like they belonged, as measured by The Belonging Scale (adapted from the Psychological Sense of School Membership; Goodenow, 1993). The special education students who had always been mainstreamed and did not have this team experienced many more negative social and affective outcomes. What this study shows is that tailoring an intervention to the needs of an individual or buffering a new social experience with individual supports may produce more positive outcomes (as the outreach team did in this study; Frederickson et al., 2007).

Sansosti and Powell-Smith (2008) similarly showed that individualized interventions could have a positive effect. They investigated the effects of computer-presented social stories and video models on the social communication skills of three boys (aged six to ten) with an ASD diagnosis. Each social story and video model was tailored to the child's specific skill deficits and a multiple-baseline across-subjects design was used to evaluate change. The social stories and video models were used in the classroom setting and observation data was collected in order to track the improvement of skills over time. The authors observed the students in various

settings to document generalization effects and also performed follow up assessments to track maintenance effects. Various modifications (e.g., teacher prompting) to the intervention were made suggesting that students' individual needs are crucial to developing a successful intervention. Overall, the authors concluded that the intervention was effective, but noted that because individual modifications were made the computer-presented stories and video models may not have been the effective components of change. Ultimately, it is impossible to tell whether the stories, computer, researcher, teacher, or attention the child received was the cause of change.

Similar to group interventions, individual interventions leave researchers, practitioners, and families with more questions than answers. What these studies have shown is that two other tactics (i.e. outreach teams, and computer-presented social stories and video modeling) have some positive effect on the increase of social skills in individuals with ASDs. It is unknown from these two studies, however, why these programs change behaviors, how long the changes last, and how the interventions can be generalized.

Numerous case studies exist in the research literature that demonstrate improvement in social skill development for individuals with ASD. It would be beyond the scope of this review to discuss all of them or attempt to synthesize the data. However, it is important to note that emphasizing the needs of individuals and the context in which individuals develop may be an important aspect of intervention implementation. Moreover, single-case research has demonstrated great effectiveness of social skills interventions for individuals, particularly when multiple-baseline and reversal designs are used (Wang, Parrila, & Cui, 2012). Wang, Parrila, and Cui (2012) conducted a meta-analysis of 115 single-case studies with 343 participants and found that overall, social skills interventions tend to be effective for those with ASD. They also

found, however, that length of intervention, quality of intervention, gender, and age of participants, were not significant predictors of effectiveness. They did find however, that study design was predictive of effectiveness and more specifically, that multiple baseline and reversal study designs more frequently showed better outcomes. This suggests that the way in which one measures outcomes is particularly important when drawing conclusions about intervention effectiveness for this population.

Interventions with peers. Multiple studies have shown that including typically developing children in intervention implementation can be beneficial for students with ASD. Harper, Symon, and Frea (2007) designed a study to address how naturalistic techniques can help improve social skills in children with ASD by testing the effects of a peer-mediated intervention for children with ASD in an elementary school. More specifically, they observed two third-grade students and how they learned social skills from six peer volunteers. These volunteers had been chosen to learn particular strategies and skills for working with individuals with ASD and had been trained over many weeks to learn how to use cards and cues when interacting with their peers with ASD. The dependent variables were specific to each individual and determined by observation, teacher input, and individualized social goals. For example, one student's dependent variables were the number of turn-taking interactions and the number of attempts of gaining peers' attention. There was a large increase in prosocial behavior in the two students with ASD and the study concluded that peer-mediated naturalistic social skills instruction can be effective.

In another study, Knott, Williams, and Lewis (2007) also observed how peers could influence social skills development, but studied family members. Contrasting Harper et al.'s (2007) study of school peers, Knott and colleagues looked at how siblings could influence social

learning. Sibling relationships have been noted as a key point of study in examining how children with ASD acquire social skills, but according to Knott et al. (2007), there has been very little longitudinal research. In this study, siblings were not trained and no intervention was implemented. Rather, naturalistic observation was used to identify patterns of interaction between typically developing children and their developmentally disabled siblings (either diagnosed with autism or Down Syndrome). The study looked at 16 sibling dyads (6 containing a child with ASD and 10 containing a child with Down Syndrome) over 12 months. Changes in the amount and rate of both prosocial and agonistic interaction were measured using behavioral observation.

The results showed that prosocial initiations significantly ($p = < .0001$) increased in children with ASD over a 12-month period, as well as the frequency of imitation ($p = < .005$). The authors conclude siblings can play a special role in social and emotional development, and more specifically that interventions grounded in existing interactions have the potential to more naturally improve a child's patterns of interaction. Similar to Harper et al.'s (2007) study above, this study provides support for the idea that learning in the context of relationships is important.

Although this one study has limited generalizability, it informs the reader about the values underlying peer-mediated interventions. Learning cannot be separated from context and this perspective is very evident in this study. Additionally, there are many published single-case studies that also examine peer-mediated interactions and show strong effects, which suggests some generalizability to other participants and contexts. These few studies of peer-mediated interventions lend support to the claim that there is little conclusive evidence on what specific intervention is most effective. Whereas one study identified school peers who had been trained to use cue cards as effective agents of change, another study identified playtime with siblings as

an effective method of learning. Both studies use different interventions, yet each author claims support for the intervention. Taken together, these studies suggest that although many different interventions may be effective, there may be some specific methods or strategies that are likely to be effective across individuals.

Video modeling interventions. Since many students with ASD have visual processing strengths, video-based interventions have become a more common form of social skills training. This approach is discussed separately from the above group, individual, and peer interventions because video modeling can be delivered in many different formats. The potential strengths of video modeling interventions are abundant, but particularly include the opportunity for frequent repetition in the presentation of material. Ayres and Langone (2005) write, "Consider the time investment needed to have a model (whether a teacher or peer) repeat a behavior several times. Repetition is important but what if the student trying to learn the skill requires more opportunities to view the model than the model has time to perform?" (p. 183). A review of 15 interventions that include the use of video as an intervention tool to teach social skills and functional communication found generally positive results across studies, and therefore did not identify a specific component of video use that leads to improved outcomes (Ayres & Langone, 2005). One important question that remained at the conclusion of this study was which elements were responsible for change? (e.g., Do self-as-model videos produce better outcomes than other-as-model?).

This question has been addressed in numerous studies however (see e.g., Sherer et al., 2001), and ultimately, there are no significant differences between self and other video models. Sherer et al. (2001) used a multiple baseline alternating treatments design with five children to examine rate of skill acquisition with both self and other video models. They found that children

who learned from video modeling learned equally well from both conditions. In general, video modeling is yet another intervention strategy, which may fall into any one of the above categories of intervention. Video modeling may be used on an individual basis or in groups, and may also utilize peers to model appropriate behaviors for individuals with ASD. It has shown some promise in recent literature and is considered a promising evidence based practice (Reichow & Volkmar, 2010).

Factors That Affect Intervention Success

Overall, many forms of social skills instruction appear to be efficacious, and a recent review has indicated that there is "much empirical evidence supporting many different treatments for the social deficits of individuals with autism" (Reichow & Volkmar, 2010, p.149). Evidence-based practices often revolve around manualized curricula, and although numerous manualized curricula can be purchased to teach social skills to children and adolescents with ASD, each may embrace different methods and modes of delivery, and none are necessarily appropriate and effective for all individuals with ASD. A better approach may be to consider guidelines for best practice that can be utilized within various intervention approaches.

Best practice guidelines for effective social skills training with individuals who have ASD include four steps: 1) identifying/targeting specific social skills, 2) distinguishing between skill and performance deficits, 3) direct and systematized instruction, and 4) monitoring student performance (Sansosti, Powell-Smith, & Cowan, 2010). These are basic steps that fit within a problem-solving model grounded in data based decision-making.

Identifying and targeting specific social skills is an important part of this process, as much of the literature above demonstrates that individuals with ASD may have different needs across the lifespan. Additionally, those with ASD may have varying perceptions of which skills

are most relevant and important in their social contexts. Distinguishing between skill and performance deficits is also a logical step in order to determine the type of support or instruction that will be most supportive for the individual. Choosing how to provide direct and systematized instruction is perhaps a more challenging step in this process.

According to Sansosti, Powell-Smith, & Cowan (2010) there are six important steps to systematic instruction: 1) provide rationale for the skill to be taught, 2) preview the skill to be taught, the activities, and the time, 3) discussion, 4) modeling, 5) role-playing, and 6) constructive evaluation of performance. The research highlighted above has demonstrated that there are multiple ways to teach social skills effectively. However, there does seem to be some evidence that strategies that embrace elements of discussion, modeling, and practice appear to be most effective. Finally, the fourth suggested step of monitoring progress is important to determine if intervention is in fact leading to the intended outcomes.

Key Factors for Online Intervention Development and Implementation

Based on the reviewed research on challenges for those with ASD and successful intervention strategies, video modeling was selected as the intervention mechanism for the current study. In comparison to studies on video modeling discussed previously in this review, the goal of this study was to investigate video modeling delivered asynchronously over the Internet. Therefore, a brief review of video modeling procedures, a rationale for online intervention, and a discussion of the intervention structure for the current study are appropriate.

Video modeling intervention procedures. Video modeling interventions involve a "procedure in which a learner is shown a videotape of a model performing a target behavior or completing a desired task" (Sigafoos, O'Reilly, & de la Cruz, 2007, p. 1). Video modeling may take place in a variety of contexts (e.g., school, home, therapy, etc.) and can be done with self-as-

model or other-as-model. Most often, "after viewing the entire videotape-from start to finish-the learner is given the opportunity to perform the modeled behavior or complete the task that was demonstrated in the video" (Sigafoos, O'Reilly, & de la Cruz, 2007, p. 1). Practice opportunities, immediate feedback, and reinforcement are thought to be critical intervention elements. Other researchers, Sansosti, Powell-Smith, and Cowan, have most clearly described the necessary video modeling procedures with the following six steps:

1) Select a skill to be taught by the video model.
2) Break the target skill down into smaller, teachable units.
3) Write a script for the video model.
4) Train models to engage in the skill.
5) Record the model and edit the video clip.
6) Implement the video modeling intervention and monitor effectiveness (2010, p. 147).

Throughout the video modeling literature, it is apparent that opportunities for repeated viewing of the target skill are also typical of video modeling interventions.

Using these video modeling procedures, many researchers have demonstrated the effectiveness of video modeling, which is why it has come to be regarded as an evidence-based practice (Bellini & Hopf, 2007). The utility of video modeling for computer based interventions however, is less well established. Given the evidence that video modeling interventions are efficacious, it seems appropriate to investigate more efficient ways of delivering video modeling interventions to children and youth. If research can provide evidence that the computer-based delivery of video modeling is an instructionally sound practice, this may provide an efficient and effective way to make treatment widely and easily accessible.

Rationale for online interventions. When developing a computer-based or online social skills intervention, it is important to consider evidence-based practices for social skills intervention, the unique features of computers and the Internet, and research on adolescents' use of technology. Each of these considerations is important to ensure that the intervention structure is most appropriate for the participants receiving the intervention.

Based on the existing social skills intervention literature, Krasny et al. (2003) outlined several important elements for successful group intervention for individuals with ASD (see Table 1). They state, "These principles can be used to develop new curricula, modify existing curricula to make them more accessible and relevant to people with autism, or evaluate programs to determine their potential usefulness for people with ASD. These essential ingredients are not mutually exclusive, nor are they an exhaustive list of all possible best practices in social skills training" (Krasny et al., 2003, p. 110). Two of the central principles identified by Krasny and colleagues (2003), were to "provide multiple and varied learning opportunities" and to "provide opportunities for programmed generalization and ongoing practice" (p. 111). Computer based interventions offer both of these opportunities.

Using computers to facilitate skill development for individuals with ASD has become a promising strategy and has been investigated in numerous research studies. Intervention strategies that engage technology (e.g., video-modeling, computer-presented Social Stories, etc.) have become common in the research literature, but the majority focus on computer or technology use in the context of a laboratory, classroom, or face-to-face group intervention (see e.g., Silver & Oakes, 2001). For high functioning adolescents with ASD who participate in general education classes, participate in after school activities, or hold part-time jobs, classroom instruction or face-to-face intervention opportunities are limited. All of the intervention strategies

discussed above may simply not be appropriate for a particular group of students with ASD (i.e. higher functioning adolescents who do not access special education supports in schools or

Table 1

Krasny et al.'s (2003) Essential Ingredients of Group Social Skills Curricula

Central principles	Implementation examples
Make the abstract concrete	Explicitly define skills/problems
	Use ''if-then'' rules
	Provide visual cues and prompts
Provide structure and predictability	Follow consistent weekly routine
	Use consistent opening and closing formats
	Provide schedules or lists of group activities
	Engage in concrete tasks that ease transitions
Provide scaffolded language support	Group children by language level
	Simplify language
	Use visual supports
	Provide language models and scripts
Provide multiple and varied learning opportunities	Offer multisensory opportunities
	Vary activities, materials, and teaching techniques within and across sessions
	Alternate size of work group
Include ''other''-focused activities	Always work in pairs or groups
	Foster cooperation and partnership
	Teach perspective-taking skills
	Highlight peers' preferences and interests
Foster self-awareness and self-esteem	Create positive, nurturing environment
	Identify individual strengths and positive attributes
	Examine ASD strengths and positive attributes
	Provide constructive feedback
Select relevant goals	Prioritize skills that are most salient to ASD
	Utilize socially relevant activities
	Provide rationale for skill use
	Individualize goals and skill development
Program in a sequential and progressive manner	Simplify complex behaviors into specific skills
	Teach skills sequentially
	Integrate and practice mastered skills together
Provide opportunities for programmed generalization and ongoing practice	Use multiple and varied learning opportunities
	Provide generalization activities for home & school
	Practice with varied people and settings
	Offer social skills training in a school

therapeutic supports outside of school). Providing opportunities for students with ASD to participate in the least restrictive environment, while also providing supports and resources for the challenges associated with ASD, presents a complex issue. One possible solution is to provide intervention content and resources, as well as opportunities to interact with others, in an online community or forum. Additionally, this mode of service delivery allows adolescents to improve their skills in a more private way that avoids labeling or the stigma that may be associated with school-based mental health services.

The Internet has become a popular mode of communication for those with ASD as it eliminates many of the challenging nonverbal components of interpersonal interaction. It appears that many adolescents with ASD prefer communicating on the Internet and therefore it could be a successful method for delivering intervention (Burke, Kraut, & Williams, 2010). Although the effectiveness of the Internet as a mode of delivery has not been examined yet, computer-aided instruction was recently identified as an emerging practice in the National Standards Project (National Autism Center, 2009) and was identified as an evidence-based practice by the National Professional Development Center on ASD (National Professional Development Center, 2011). Numerous articles in popular media have been tackling this issue (see e.g., Blume, 1997) and the large numbers of adolescent members of online communities, such as WrongPlanet.net, indicate a preference for computer-based communication. Multiple explanations have been proposed for why those with ASD may prefer online communication. Benford (2008) writes, "Online communication may compensate for difficulties with spoken and/or face-to-face social interaction and the lack of offline social interaction which may result from such barriers. The different synchronicity of Internet-based communication, the use of text rather than speech, and the lack of nonverbal communication have been raised as possible factors

which may make online interaction easier, perhaps more comfortable, for people with HFA/AS." In Benford's (2008) online survey of 138 adults with HFA/AS, respondents indicated their top two reasons for using the Internet were to have contact with others who had a shared hobby or interest and because they simply enjoyed this type of communication.

There are many assumed benefits to delivering social skills instruction online. In fact, "Virtual communities can be seen as mental health and social support interventions" in and of themselves (Eysenbach, Powell, Englesakis, Rizo, & Stern, 2004). Online communities provide opportunities for individuals who are geographically distant to communicate in real time. People with no prior acquaintance who share similar interests are able to connect in online communities and this connection can often result in members providing one another with social support (DiMaggio, Hargittai, Neuman, & Robinson, 2001). Numerous studies have been completed examining the health benefits of online support networks and virtual communities and the results of those studies are mixed (Eysenbach et al., 2004). There are few studies that explore the utility of online communities for virtual learning environments for those with ASD, however. Burke et al. (2010) suggest that computer-mediated communication may be useful for individuals with ASD for both social reasons and practical reasons. Virtual learning environments have recently begun to be explored as a possible mechanism of social skills instruction for those with ASD. Even though there are many potential benefits to virtual learning environments, one valid argument against this is that many virtual learning environments provide a nonsocial environment for learning that may inhibit generalization of skills to more social environments (Bishop, 2003). In order to make training more relevant to real-life interactions, Bishop (2003) suggests that virtual learning environments should be used in collaboration with others.

"Telehealth", "telepsychiatry", and "virtual therapy" are all terms used to describe the emerging phenomenon of individuals seeking mental health services on the Internet. There are multiple pros and cons to this form of service delivery, but one promising aspect is that it may provide services to those who are unable or unwilling to seek services elsewhere, as the anonymity of online therapy reduces some of the stigma associated with accessing mental health services (Stross, 2011). Perceptions of support and specific needs of individuals should be addressed in all interventions, as perceptions of support are correlated with overall quality of life in adults with ASD (Renty & Roeyers, as cited in Harmse & Pottas, 2010). Tynes (2007) suggests that online social networks and virtual communities can be an important source of psychosocial support for teens. These online communities provide opportunities for adolescents to seek help and support from others who are like them and ask questions that they may not otherwise feel comfortable asking someone. Communicating via the Internet can be a unique form of relationship formation and maintenance that may lead to greater feelings of social support for individuals. This has not yet been empirically supported for adolescents with ASD, however, and therefore is worth investigating.

Proposed structure for online implementation of video modeling. There is a lack of research on best practices for online implementation of video modeling. Drawing on best practice guidelines for social skills interventions and research on computer-mediated interventions, however, this researcher has identified specific intervention components that seem critical for online implementation of video modeling. First and foremost, without an intervention facilitator it becomes most important that the intervention procedures are specific and easily understood by the intended audience. The online format must be appropriate for the age and ability level of the intended recipients and must be easy to navigate. Structure and predictability

are important, as well as a clear sequence of lessons. Additionally, since a facilitator is not present to provide praise or reinforcement for attending to videos, it is important that the online program be visually appealing, yet not over stimulating. Each of these goals can be accomplished by selecting an appropriate online platform.

Another key factor is to choose appropriate intervention content. Relevant goals, multiple learning opportunities, and practice opportunities are important. This can be accomplished by matching the target skills displayed in the videos to participants' needs, having videos that participants can identify with, and providing suggestions for practice opportunities that may occur in participants' daily lives. Given the lack of an in-person facilitator, the immediate practice opportunities that take place in most video modeling interventions are not possible within an asynchronous online intervention. One way to implement this important feature of video modeling interventions may be to provide a quiz with video models to check for understanding after the skill is taught. Quiz feedback may serve a similar purpose and provides a method for monitoring one aspect of learner performance.

With online implementation of video modeling, another feature that is noticeable absent is other peers. While some video modeling interventions are implemented independently, others occur in groups and provide socialization opportunities in addition to instruction. To target this important feature of face-to-face intervention, an online intervention should provide opportunities for social interaction between participants. This may help to promote relationship building, support seeking, or intervention debriefing. Methods for increasing opportunities for social interaction include discussion forums, instant message, or group chats.

The specific intervention components chosen for the current study, as well as the rationale for each, are described in the Methods section of this dissertation.

Current Study Research Questions and Hypotheses

This literature review has described social skills problems and psychological adjustment problems for those with ASD, success of previous social skills interventions, the factors that affect intervention success, and key factors for the development and implementation of an online intervention. Many social skills intervention strategies have proven to be effective, but high functioning adolescents with ASD may not always access those interventions and may still be a challenging group to serve. In addition, adolescents with ASD face potential mental health challenges, which may or may not be clearly related to their social skills difficulties. In considering the intervention effectiveness literature and the best practice guidelines for intervention implementation, it was appropriate to investigate the effectiveness of video-modeling instruction delivered through the Internet to improve social communication skills. It was also appropriate however, to consider multiple forms of measurement in order to gain a complete picture of skill development over time. Finally, it was important to further investigate the relationships between social skills and skill development, and mental health outcomes. To address these goals, and with the research literature in mind, the following research questions and hypotheses were written.

This dissertation addresses the following research questions.

Research Question 1. *Does an online social skills intervention with video modeling improve social skills and social support?*

It was hypothesized that the intervention group would show greater improvement in social skills and perceptions of social support over the course of intervention in comparison to the wait-list control group.

Research Question 2. *How do parents and adolescents in the intervention group compare in their views of social skill improvement?*

It was hypothesized that parents and adolescents would have different perspectives of the adolescents' social skills improvement.

Research Question 3. *How do attitudes about the intervention relate to intervention outcomes?*

It was hypothesized that attitudes about the interventions would predict intervention outcomes (i.e. changes in social and emotional functioning).

Research Question 4A. *Are social skills and perceptions of social support predictive of academic achievement or mental health problems?*

It was hypothesized that parent and adolescent reports of social skills and perceptions of social support would be predictive of mental health problems and academic achievement.

Research Question 4B. *Are these relationships different depending on adolescent- or parent-report?*

It was expected that the strength of these relationships would vary depending on reporter.

Research Question 5. *Are adolescents' self-reported changes in social skills related to changes in mental health problems?*

It was hypothesized that changes in social functioning would predict changes in mental health problems.

CHAPTER 3

Research Methods

The online intervention used in the current study builds on a pre-dissertation study by the author. In this section, the procedures in developing the intervention are first detailed, followed by the current study procedures.

Pre-Dissertation Study

A pre-dissertation study was conducted to inform the development of the intervention for the current study. From May 2011 through August 2011, adolescent members of WrongPlanet.net, an online community for individuals with ASD, were invited to participate in a research study online. The purpose of this study was to invite adolescent forum members to share their perceptions of how easy or difficult particular social skills are for them and how important they deem those skills to be. In addition, adolescents were asked about their preferred mode of communication with others and their use of online social media. The goal was to gain a greater understanding of adolescents' interpersonal skills and social experiences in order to guide the development of meaningful social skills interventions for higher functioning adolescents with ASD. The reflections of adolescents with ASD and their identification of relevant challenges informed the selection of intervention content for the current dissertation study.

Methods. A study announcement was posted in the discussion forum of an online community for individuals with ASD. The post explained that researchers were interested in gaining the perspective of adolescents with ASD to better understand their experience. The researchers directed interested participants to an online survey that included the informed consent document and a 15-minute survey. The university institutional review board approved

the waiver of parental consent to participate in the survey, but adolescents were encouraged to seek permission from a parent before completing the survey.

The online survey included a demographic questionnaire, communication preferences and social media questions, and a researcher-developed social skills self-assessment. In addition, two open-ended questions invited adolescents to identify any other social skills that were particularly easy or difficult, or any other skills that they felt were important for adolescents to have.

Results. Preliminary analysis of an initial sample of 49 participants indicated that 24 participants reported their gender as female, 23 participants reported their gender as male, and two participants did not report their gender. Participants ranged from 13 to 24 years of age (M = 16.76) and all reported currently attending high school or college. Of the 49 respondents, 47 indicated they were high functioning (i.e. they were best described as having high functioning autism, Asperger's, or pervasive developmental disorder-not otherwise specified), one indicated she had a nonverbal learning disability, one indicated she had high-functioning childhood disintegrative disorder, and none indicated a diagnosis of low functioning autism, childhood disintegrative disorder, or Rett's disorder. Thirty five participants indicated that they took all General Education classes, five indicated they took mostly General Education classes with a few Special Education classes, five indicated they were homeschooled, one indicated that he took all Special Education classes, and three described other schedule arrangements (e.g. gifted classes, testing accommodations). Results indicated that 76% of respondents preferred to communicate with people their age online and 73% use online social media, such as Facebook.

The social skills identified on the survey were ranked according to mean difficulty ratings and mean importance ratings to identify where the greatest overlap exists. Identifying the skills

that adolescents find both extremely difficult and important is a vital step in enabling educators and other practitioners to provide targeted, meaningful, and relevant intervention for adolescents with ASD. Examination of the difficulty ratings and importance ratings, suggested that there are some skills that adolescents find extremely difficult, but not at all important. For example, on a scale of 1 (not at all difficult) to 5 (extremely difficult), asking someone to a school dance received an average rating of 4.58. However, on a scale of 1 (not at all important) to 5 (extremely important), adolescents gave this particular skill an average rating of 1.86. This indicates that adolescents recognized that they are not skilled in engaging in this typical teenage behavior, and it is not very important to them that they are able to do so. There were also skills that adolescents found extremely difficult and extremely important, however, such as talking to someone their age about hobbies, understanding sarcasm, and understanding tone of voice, for example. Overall, this sample of adolescents with ASD highlighted the need for support with various skills, most of which require social communication strategies. These reflections of adolescents with ASD and their description of experiences and challenges influenced the selection of intervention content for this study.

Social Skills Intervention Development

Video model development. Based on this pre-dissertation study, work began to design the intervention to be used in the dissertation research. Specific social behaviors in the area of social communication were selected from the results of the pre-dissertation study and from referencing *Social Skills for Teenagers with Developmental and Autism Spectrum Disorders: The Peers Treatment Manual* (Laugeson & Frankel, 2010). The PEERS program was developed at UCLA's Semel Institute for Neuroscience and Human Behavior and the curriculum has received praise from many leaders in the field of ASD research. Additionally, recent literature has

provided evidence for the efficacy of the PEERS program (see e.g. Laugeson et al., 2012), and therefore the intervention manual was thought to be a good resource. This curriculum was developed for use with teenagers who have ASD and provides materials that target developmentally appropriate social communication skills. Although the manual was not used to implement the PEERS program as described, it breaks down complex social skills into specific behaviors (e.g., entering a conversation) and was used in conjunction with the results of the pre-dissertation study to guide the selection of target behaviors for video modeling (see Table 2 below).

Table 2

Weekly Lesson Topics Adapted From Laugeson & Frankel (2010)

Week 1: Entering a Conversation
Week 2: Exiting a Conversation
Week 3: Two-Way Conversations
Week 4: Beginning Get-Togethers
Week 5: Ending Get-Togethers
Week 6: Handling Disagreements
Week 7: Teasing and Embarrassing Feedback
Week 8: Asking for Help

Video models were developed for each of the target behaviors using the guidelines set forth by Sansosti, Powell-Smith, and Cowan (2010). Additionally, the researcher sought additional instruction from *How to Use Video Modeling and Video Prompting* for the development of the videos (Sigafoos, O'Reilly, & de la Cruz, 2007). Overall, multiple published curricula, instructions, and guidelines were consulted in the development of this intervention in order to draw upon the methods and techniques that have proven successful.

The material from the PEERS curriculum was most closely used as a reference for the development of video model scripts and copyright permissions were obtained from the authors and from the Copyright Clearance Center. Scripts were developed for both a male and female to

portray each target skill so that participants could view gender specific videos. Additionally, three separate videos with different scripts were filmed for each skill and each gender, so that there would be an instructional clip, an example, and non-example, for each of the eight target skills. The total 48 scripts were sent to a high school drama club that had agreed to film the videos for the researcher. The drama club was able to successfully complete 44 of the 48 video clips and the remaining four video clips were filmed by four adolescent acquaintances of the researcher.

Video models were pre-recorded and streamed online for participants to view. The video models were short video clips (i.e. 30-180 seconds) that featured adolescents engaging in each of the target behaviors. A diverse sample of adolescents acted as the models for the videos and were either provided with community service hours or a small incentive for their assistance.

Website development. The Knoodle online learning management system (http://www.knoodle.com/) was used to implement and disseminate the intervention to the intervention group. The Knoodle online learning management system was one of many commercially available systems to facilitate the development of online learning courses. This particular system was chosen because of the ease of content development, the opportunity to integrate video and PowerPoint, the opportunity to create groups within the learning environment, the social interactivity features, and the testing and reporting analytics that are built into the system. Additionally, the cost of this particular system was comparable or less than the cost of other commercially available systems.

Four sample lessons were initially developed on the Knoodle site. Each weekly lesson consisted of the following components: 1) a rationale for skill development, 2) a first view of video model clip, 3) prompts for specific interactions to observe within the video, followed by a

second view of the video model clip, 4) a review of what was seen in the video, 5) a brief assessment to check for understanding (i.e., two video clips followed by a quiz asking for the example of the correct skill), 6) generalization prompts, 7) opportunities for participants to rate the lesson and provide feedback, and 8) opportunities for participant interaction through discussion forums. The quiz was presented through the Knoodle quiz function, but all other components were presented in the form of PowerPoint slides without any audio. Each of the weekly lessons was designed to be completed in approximately 15-30 minutes, with additional time required to practice the new skills as suggested in the generalization prompts.

Intervention revisions. After developing the four weekly lessons, a small feedback session was arranged with adolescents with ASD and their parents to solicit feedback on each of the proposed elements before intervention implementation occurred. A local parent group was solicited for feedback and five parents and three of their adolescent children agreed to meet with the researcher. During a one-hour meeting, the parents and their adolescents viewed the four lessons and offered suggestions and comments. The researcher took notes and at the end of the meeting, reviewed the big ideas to ensure that everyone's voice had been heard. Though unstructured, this meeting provided valuable feedback as parents suggested the following primary changes: 1) present one integrated video clip with the quiz embedded, 2) include voiceover with the text, and 3) add an introductory video to the website that explains how to use the site features.

After making the changes suggested by parents and adolescents, two members of the dissertation committee, one of which has video modeling expertise and another who has online teaching expertise, were consulted for feedback on the draft version of the intervention website. Additional suggestions for improvement included altering the quality of delivery by completing

voiceover recordings with more energy and a slower pace, increasing the font size on the quizzes, providing differential feedback based on quiz response, and decreasing the video file size (without losing quality) so that the video would load more quickly. Unfortunately, changing the font size and providing differential feedback were not possible within the Knoodle quiz function, but all other changes were made. Also at this time, the remaining four lessons were completed with the above feedback in mind. The final elements of the online intervention are displayed in Table 3 below.

Table 3

Elements of Online Intervention

Intervention Element	Description
Introduction to Lesson	Provides a rationale for why the skill is useful or necessary.
Video Clip - First View	Introduces the participant to the video and allows him/her to watch without interruption.
Video Prompts	Provides questions that prompt viewers to watch for particular interactions.
Video Clip - Second View	Replays the video to allow participant to watch for interactions prompted in the previous step.
Review	Provides answers to the questions introduced above.
Brief Skill Assessment	Shows two videos, one example and one non-example, and instructs participants to choose the correct video. Provides feedback to participants regarding their learning outcomes.
Suggestions for Practice	Explicitly communicates how to use the learned skills in real-life settings. Also encourages participants to use the discussion forum to talk about successes and challenges with practicing skills.
Rating of the Lesson/Feedback	Provides method of assessing participant satisfaction and hopefully communicates to participants that their feedback is valued.
Discussion with Peers	Provides opportunity for participants to discuss their successes and challenges with the target skills or other topics with others.

Rationale for intervention components. It is important to provide students with ASD a rationale for why a particular social skill is useful or necessary because they often have little social understanding (Myles, 2005). Sansosti et al. (2010) suggest that, "rationales for teaching social skills should include why the information is important or useful and how the student can use the information taught within the lesson(s)" (p. 136). Additionally, they suggest that, "teaching efforts need to provide students with information regarding what skills are going to be taught, what activities will be used to teach the skills, and the length of time of instruction within each group session." Once students with ASD understand why they are participating in social skills instruction and once they know what to expect, then instruction can begin (Sansosti et al., 2010).

Suggestions for practice opportunities accompanied each target skill as a means of encouraging adolescents to use the knowledge they gained. It has been suggested that one of the greatest drawbacks of virtual interventions is that generalization to real-life settings is less likely to occur (Bishop, 2003). Therefore, suggestions for role-playing and real-life practice opportunities were included with each lesson and participants were requested to report whether or not they followed through with each suggestion in the discussion forums. Additionally, the discussion forums provided an opportunity for participants to discuss their experiences in practicing the learned skills.

Participants were invited to provide feedback on each lesson. The user-rating feature of the online learning management system allowed participants to rate each lesson with one to five stars and also provide qualitative feedback. This not only provided a method of assessing participant satisfaction, but also hopefully communicated to participants that their feedback was valued.

Brief quizzes were used to provide feedback to participants so they could track their progress throughout the intervention. Since there was no instructor present during intervention, the brief quizzes provided some feedback to participants regarding their learning outcomes. When appropriate/necessary, there was an opportunity to contact the researcher. Participants were able to view each lesson multiple times throughout the 8-week intervention and were allowed to retake quizzes in order to maximize opportunities for success.

Discussion forums were provided as an opportunity for peers to interact with others who possibly share similar interests, strengths, difficulties, and concerns. Discussion forums provide a form of asynchronous communication that allows multiple people in geographically distant locations to interact with one another. It has been found that those with ASD do use technology to interact with peers, but prefer nonverbal methods of doing so (i.e., cell phones are used for text messaging more frequently than they are for phone calls; Durkin, Whitehouse, Jaquet, Ziatas, & Walker, 2010). The discussion forums were monitored, but not moderated, as research shows that adolescents are likely to engage in more social conversation when the discussion is not moderated (Oren, Mioduser, & Nachmias, 2002). There was also a mechanism for participants to report inappropriate behavior to the researcher.

Final considerations. Oren and colleagues (2002) have suggested four guidelines for establishing virtual learning groups that support the development of a positive social climate:

1) Teachers should moderate the group's work in a way that enables students to interact. They should act mainly as facilitators of processes and they minimize their interventions so as to allow students to gain knowledge from each other and manage discussions independently. They should therefore refrain from dominating the discussion and from interacting mainly with individual students (the one -to-many teacher-centric template

typical of the frontal classroom), encouraging instead dense student-to-student interactions.

2) They should also encourage participants to act friendly with each other and create a relaxed and calm atmosphere.
3) Online course moderators should be attentive to participants' social needs, and offer a legitimate platform for messages (or parts in messages) that have social rather than solely content significance.
4) It is crucial to enhance the social atmosphere by using supportive feedback, discussing with the group ways to facilitate the creation of social interactions, emphasizing the importance of peer feedback, and by encouraging students to relate to each other during the learning activities and beyond (p. 7).

Finally, the following guidelines are suggested by Murray (as cited in Walsh, 2009) for developing an online environment that can cater to a learner with ASD: reduced stimuli, visual cues, repetition, clear cut rules, lack of affect, structure, predictability, controllability, interest, and unhurried pace. Overall, the online learning management system, Knoodle, was selected based on the above-described guidelines and the above-stated rationales for particular intervention elements.

Recruitment

Following the completion of the intervention website and approval from the Michigan State University Institutional Review Board, participants were recruited through the Interactive Autism Network (IAN) Community (see http://www.iancommunity.org/). This is an online community, developed at the Kennedy Krieger Institute, designed to link researchers and the ASD community. The researcher submitted an application to IAN along with the IRB-approved

recruitment letter and IAN provided the researcher with the cost for using the recruitment service. The recruitment fee was paid and IAN then forwarded the recruitment letter to all members of the IAN Community who met the study's inclusion criteria (described below). In total, the advertisement was sent to 1488 parents of 1499 children with ASD, with only 11 emails that were not deliverable. The advertisement was only sent to families of children between 13 and 18 years of age who did not have a Mental Retardation diagnosis and were spending half or more of their day in regular education classrooms. Individuals in the IAN database have had their diagnosis of ASD verified by a review of medical records (Daniels et al., 2011) and clinically validated (Lee et al., 2010).

Parents and adolescents who were interested in participating contacted the researcher to be enrolled through an online enrollment form. The online enrollment form asked for parent and adolescent names, adolescent age and grade, and family contact info to send study materials. Additionally, there were items to assess whether or not the participant met inclusion criteria so that only those who qualified were sent further study info. To assess adolescents reading level (one of the inclusion criteria described below), a brief fifth grade passage was presented as an example, and parents were asked to indicate whether their child reads above or below a fifth grade level.

Participants

A power analysis, using G*Power statistical software, was used to establish a minimum participant sample of goal of 128 total participants. Initially, a recruitment goal of 256 was set, which would have allowed for up to 50% attrition while still maintaining adequate statistical power for planned analyses. A total of 89 participants had been recruited and sent pre-test packets with consent forms to begin the study, but only 50 of those packets were returned when

the Knoodle company unexpectedly shut down and announced their website would be closing. At this time, recruitment was stopped, as any additional participants would not have adequate time to complete the intervention. Therefore, participants for this study were 50 adolescents with ASD in grades 9-12, and one parent of each participating adolescent child. All participants were included in analyses of pre-test data, but participants in the intervention group who did not complete any of the online lessons were excluded from any analyses that included post-test data.

Both male and female students were included in this study. Though the incidence of ASD is higher for males, it was believed that female adolescents would benefit from intervention as well. In the pre-dissertation study described above, there were similar numbers of male and female respondents suggesting that many females with ASD may be interested in or desire support in developing social skills. A total of four adolescent females enrolled in the study, but all were randomly assigned to the wait-list control group.

Students in grades 9-12 were included in this study. Students who were retained and students who were promoted were not be excluded from the study, but data were examined during statistical analysis to check for outlying tendencies. Students over 18 years of age were excluded from the study due to the age limitations of selected measures. Finally, only those who had regular Internet access and could use a computer independently were included in this study in order to provide maximum opportunities for participation.

The participant sample was primarily defined according to school placement for the purposes of this study. Only those who spend more than 50% of their time in general education were included in the study. Students who are homeschooled were not included in this study, unless they participated in homeschool groups.

The rationale for including only those who spend 50% of their time or more in general education classes is three-fold. First, as the diagnosis of ASD changes, the diagnostic labels are less informative for communicating information about one's particular skill deficits. Students with diagnostic classifications of Autism, Asperger's, and other PDDs present with various developmental, language, and cognitive delays, and school placement is a more useful way of selecting a group of participants that have some shared characteristics in regard to language and cognitive development.

Second, adolescents with ASD who spend the majority of their time in general education classrooms are participating in a different social context than those who spend the majority of their time in special education classrooms. They interact with typically developing peers more often and are therefore more frequently confronted with misunderstanding typical adolescent interactions.

Finally, the third reason to use class placement for selecting participants was that those in a majority of general education classes are less likely to be receiving intensive social supports or intervention within the schools. As students progress through school grades, there is an increased focus on academics and less emphasis on social-emotional learning. Despite the fact that many high functioning adolescents with ASD can perform well and succeed in general education classes, many still struggle socially and face mental health problems. Although it is important to keep those students enrolled in general education or advanced placement classes to increase chances for success beyond graduation, it is also important to provide them with social and emotional supports. Therefore, this group of participants is an important target group for online intervention that can be utilized outside of the school setting.

An additional, and final, inclusion criterion was that participants must read at a fifth grade reading level or above. This criterion was established to ensure that any students with more severe autism symptoms who spend more than 50 percent of their time in general education due to inclusion policies were excluded from the current study. This also ensured that any students who had significant reading disabilities, but perhaps still spent significant time in general education classes, were excluded from the study. It was important to ensure that study participants had a fifth grade reading level or above so that they were able to successfully read and interpret lesson instructions, quizzes, and peer discussions. Tables 4-7 display demographic, diagnostic, school, and intervention information for all included participants.

Table 4

Demographic Characteristics of Adolescent Participants

Variable	Intervention		Control		Total	
	n	*%*	*n*	*%*	*n*	*%*
Gender						
Male	24	100.0	22	84.6	46	92.0
Female	0	0.0	4	15.4	4	8.0
Age						
14	3	12.5	4	15.4	7	14.0
15	10	41.7	4	15.4	14	28.0
16	3	12.5	10	38.5	13	26.0
17	5	20.8	5	19.2	10	20.0
18	3	12.5	3	11.5	6	12.0
Race						
Hispanic	3	12.5	2	7.7	5	10.0
Asian	0	0.0	1	3.8	1	2.0
White	18	75.0	21	80.8	39	78.0
Multiracial	3	12.5	2	7.7	5	10.0

Table 5

School Demographic Information for Adolescent Participants

Variable	Intervention		Control		Total	
	n	*%*	*n*	*%*	*n*	*%*
Grade						
9	12	50.0	11	42.3	23	46.0
10	8	33.3	9	34.6	17	34.0
11	2	8.3	4	15.4	6	12.0
12	2	8.3	2	7.7	4	8.0
Retained						
Yes	7	29.2	6	23.1	13	26.0
No	17	70.8	20	76.9	37	74.0
Promoted						
Yes	1	4.2	0	0.0	1	2.0
No	23	95.8	26	100.0	49	98.0

Table 6

Diagnostic Information of Adolescent Participants

Variable	Intervention		Control		Total	
	n	*%*	*n*	*%*	*n*	*%*
Age of Diagnosis						
2	4	16.7	1	3.85	5	10.0
3	3	12.5	6	23.1	9	18.0
4	1	4.2	1	3.85	2	4.0
5	0	0.0	3	11.5	3	6.0
6	2	8.3	1	3.85	3	6.0
7	3	12.5	6	23.1	9	18.0
8	3	12.5	3	11.5	6	12.0
9	2	8.3	2	7.7	4	8.0
10	2	8.3	1	3.85	3	6.0
11	2	8.3	1	3.85	3	6.0
12	1	4.2	1	3.85	2	4.0
Missing Data	1	4.2	0	0.0	1	2.0
Diagnosis						
Autism	4	16.7	3	11.5	7	14.0
Asperger's	17	70.8	15	57.7	32	64.0
PDD-NOS	3	12.5	8	30.8	11	22.0
Additional Diagnosis						
Yes	21	87.5	21	80.8	42	84.0
No	3	12.5	5	19.2	8	16.0

Table 7

Intervention Information for Adolescent Participants

Variable	Intervention		Control		Total	
	n	*%*	*n*	*%*	*n*	*%*
Receiving Other Current Intervention(s)						
Yes	7	29.2	9	34.6	16	32.0
No	15	62.5	17	65.4	32	64.0
Missing Data	2	8.3	0	0.0	2	4.0
Received Past Intervention(s)						
Yes	14	58.3	17	65.4	31	62.0
No	8	33.3	9	34.6	17	34.0
Missing Data	2	8.3	0	0.0	2	4.0

Measures and Instruments

Multiple measures were selected to gather information about social, emotional, and academic variables from multiple perspectives at multiple time points. Each measure is described below and Cronbach's alpha for each measure is presented in Table 9.

Social skills. Social skills were measured in three different ways: the Social Skills Improvement System (SSIS; Gresham & Elliot, 2008), the Autism Social Skills Profile (ASSP; Bellini, 2006), and a researcher-developed Likert scale, referred to as Difficulty Likert from here forward.

Social Skills Improvement System. The SSIS measures social skills and problem behaviors from both student and parent perspectives. The rating scale can be administered to students aged 3-18 and their parents, and can be completed in 10-25 minutes. The SSIS-Student is written at a second grade reading level and the SSIS-Parent is written at a fifth grade reading level. The Social Skills domain includes communication, cooperation, assertion, responsibility, empathy, engagement, and self-control subscales. The competing Problem Behaviors domain includes externalizing, bullying, hyperactivity/inattention, internalizing subscales. Additionally, the parent form includes an autism spectrum subscale. This broad assessment of social skills was administered at Time 1 (i.e. before the experimental group received the intervention) and Time 2 (i.e. after the experimental group received the intervention). Internal consistency reliability is above .90 for both scales on both the parent and student forms and test-retest reliability is above .70 for both parent and student forms. Intercorrelations among scales and subscales support content validity, whereas correlations with other reportedly valid measures (e.g., the Social Skills Rating System, the Behavior Assessment System for Children, and the Vineland Adaptive Behavior Scales) support construct validity.

The SSIS subscale raw scores are categorized into Behavior Levels rather than converted to standard scores. For this study, the Problem Behavior subscales were used and therefore the Behavior Levels in Table 8 are relevant for interpreting the data.

Table 8

SSIS Problem Behavior Subscale Raw Scores Corresponding to Behavior Levels

Subscale	Parent Report			Adolescent Report		
	Below Average	Average	Above Average	Below Average	Average	Above Average
Externalizing	---	0-10	11-36	0	1-14	15-36
Bullying	---	0-3	4-15	---	0-5	6-15
Hyperactivity/ Inattention	---	0-7	8-21	0	1-11	12-21
Internalizing	---	0-9	10-30	0	1-13	14-30
Autism Spectrum	0-1	2-13	14-45	---	---	---

Note. From Gresham & Elliot, 2008, p. 201.

Autism Social Skills Profile. The ASSP was designed as a parent- or teacher-report instrument for use with children and adolescents with ASD. In particular, this scale was developed for use as an intervention-planning tool and as a tool for monitoring intervention progress when working with youth with ASD. The 49 items on the ASSP represent skills in initiation, reciprocity, perspective taking, and non-verbal communication. This measure of social skills was administered to parents at Time 1 and Time 2, in addition to the SSIS, as it was believed to potentially be a better measure of change over the course of an 8-week intervention. An analysis of the psychometric properties of the ASSP revealed high internal consistency (.92) and high test-retest reliability (.90) (Bellini & Hopf, 2007). Additionally, principal component analysis revealed a three-factor model that included Social Reciprocity, Social

Participation/Avoidance, and Detrimental Social Behaviors subscales (Bellini & Hopf, 2007).

Difficulty Likert scales. These scales were developed by the researcher to assess participants' perceived difficulty with each of the target intervention skills. Adolescent participants were instructed, "Please rate how difficult you think the following skills are." A scale from 1 (not at all difficult) to 7 (very difficult) was presented and each of the target skills for intervention was listed. Parents were presented with the same Likert scale and same items, but prompted, "Please rate how difficult you think the following skills are for your child". The purpose of these scales was to assess participants' changes in perceived difficulty with the exact skills that were being taught in the intervention. Although the validity of this approach is limited methodologically, it aligns well with this study's theoretical foundation and provided unique information about participant perspectives, as well as more specific information about the particular target skills.

Table 9

Current Study Scale Reliability

Study Measure	Cronbach's Alpha
SSIS Child Social Skills Total Score	.92
SSIS Child Problem Behaviors Total Score	.80
SSIS Parent Social Skills Total Score	.94
SSIS Parent Problem Behaviors Total Score	.78
SSIS Parent Autism Spectrum (Subscale)	.49
RCMAS-2 Total Score	.89
RADS-2 Total Score	.88
ASSP Total Score	.91
Child Difficulty Likert Ratings	.84
Parent Difficulty Likert Ratings	.81
Child MSPSS Total Score	.90
Parent MSPSS Total Score	.86
Perceived Competence for Learning Scale	.81
IMI – Interest/Enjoyment	.95
Attitude Toward Using Technology	.85

Perceived social support. Parents' and adolescents' perceptions of adolescents' social support were measured using the Multidimensional Scale of Perceived Social Support (MSPSS; Zimet, Dahlem, Zimet, & Farley, 1988). The scale consists of 12 items that are answered on a 7-point rating scale. The 12 items can be divided into three factor groups that address the source of social support: family, friends, and significant other. The scale is brief, is written at a fourth grade level, and improves upon other scales that only assess support from family and friends (e.g., Procidano & Heller, 1983) making it a useful tool for conducting research with various groups. Though initially developed using a sample of university students, the MSPSS has been widely tested and used across diverse samples, including adolescents (see Canty-Mitchell & Zimet, 2000; Cheng & Chan, 2004). The authors of the scale report internal consistency of .88 (.91 for significant other, .87 for family, and .85 for friends) and test-retest reliability of .85 (.72 for significant other, .85 for family, and .75 for friends). Internal consistency of the MSPSS was strong when examined in a prior unpublished study (i.e., this author's thesis) of 12 adolescents with ASD (.88 total, .81 for significant other, .95 for family, and .97 for friends). Construct validity of the MSPSS was assessed during scale development based on the hypothesis that perceived social support would be negatively related to reported depression and anxiety symptoms. Zimet et al., 1988 found that perceived social support was inversely related to reported depression on the Hopkins Symptoms Checklist (Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974) at the $p = < .01$ level for all three constructs and for the scale as a whole. Additionally, they found that perceived social support from family was inversely related to reported anxiety on the Hopkins Symptom Checklist ($p = < .01$).

This self-report scale was slightly adapted for use as a parent-report survey as well. Each item of the questionnaire was altered to allow parents to provide their perceptions of the

adolescent's social support. This adaptation was made in a prior unpublished study (i.e., this author's thesis), and internal consistency remained high (.86 total, .87 for significant other, .92 for family, and .97 for friends). In the current study, reliability estimates of the parent measure were obtained before statistical analysis was completed to ensure that the scale maintained adequate internal-consistency reliability despite the adaptation (see Results).

Depression. Participants were asked to complete the Reynolds Adolescent Depression Scale, Second Edition (RADS-2; Reynolds, 2002) at Time 1 and Time 2. The RADS-2 is a brief screener for adolescent depression that includes 30 items written at a third grade level. It can be administered to adolescents aged 11 to 20 and completed in five to 10 minutes. The items cover dysphoric mood, anhedonia/negative affect, negative self-evaluation, and somatic complaints. The RADS-2 yields a total score as well as clinical cutoff scores that allow evaluation of symptom severity into normal, mild, moderate, and severe categories. Internal consistency reliability for Depression Total is .94, whereas test-retest reliability is .85. Content and construct validity are supported by numerous empirical studies detailed in the professional manual.

Anxiety. Anxiety was measured using the Revised Children's Manifest Anxiety Scale, Second Edition (RCMAS-2; Reynolds & Richmond, 2008) at Time 1 and Time 2. The RCMAS-2 is a self-report inventory that allows for the screening of anxiety in children from six to 19 years old. It is written in a simple yes-no response format and can be completed in approximately 10 minutes. The RCMAS-2 consists of 49 items covering scales of physiological anxiety, worry, social anxiety, and defensiveness, as well as an inconsistent responding index. Internal consistency reliability for Total Anxiety is .92, whereas test-retest reliability is .76. Interscale correlations were moderate to high suggesting adequate content validity.

Demographic information. Parents were asked to complete a demographic

questionnaire (see Appendix B) that includes items for the adolescent participants' gender, age, grade, race, relevant educational history, diagnostic information, and relevant intervention history. Additionally, on this demographic survey, parents were asked to report adolescents' current grades and GPA as measures of academic achievement. GPA was reported on a 4.0 scale, whereas grades were reported as Mostly As, Mostly Bs, Mostly Cs, Mostly Ds, or Mostly Fs and then converted to a 5-point ordinal scale. If more than one grade category was selected, the median score was used for analysis.

Attitudes. To examine the influence of various contextual factors on adolescents' experience using the online intervention, three different scales were used to assess the attitudes of participants in the intervention group. Each of these scales measuring attitudes was slightly adapted for the current study, and therefore reliability of each scale was assessed with the current study sample prior to conducting any statistical analyses.

Intrinsic Motivation Inventory. The perceived competence and interest/enjoyment subscales of the Intrinsic Motivation Inventory (IMI; Ryan, 1982) were used to assess participants perceived competence for learning social skills and their enjoyment of the online intervention. The IMI is a multidimensional measure that is used to assess participants' subjective experiences of an activity. It has been used in many research studies across disciplines, including education, and has been validated in several experiments (see selfdeterminationtheory.org for a list of selected publications).

Attitude Toward Using Technology Scale. Finally, participants' attitudes toward the online course management system (i.e. Knoodle) were assessed with a 4-item Likert scale (Venkatesh, Morris, Davis, & Davis, 2003). This scale, although not often used in intervention studies, has strong research support in the communications and information technology

literature, as it is an integral part of the well-known Technology Acceptance Model (Venkatesh & Davis, 2000).

Exposure. The number of weekly lessons completed was used to measure participation and was recorded by the online learning management system. This also served as a measure of treatment integrity to ensure that participants in the intervention group were in fact viewing the intervention lessons.

Participant satisfaction. Additionally, participant ratings of the online intervention lessons were used to examine participant satisfaction. The user-rating feature of the online learning management system allowed participants to rate each lesson with one to five stars and also provide qualitative feedback.

Procedure

Time 1 assessment. All enrolled participants were sent a pre-test packet following enrollment in the study. Though online pre-test measures would have been ideal, it was not possible to use copyrighted, standardized measures online. The pre-test packet included a welcome letter, consent form, assent form, a demographic questionnaire, and all Time 1 measures (i.e., SSIS, ASSP, MSPSS, Difficulty Likert scales, Perceived Competence for Learning scale, RADS-2, RCMAS-2). Parents and adolescents were instructed to complete and return all documents within a 1-week period. Upon receiving a complete packet, the researcher provided the participant with a $10 incentive.

Implementation. As pre-test packets were received, participants were assigned to either the online video modeling intervention or a wait-list control group using random assignment. More specifically, a random number generator was used to assign the participants to two

conditions. One group was asked to begin the 8-week intervention immediately and the other was put on a waiting list.

The intervention began with a brief welcome in Week 1 to explain the purpose and structure of intervention. Additionally, a participation agreement form that detailed the norms and expectations for communicating in the discussion forums was shared with participants. The purpose of this agreement was to explicitly communicate the social norms of online communication and to minimize the risk of bullying among participants. Participants had to agree to abide by the proposed expectations before beginning the intervention. Following the introduction, each weekly lesson was focused on social communication skills (see Table 2).

While the intervention was in progress, Knoodle suddenly announced the closing of their company. The researcher received a two-week notice of the website shutting down and therefore, the best solution was to have all currently enrolled intervention participants to complete a 6-week intervention rather than the intended 8-week intervention (i.e. lessons seven and eight were dropped from the intervention). After an immediate, careful review of alternatives, a replacement website, Mindflash (http://www.mindflash.com/home) was promptly selected for the control group. Mindflash is a similar course management system that provides a user-friendly interface, opportunities for video streaming, PowerPoint presentation, quizzes, surveys, and reporting analytics. Unlike Knoodle, Mindflash does not provide options for social interaction between users. However, also unlike Knoodle, Mindflash does provide opportunities for differentiated feedback within the quiz function. Most importantly, Mindflash allowed for participant anonymity and a site that could be developed with a similar structure and in a timely manner.

Time 2 assessment. Immediately following the conclusion of intervention, post-test measures (i.e., SSIS, ASSP, Difficulty Likert scales, RADS-2, RCMAS-2, and attitudes scales) were mailed to adolescents and their parents in both groups. Similar to pre-test packets, it was requested that materials were returned within a 1-week period. After post-test packets were returned, $10 incentives were sent to participants. At that time, participants in the wait-list control group began the intervention on the Mindflash site. Participants in both groups who participated fully throughout the duration of the study were entered in a raffle for one of two pocket video cameras at the conclusion of the study.

CHAPTER 4

Results

All raw participant data were entered into IBM SPSS Statistics software on a password-protected computer. Identification numbers assigned to each participant were entered into the database; no identifying information was recorded in the data set. The researcher wrote syntax to calculate total scores (e.g., standard scores, *T*-scores, and difference scores) for all relevant variables in the data set. Intervention metadata and preliminary data checks are discussed first, followed by the results of each of the research questions. Due to the large number of measures utilized in this study, and the various statistical procedures used across research questions, preliminary analyses and descriptive statistics are presented separately for each research question.

Intervention Metadata

In order to appropriately analyze the study data, it is first important to look at the metadata, which provide a better understanding of the extent to which participants utilized the intervention components. In Table 10 below, data regarding lessons completed, posts in the discussion forum, and lesson ratings are presented.

The data show that on average, participants completed just over two thirds of the available lessons. Of those lessons completed, participants were able to answer the quiz questions correctly in approximately 97 percent of attempts made. Lessons were rated an average of 3.8 out of five stars, and all six lessons were rated similarly.

Unexpectedly, the discussion forum was utilized infrequently and only four of the 24 intervention participants posted at all. Although a rationale was provided in the introduction to this dissertation for examining online communities, and research literature suggests positive

social-emotional effects for virtual communities, it is not appropriate to examine such effects within this study given the lack of use of the discussion forum component. As such, the research questions below will not address changes in social support over time. Those changes were expected to result from the opportunities provided by the discussion forum, and participants did not pursue those opportunities.

Table 10

Intervention Metadata

Intervention Participants	$N = 24$
Lessons Completed (6 Possible Lessons)	$M = 4.5$
Quiz Scores	Average % Correct: 97.2 Average % Incorrect: 2.8
Lesson Ratings (5 Stars Possible)	$M = 3.8$; Range 3.7-4
Users Completing Weekly Ratings	$M = 7.8$; Range 5-14
Discussion Posts	$N = 9$
Users Posting in Forum	$N = 4$

Preliminary Data Checks

To ensure accurate data entry and syntax accuracy, a minimum of ten percent of each measure was also hand-scored and compared to the SPSS dataset to check for inaccuracies. Any inaccuracies that were found were corrected by comparing the SPSS database with the raw data to identify errors. Additionally, raw data were visually examined and descriptive statistics were used to check for errors. No more than two errors were found across all measures.

Prior to examining the results of any analyses, reliability checks were completed for each of the study measures. For the purposes of this study, reliability above 0.70 was considered

acceptable, as suggested by George and Mallery (2003). As seen in Table 8, all measures had reliabilities at or greater than 0.70 except for the Autism Spectrum subscale of the Parent SSIS measure.

Research Question 1: Does an online social skills intervention improve social skills?

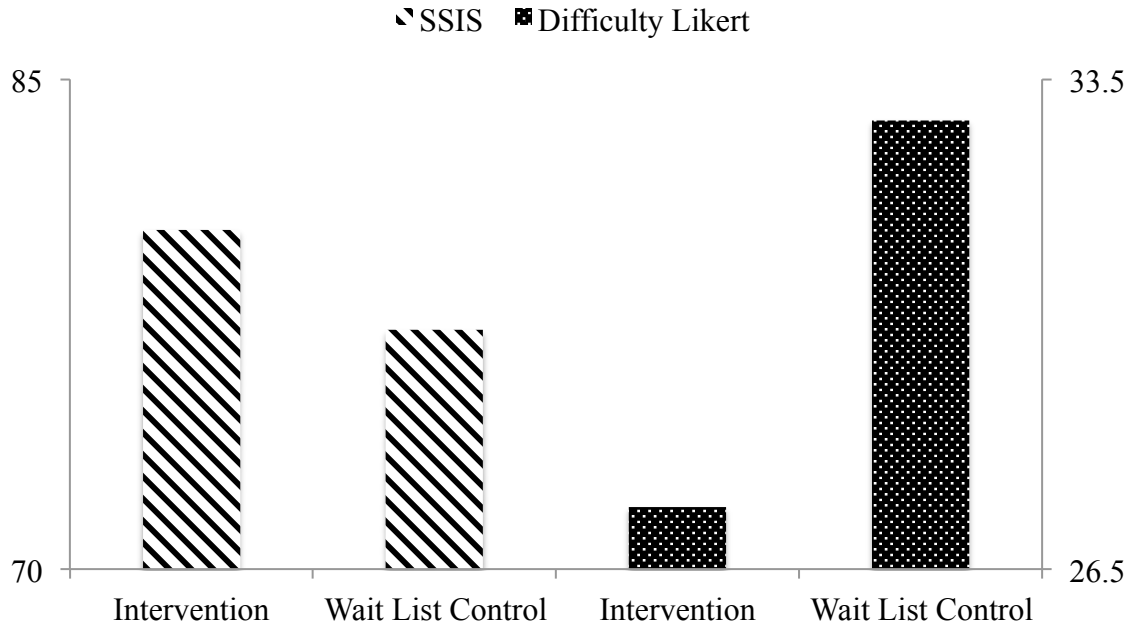
The primary goal of this study was to examine whether or not an online social skills intervention with video modeling could improve social skills. Social skills were measured through parent- and adolescent-report on the SSIS, parent-report on the ASSP, and through a Likert scale that measured perceptions of social skill difficulty from both parent- and adolescent-report.

Parent perspectives were examined first, and a MANCOVA was run to examine the differences in social skills between groups at post-test, while controlling for pre-test scores. Three measures of social skills were used to assess parent perspectives on adolescents' social skills: SSIS scores, ASSP scores, and Difficulty Likert scores. Preliminary checks of assumptions indicated that data was normally distributed, as assessed by Shapiro-Wilks test ($p >$ .05). Also, there were no univariate or multivariate outliers, as assessed by a visual inspection of boxplots. There were linear relationships between variables, as assessed by visual inspection of scatterplots, and Box's M test indicated there was homogeneity of variance-covariance matrices. Due to multicollinearity between the ASSP and the SSIS ($r = .850$, $p = < .01$), the ASSP measure was dropped from the analysis. The resulting model included two measures of social skills, the SSIS and the Difficulty Likert scale. As shown in Figure 1, participants in the intervention group scored higher on the SSIS ($M = 80.39$, $SD = 13.44$) and lower on the Difficulty Likert scale ($M =$ 27.39, $SD = 7.45$) than the wait list group ($M = 77.32$, $SD = 15.32$; $M = 32.91$, $SD = 7.39$). The

difference between groups on the combined dependent variables was not significant, however (F = 1.181, p = .318, Wilks' Λ = .938, partial η^2 = .062).

Figure 1

Mean Social Skills Scores at Time 2 from Parent Report



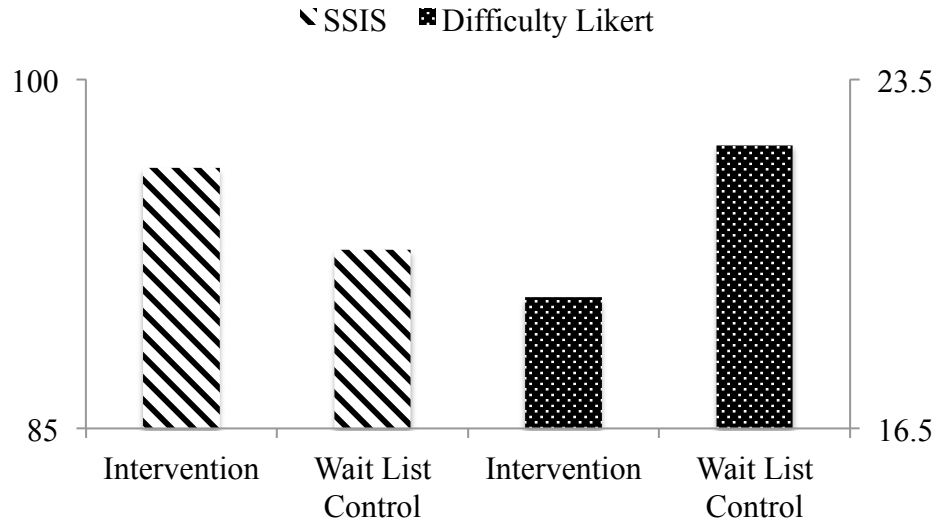
Note. SSIS Social Skills scores have a mean of 100 and a standard deviation of 15. Scores between 70 and 85 fall within the Below Average range. The Difficulty Likert scale had a standard deviation of approximately 7 within the study sample. Possible scores ranged from seven to 42 with higher scores indicating greater difficulty.

A second MANCOVA was run to examine the differences in social skills between groups at post-test, while controlling for pre-test scores, from adolescent perspectives. Similar to the first MANCOVA, two measures of social skills were utilized: SSIS scores and Difficulty Likert scores. The same assumptions were checked for this analysis and data supported the use of the MANCOVA procedure. As shown in Figure 2, participants in the intervention group scored higher on the SSIS (M = 96.19, SD = 17.29) and lower on the Difficulty Likert scale (M = 19.13, SD = 6.28) than the wait list group (M = 92.68, SD = 17.40; M = 22.18, SD = 9.28). The

difference between groups on the combined dependent variables, however, was not significant, $F = .953$, $p = .448$, Wilks' $\Lambda = .953$, partial $\eta^2 = .047$.

Figure 2

Mean Social Skills Scores at Time 2 from Adolescent Report



Note. SSIS Social Skills scores have a mean of 100 and a standard deviation of 15. Scores between 70 and 85 fall within the Below Average range, and scores between 85 and 115 fall within the Average range. The Difficulty Likert scale had a standard deviation of approximately 7 within the study sample. Possible scores ranged from seven to 42 with higher scores indicating greater difficulty.

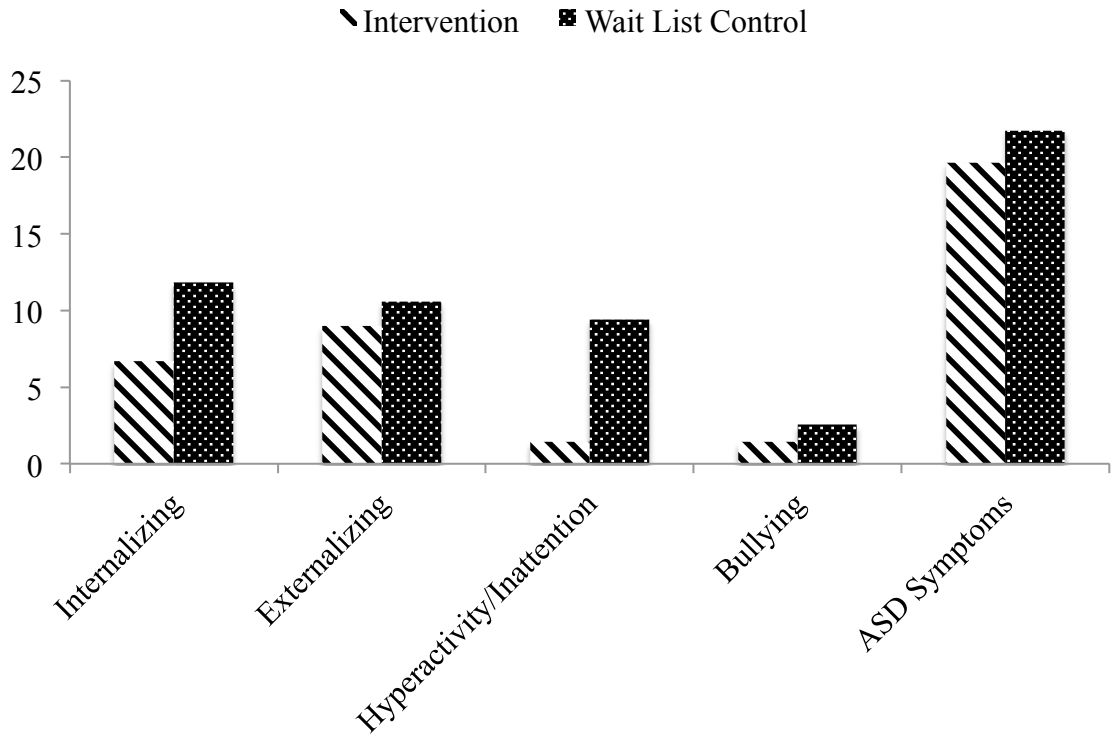
Due to the lack of clear differences in social skill changes between the two groups, the problem behaviors scale of the SSIS was also examined to see if any trends would emerge when skill deficits were considered instead. Given that problem behaviors often emerge for those with ASD due to individuals' lack of social skills, a secondary hypothesis was developed during data analysis that perhaps problem behaviors had decreased for the intervention group even though clear social skill improvement had not been attained.

A MANCOVA was run to examine the differences in problem behaviors between groups at post-test, while controlling for pre-test scores. Five subscale measures were used to assess

parent perspectives on adolescents' problem behaviors: Externalizing, Internalizing, ASD Symptoms, Bullying, and Hyperactivity/Inattention subscales. Assumptions of normality, linearity, homogeneity of variance-covariance matrices, and multicollinearity were satisfied. Additionally, box plots were used to conduct a visual inspection of univariate and multivariate outliers and none were found. As displayed in Figure 3, participants in the intervention group scored lower on all five subscales than the wait list group. The difference between groups on the combined dependent variables was significant, $F = 3.007$, $p = .026$, Wilks' $\Lambda = .666$, partial $\eta^2 = .334$. Follow-up univariate analyses were conducted to examine the treatment effects on each of the individual subtests. There were statistically significant differences between groups on the Internalizing ($F = 8.695$, $p = .006$, partial $\eta^2 = .204$), ASD Symptoms ($F = 4.824$, $p = .035$, partial $\eta^2 = .124$), Bullying ($F = 4.658$, $p = .038$, partial $\eta^2 = .120$), and Hyperactive/Inattention subscales ($F = 5.496$, $p = .025$, partial $\eta^2 = .139$, but not on the Externalizing subscale ($F = 2.878$, $p = .099$, partial $\eta^2 = .078$), with the intervention group reporting fewer problem behaviors.

Figure 3

Mean Problem Behavior Subscale Scores at Time 2 from Parent Report

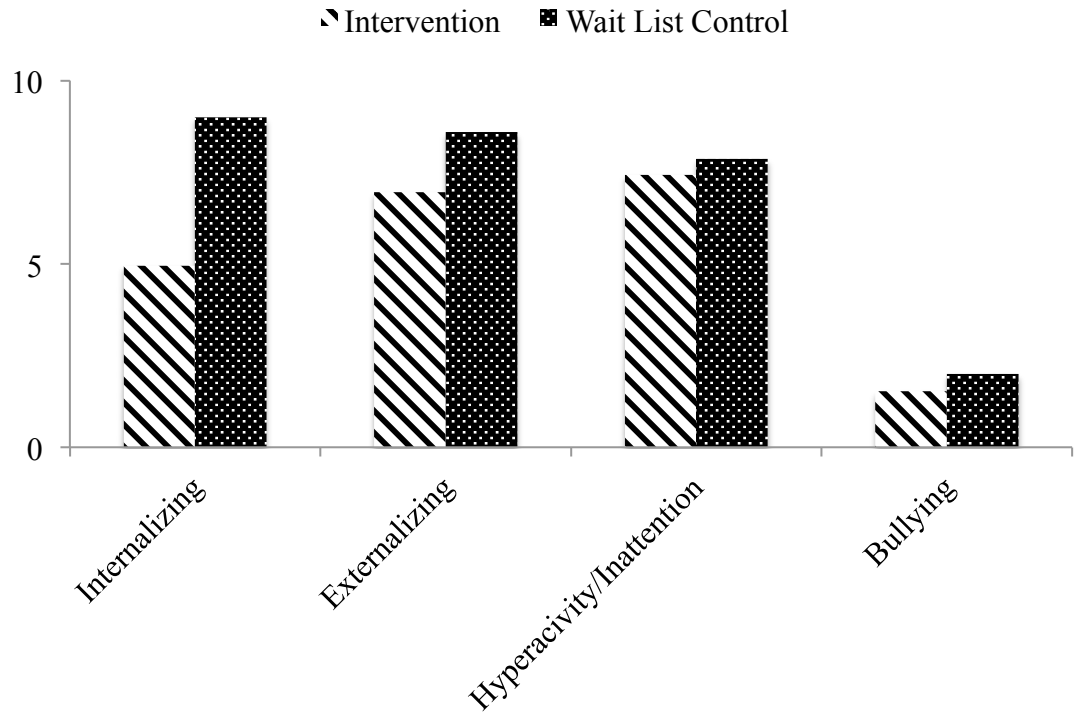


Note. SSIS subscale scores are categorized into "Behavior Levels" rather than converted to standard scores. See Table 8 in the Methods section for descriptive categories.

Once again, a similar analysis was run to examine the differences in problem behaviors between groups from adolescent perspectives. This time, however, four subscale measures were used (i.e. Externalizing, Internalizing, Bullying, and Hyperactivity/Inattention subscales) because the adolescent report measure does not include the ASD Symptoms subscale. The same checks for assumptions were conducted and the use of the MANCOVA was procedure was supported. Similar to parents, adolescents in the intervention group rated their problem behaviors lower on all four subscales compared to the wait list group (see Figure 4). In contrast to the parent report results, the difference between groups on the combined dependent variables from adolescent perspectives was not significant ($F = .576$, $p = .682$, Wilks' $\Lambda = .933$; partial $\eta^2 = .067$).

Figure 4

Mean Problem Behavior Subscale Scores at Time 2 from Adolescent Report



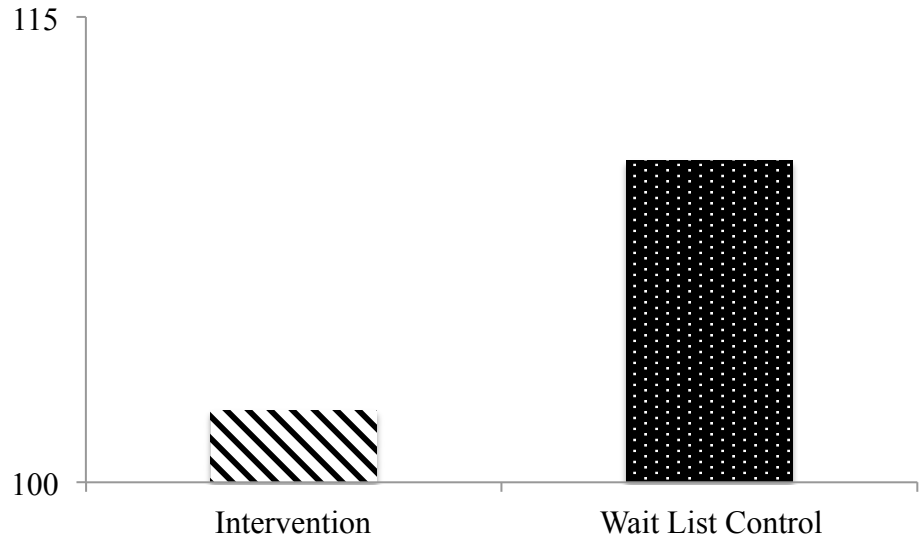
Note. SSIS subscale scores are categorized into "Behavior Levels" rather than converted to standard scores. See Table 8 in the Methods section for descriptive categories.

Since the SSIS Problem Behaviors Scale has greater reliability than each of its subscales, and because the MANCOVA analysis had limited power, this researcher decided to also conduct an ANCOVA using the Problem Behaviors post-test total score as the dependent variable and controlling for pre-test scores. As with the MANCOVA analyses above, linearity was checked through visual inspection of a scatterplot, normality was assessed by Shapiro-Wilk's test ($p <$ .05), Levene's Test of Homogeneity of Variance was satisfied ($p < .05$), and no outliers were found through visual inspection of boxplots. The results displayed in Figure 5 show that from parent perspectives, there was a statistically significant difference between intervention and wait-list groups on post-test measures of problem behaviors ($F = 7.936$, $p = .008$, partial $\eta^2 = .173$),

with the intervention group reporting fewer problem behaviors (M = 102.32, SD = 5.89) than the wait list group (M = 110.36, SD = 11.36).

Figure 5

Mean Problem Behavior Total at Time 2 from Parent Report

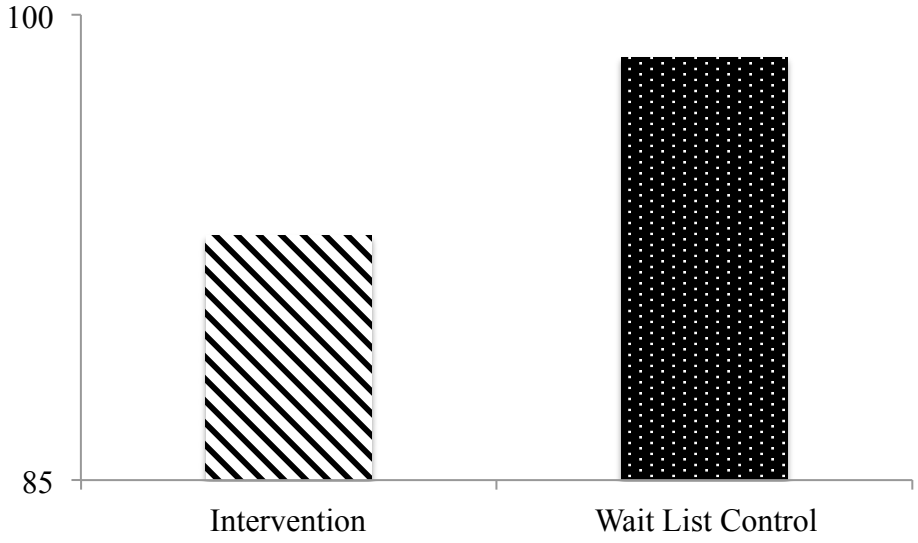


Note. SSIS Problem Behavior scores have a mean of 100 and a standard deviation of 15. Scores between 85 and 115 fall within the Average range.

Similarly, a repeated measures ANCOVA examining adolescent perspectives was conducted using the Problem Behaviors total score. All relevant assumptions were checked and satisfied. As displayed in Figure 6, the intervention group reported fewer problem behaviors (M = 92.89, SD = 6.87) than the wait list group (M = 98.64, SD = 9.42). The ANCOVA indicated that this group difference approached significance (F = 3.799, p = .059, partial η^2 = .091).

Figure 6

Mean Problem Behavior Total at Time 2 from Adolescent Report



Note. SSIS Problem Behavior scores have a mean of 100 and a standard deviation of 15. Scores between 85 and 115 fall within the Average range.

All descriptive and statistical data for the MANCOVA and ANCOVA analyses described above are displayed in Table 11.

Table 11

Treatment Effects

	Intervention			Wait List Control			*F Statistic*	*P Value*	*Partial* η^2
	n	*M*	*SD*	*n*	*M*	*SD*			
SOCIAL SKILLS Parent Report							**1.181**	**.318**	**.062**
SSIS Total	18	80.39	13.44	22	77.32	15.32	---	---	---
Difficulty Likert	18	27.39	7.45	22	32.91	7.39	---	---	---
SOCIAL SKILLS Adolescent Report							**.953**	**.448**	**.047**
SSIS Total	16	96.19	17.29	22	92.68	17.40	---	---	---
Difficulty Likert	16	19.13	6.28	22	22.18	9.28	---	---	---
PROBLEM BEHAVIOR SUBSCALES Parent Report							**3.007**	**.026***	**.334**
Internalizing	19	6.68	2.95	22	11.82	6.37	8.695	.006**	.204
Externalizing	19	9.00	4.62	22	10.59	6.48	2.878	.099	.078
Hyperactivity/Inattention	19	7.74	3.26	22	9.41	3.47	5.496	.025*	.139
Bullying	19	1.42	1.35	22	2.55	2.97	4.658	.038*	.120
Autism Spectrum	19	19.63	5.39	22	21.73	6.20	4.824	.035*	.124
PROBLEM BEHAVIOR SUBSCALES Adolescent Report							**.576**	**.682**	**.067**
Internalizing	19	4.95	3.57	22	9.00	6.17	---	---	---
Externalizing	19	6.95	4.29	22	8.59	4.81	---	---	---
Hyperactivity/Inattention	19	7.42	4.21	22	7.86	3.50	---	---	---
Bullying	19	1.53	1.93	22	2.00	1.77	---	---	---
PROBLEM BEHAVIOR TOTAL									
Parent Report	19	102.32	5.89	22	110.36	11.36	**7.938**	**.008****	**.173**
Adolescent Report	19	92.89	6.87	22	98.64	9.42	**3.799**	**.059**	**.091**

** $p < .01$; * $p < .0$; Results of MANCOVA and ANCOVA results are in bold and follow-up univariate analyses are in plain text.

Research Question 2: How do parents and adolescents in the intervention group compare in their views of social skill improvement?

A second goal of this study was to examine how outcomes for those in the intervention group varied by reporter. In particular, differences between adolescent and parent report were examined on a standardized measure of social skills (i.e. SSIS) and through a Likert rating of social skill difficulty. Although not an initial goal of the study, differences in problem behavior change over time were examined by reporter as well, given the significant decrease in problem behavior for the intervention group.

An initial inspection of mean differences at pre-test was conducted prior to examining reporter-time interaction effects. Pre-test data sets contained no outliers and the data were normally distributed, as assessed through visual inspection of boxplots and Normal Q-Q plots. A paired samples *t*-test indicated a mean SSIS standard score difference of 10.667 between adolescent and parent ratings, with adolescents reporting significantly higher social skill scores ($t = 2.992$, $p = .007$, $d = 0.65$). Similarly, a paired samples *t*-test indicated a mean Difficulty Likert score difference of 9.762 between adolescent and parent ratings of social skill difficulty at pre-test. This is a significant difference between reporters, with parents reporting greater difficulty ($t = -5.524$, $p < .001$, $d = 1.21$).

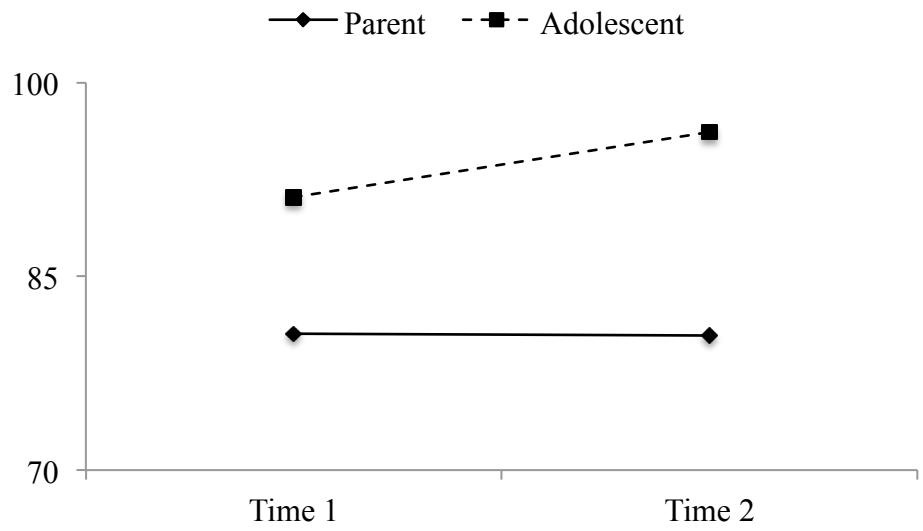
To examine differences in perspectives on social skills change throughout the intervention, a repeated measures MANOVA procedure was used. Two measures of social skills were used with both adolescent and parent reporters to assess perspectives on adolescents' social skills: SSIS scores and Difficulty Likert scores. Preliminary checks of assumptions indicated that the data were normally distributed (i.e. Shapiro-Wilk's test $p > .05$). A visual inspection of boxplots indicated that there was one univariate outlier in the child SSIS data (i.e. one data point

that was more than 1/5 box-lengths from the edge of the box in the boxplot). Inspection of the value did not reveal it to be extreme and it was retained in the analysis. All other adolescent and parent data contained no univariate or multivariate outliers (i.e. Mahalonobis distance $p > .001$). Linear relationships between variables were confirmed through a visual inspection of scatterplots, and Box's M test revealed there was homogeneity of variance-covariance matrices. Additionally, multicollinearity was not found upon examination of Pearson correlations between variables.

When examining social skills change over time, there was no statistically significant difference between reporters on the combined dependent variables (i.e. SSIS and Difficulty Likert scores), $F = 1.805$, $p = .181$, Wilks' $\Lambda = .899$; partial $\eta^2 = .101$ (see Figures 7 and 8). Though the interaction between reporter and time was not significant, there was a main effect of reporter ($F = 6.836$, $p = .003$, Wilks' $\Lambda = .701$; partial $\eta^2 = .299$), with parents reporting weaker social skills (i.e. lower SSIS scores and higher Difficulty Likert scores) at both times.

Figure 7

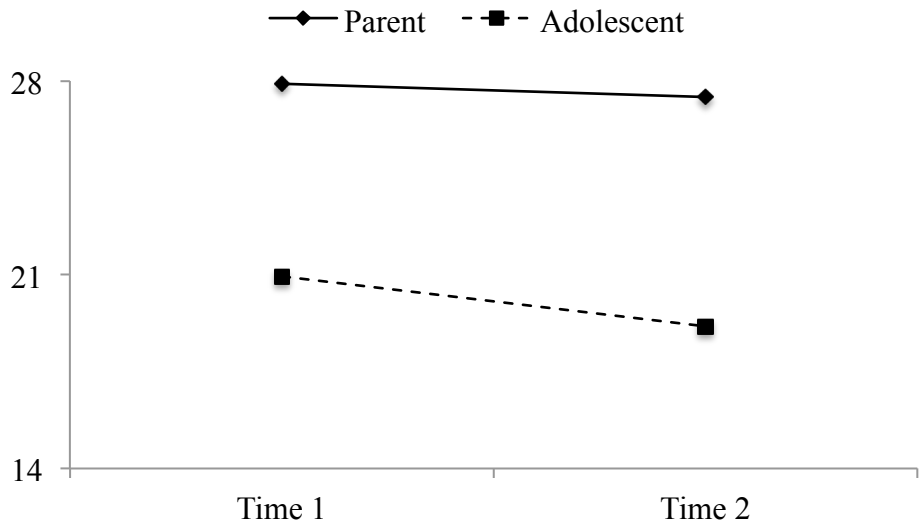
SSIS Scores at Time 1 and Time 2 for Parent and Adolescent Report



Note. The SSIS has a mean of 100 and a standard deviation of 15. Scores between 70 and 85 fall within the Below Average range, and scores between 85 and 115 fall within the Average range.

Figure 8

Difficulty Likert Scores at Time 1 and Time 2 for Parent and Adolescent Report

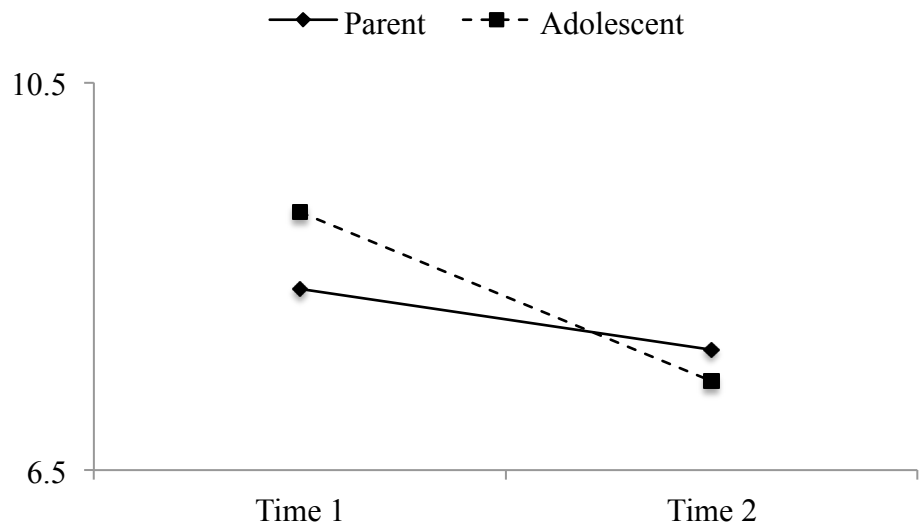


Note. The Difficulty Likert scale had an average standard deviation of 7 across reporters. Possible scores ranged from seven to 42 with higher scores indicating greater difficulty.

To examine reporter differences in perspectives on problem behavior changes throughout the intervention, a repeated measures MANOVA procedure was also used. The four subscales present on both the adolescent and parent measures were used for analysis: Externalizing, Internalizing, Bullying, and Hyperactive/Inattentive. The same checks of assumptions conducted for the previous MANOVA were repeated and all assumptions were met. Results of the repeated measures MANOVA indicated that there was a non-significant reporter-time interaction on the combined dependent variables, $F = .673$, $p = .616$; Wilks' $\Lambda = .925$; partial $\eta^2 = .075$. There was a main effect for time however, with both parent and adolescent reporting fewer problem behaviors at Time 2 ($F = 8.56$, $p < .001$, Wilks' $\Lambda = .490$; partial $\eta^2 = .510$). Follow-up univariate analyses indicated the main effect of time was significant for all four subscales: Hyperactivity/Inattention ($p = .029$), Bullying ($p = .032$), Externalizing Problems ($p = .020$), and Internalizing problems ($p < .001$). See Figures 9-12 for a visual display of problem behavior changes over time from both reporters.

Figure 9

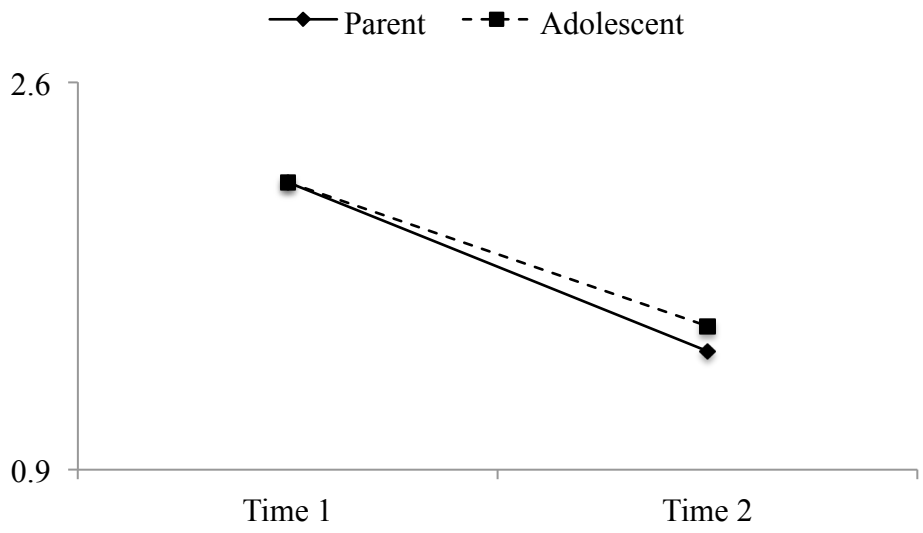
Hyperactivity/Inattention Scores at Time 1 and Time 2 for Parent and Adolescent Report



Note. The average standard deviation across reporters was approximately 4.0. See Table 8 for SSIS Problem Behavior subscale Behavior Levels (i.e. descriptive categories).

Figure 10

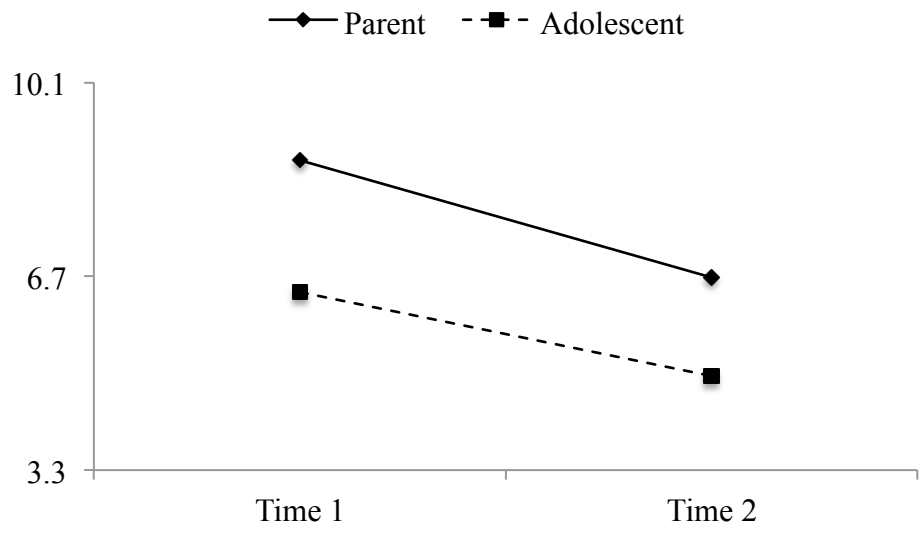
Bullying Scores at Time 1 and Time 2 for Parent and Adolescent Report



Note. The average standard deviation across reporters was approximately 1.7. See Table 8 for SSIS Problem Behavior subscale Behavior Levels (i.e. descriptive categories).

Figure 11

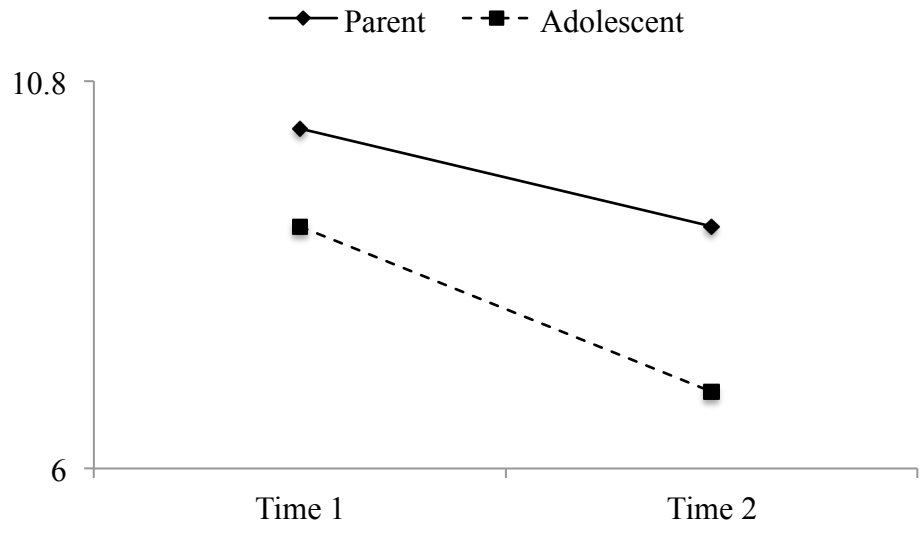
Internalizing Symptoms Scores at Time 1 and Time 2 for Parent and Adolescent Report



Note. The average standard deviation across reporters was approximately 3.4. See Table 8 for SSIS Problem Behavior subscale Behavior Levels (i.e. descriptive categories).

Figure 12

Externalizing Symptoms Scores at Time 1 and Time 2 for Parent and Adolescent Report

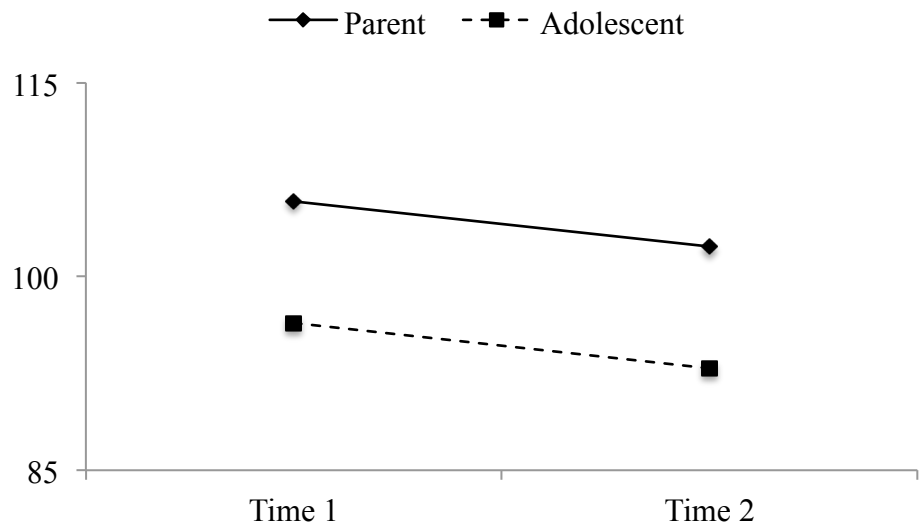


Note. The average standard deviation across reporters was approximately 4.8. See Table 8 for SSIS Problem Behavior subscale Behavior Levels (i.e. descriptive categories).

Given the lack of a significant interaction effect at the subtest level, a repeated measures ANOVA was used to also examine reporter differences over time on the problem behaviors total score. Once again, all relevant assumptions were checked and met. Results of the repeated measures ANOVA (shown in Figure 13) indicated that there was not a significant difference between adolescent and parent reporter changes in problem behavior scores from Time 1 to Time 2 ($F = .000$, $p = 1.000$, Wilks' $\Lambda = 1.000$; partial $\eta^2 = .000$). There were however, main effects for time ($F = 18.622$, $p < .001$, Wilks' $\Lambda = .659$; partial $\eta^2 = .341$) and for reporter ($F = 21.480$, $p < .001$, partial $\eta^2 = .374$).

Figure 13

Problem Behavior Total Scores at Time 1 and Time 2 for Parent and Adolescent Report



Note. SSIS Problem Behavior total scores have a mean of 100 and a standard deviation of 15.

Research Question 3: How do attitudes about the intervention relate to intervention outcomes?

To complement research questions one and two, this question investigated possible

predictors of intervention effectiveness. More specifically, perceived competence for learning (as measured by the PCLS), interest and enjoyment (as measured by the IMI-Interest/Enjoyment), and attitudes toward using the online intervention (as measured by the Attitude Toward Using Technology Scale), were hypothesized to be predictors of intervention effectiveness. Perceived competence for learning was measured before the intervention began, and interest/enjoyment and attitudes toward the online intervention were measured after the intervention had concluded. The primary outcome variable of interest was social skills, which was measured in multiple ways (i.e. SSIS-Child, SSIS-Parent, Child Likert, Parent Likert, ASSP). For this analysis, gain scores representing the change from Time 1 to Time 2 were used as outcome variables. Additionally, changes in adolescent reports of anxiety (i.e. RCMAS gain scores) and depression (i.e. RADS gain scores) were also outcomes of interest, as it was hypothesized that opportunities for skill development and for relationship building (through the online forums) may have secondary effects on adolescents' emotional outcomes as well. To examine the influence of attitudes on each of these outcome variables, multivariate regression was used.

Prior to performing each analysis, independence of residuals was assessed by examining Durbin-Watson statistics, all of which ranged from 1.5-2.3 indicating the assumption of independence was met. Additionally, for each analysis, the assumptions of linearity, independence of errors, homoscedasticity, and normality of residuals were met.

First, a multiple regression was performed to predict social skills gain, as rated by adolescents (N=17) on the SSIS, from perceived competence for learning, interest/enjoyment, and attitudes toward using technology. These variables did not significantly predict social skills gain as rated by adolescents, $F = .108$, $p = .954$, $R^2 = .024$. None of the three variables added

statistically significantly to the prediction. Next, a multiple regression was run to predict social skills gain, as rated by parents (N=17) on the SSIS, from perceived competence for learning, interest/enjoyment, and attitudes toward using technology. Attitudes also did not significantly predict social skills gain as rated by parents on the SSIS, $F = 1.025$, $p = .414$, $R^2 = .191$. None of the three variables added significantly to the prediction. Additionally, attitudes did not significantly predict social skills gain on the ASSP, $F = .848$, $p = .494$, $R^2 = .175$. None of the three variables added significantly to the prediction.

Next, decreases in difficulty ratings on the Likert scale were examined. A multiple regression was run to predict decrease in social skill difficulty ratings, as rated by adolescents (N=16) on the Likert scale, from perceived competence for learning, interest/enjoyment, and attitudes toward using technology. These variables did not significantly predict difficulty changes reported by adolescents, $F = .967$, $p = .440$, $R^2 = .195$. None of the three variables added significantly to the prediction. Similarly, attitudes did not significantly predict difficulty changes rated by parents (N=17), $F = .348$, $p = .791$, $R^2 = .074$. None of the three variables added significantly to the prediction.

Finally, to examine the potential influence of attitudes on mental health changes, anxiety and depression gain scores were used. A multiple regression was run to predict depression changes as rated by adolescents (N=17) on the RADS, from perceived competence for learning, interest/enjoyment, and attitudes toward using technology. These variables did not significantly predict depression changes, $F = 2.027$, $p = .160$, $R^2 = .319$. None of the three variables added significantly to the prediction. Similarly, these variables did not significantly predict anxiety

changes as measured by the RCMAS, $F = .309$, $p = .818$, $R^2 = .067$. None of the three variables added significantly to the prediction.

Research Question 4A: Are social skills and perceptions of social support related to academic achievement or mental health problems?

An additional goal of this study was to investigate the relationship between social skills and perceptions of social support, and academic (i.e. grades and GPA) and mental health outcomes (i.e. anxiety and depression; see Table 12 for correlations between Time 1 measures, and Table 13 for correlations between Time 2 measures).

Table 12

Pearson Correlations Between Pre-Test Measures

	1.	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*	*8.*	*9.*	*10.*	*11.*	*12.*
1. PCLS	1											
2. MSPSS-A	**.388***	1										
3. MSPSS-P	.264	**.424****	1									
4. Difficulty Likert-A	-.260	-.087	.060	1								
5. Difficulty Likert-P	-.231	**-.394****	-.270	.086	1							
6. SSIS-A Soc Skills	**.365***	**.441****	.125	.012	**-.321***	1						
7. SSIS-A Prob Beh	.177	.034	.195	.095	.278	-.198	1					
8. SSIS-P Soc Skills	.030	.213	**.498****	.180	**-.504****	**.379****	-.262	1				
9. SSIS-P Prob Beh	-.103	-.167	**-.316***	-.236	**.404****	**-.509****	**.311***	**-.737****	1			
10. ASSP	-.027	.158	**.473****	.157	**-.511****	.276	-.181	**.850****	**-.627****	1		
11. RADS-2	-.146	-.263	-.220	.090	**.415****	-.240	**.514****	**-.291***	**.427****	-.193	1	
12. RCMAS-2	-.038	-.067	.213	**.366***	**.444****	-.017	**.656****	-.031	.106	.086	**.633****	1

** $p < .01$; * $p < .05$

Table 13

Pearson Correlations Between Post-Test Measures

	1.	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*	*8.*	*9.*	*10.*	*11.*
1. Difficulty Likert-A	1										
2. Difficulty Likert-P	.043	1									
3. SSIS-A Soc Skills	.122	-.220	1								
4. SSIS-A Prob Beh	-.147	.248	-.187	1							
5. SSIS-P Soc Skills	.255	**-.553****	**.405****	**-.366***	1						
6. SSIS-P Prob Beh	-.217	**.472****	**-.324***	**.479****	**-.691****	1					
7. ASSP	.093	**-.661****	.112	-.183	**.772****	**-.520****	1				
8. RADS-2	.005	.271	-.232	**.700****	**-.350***	**.339***	**-.312***	1			
9. RCMAS-2	.172	.200	-.120	**.704****	-.068	.145	-.042	**.706****	1		
10. IMI	-.012	.008	.329	-.085	.211	-.177	.243	-.020	-.008	1	
11. Attitude Toward Tech	-.140	.101	.114	-.131	-.040	-.213	.013	-.123	-.133	**.596****	1

** $p < .01$; * $p < .05$

More specifically, given that social impairments are a primary symptom of ASD, the goal was to explore whether or not social factors were predictive of functioning in academic or emotional domains. Given the significant differences between adolescent and parent reporters on the SSIS and the Likert scale ratings of skill difficulty, and given the sample size of the current study, separate regressions were conducted to examine effects separately for adolescent and parent reporters. Research question 4B (below) describes whether or not the differences between reporters were significant.

All participant data at Time 1 were used to answer this research question (see Table 9 above for social skills means and standard deviations, and Table 14 below for social support, depression, and anxiety).

Table 14

Means and Standard Deviations for Social Support, Depression, and Anxiety

	Intervention Group					Control Group				
		Time 1		*Time 2*			*Time 1*		*Time 2*	
	n	*M*	*SD*	*M*	*SD*	*n*	*M*	*SD*	*M*	*SD*
RADS-2	19	47.95	8.15	47.49	10.14	23	54.04	9.34	51.96	9.55
RCMAS-2	18	48.42	7.28	46.58	8.53	23	53.22	11.02	50.43	11.25
MSPSS Child	21	58.81	14.68	---	---	26	57.88	15.04	---	---
MSPSS Parent	20	61.50	10.18	---	---	25	59.44	12.04	---	---

First, multiple regression was used to predict academic achievement, measured by GPA, from adolescent SSIS scores, adolescent Likert ratings, and adolescent MSPSS scores (N=31). There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.532. The assumptions of linearity, independence of errors, homoscedasticity, and normality of residuals

were met. Child SSIS scores and Likert ratings did not significantly predict academic achievement as measured by GPA, $F = 1.009$, $p = .404$, $R^2 = .101$. Though GPA is a more commonly used measure of academic achievement, many participants did not report GPA and therefore a regression was also run with grades as an outcome variable (N=47). Similarly, the predictor variables also did not significantly predict school grades, $F = .791$, $p = .506$, $R^2 = .057$.

Next, academic outcomes were explored with parent-reports of social skills, social difficulty, and social support as predictors. A multiple regression was run to predict academic achievement, measured by GPA, from parent SSIS scores, parent Likert ratings, and parents MSPSS score (N=35). There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.729. The assumptions of linearity, independence of errors, homoscedasticity, and normality of residuals were met. These variables significantly predicted GPA, $F = 3.173$, $p = .038$, $R^2 = .235$. Parent SSIS scores significantly added to the prediction ($p < .05$), whereas parent Likert ratings and parent MSPSS scores did not. Regression coefficients and standard errors can be found in Table 15 (below).

Table 15

Social Skills & GPA – Parent Ratings

Variable	B	SE_B	β
Intercept	1.555	.833	
MSPSS	.008	.009	.155
SSIS	.016	.008	.390*
Difficulty Likert	.001	.013	.018

Note. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized coefficient
* $p < .05$

As with the child data, a regression was also run with grades as the outcome variable. These predictors also significantly predicted school grades, $F = 3.940$, $p = .014$, $R^2 = .216$. As with GPA, parent SSIS scores significantly added to the prediction ($p < .05$), whereas parent Likert ratings and parent MSPSS scores did not. Regression coefficients and standard errors can be found in Table 16 (below).

Table 16

Social Skills & School Grades – Parent Ratings

Variable	B	SE_B	β
Intercept	1.793	1.034	
MSPSS	.012	.010	.184
SSIS	.019	.009	.366*
Difficulty Likert	.004	.016	.040

Note. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized coefficient
* $p < .05$

Next, multiple regression was used to examine mental health outcomes at Time 1, with adolescent report data on the SSIS, Likert rating, and MSPSS at Time 1 used as predictors (N=44). These variables did not significantly predict depression, $F = 1.183$, $p = .160$, $R^2 = .120$, nor did they significantly predict anxiety, $F = 2.245$, $p = .098$, $R^2 = .144$. Similarly, social variables at Time 2 did not predict depression or anxiety at Time 2 ($F = 1.073$, $p = .352$, $R^2 = .053$; $F = .980$, $p = .385$, $R^2 = .049$). Additionally, social variables at Time 1 also did not predict depression or anxiety at Time 2 ($F = .325$, $p = .808$, $R^2 = .027$; $F = 1.471$, $p = .239$, $R^2 = .112$).

Finally, mental health outcomes at Time 1 were examined from parent report data on the SSIS, Likert rating, and MSPSS scores at Time 1 (N=47). These variables significantly

predicted depression scores on the RADS, $F = 3.293$, $p = .029$, $R^2 = .187$. Parent Likert ratings significantly added to the prediction ($p < .05$), whereas Parent SSIS scores and parent MSPSS scores did not. Regression coefficients and standard errors can be found in Table 17.

Table 17

Prediction of Time 1 Depression Scores From Time 1 Parent Social Skills Ratings

Variable	B	SE_B	β
Intercept	49.532	12.978	
MSPSS	-.071	.126	-.088
SSIS	-.073	.115	-.115
Difficulty Likert	.400	.200	.322*

Note. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized coefficient
* $p < .05$

Social variables at Time 2 did not predict depression at Time 2 ($F = .2.872$, $p = .069$, $R^2 = .131$). However, these variables at Time 1 did predict depression scores at Time 2 ($F = 4.447$, $p = .009$, $R^2 = .270$). See Table 18 below for regression coefficients and standard errors. None of the variables significantly added to the prediction.

Table 18

Prediction of Time 2 Depression Scores From Time 1 Parent Social Skills Ratings

Variable	B	SE_B	β
Intercept	50.395	14.939	
MSPSS	.094	.145	.105
SSIS	-.229	.124	-.344
Difficulty Likert	.381	.226	.290

Note. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized coefficient
* $p < .05$

Similarly, these variables at Time 1 significantly predicted anxiety scores on the RCMAS at Time 1 and Time 2 ($F = 4.809$, $p = .006$, $R^2 = .251$; $F = 4.398$, $p = .010$, $R^2 = .268$). Parent MSPSS scores and parent Likert ratings significantly added to both predictions ($p < .05$), whereas parent SSIS scores did not. Regression coefficients and standard errors can be found in Tables 19 and 20 (below).

Table 19

Prediction of Time 1 Anxiety Scores From Time 1 Parent Social Skills Ratings

Variable	B	SE_B	β
Intercept	18.394	13.470	
MSPSS	.262	.131	.302*
SSIS	-.025	.119	-.037
Difficulty Likert	.623	.208	.465*

Note. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized coefficient
* $p < .05$

Table 20

Prediction of Time 2 Anxiety Scores From Time 1 Parent Social Skills Ratings

Variable	B	SE_B	β
Intercept	23.390	15.486	
MSPSS	.374	.151	.405*
SSIS	-.164	.129	-.238
Difficulty Likert	.498	.234	.366*

Note. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized coefficient
* $p < .05$

Similar to the outcomes for depression however, social variables at Time 2 did not predict anxiety at Time 2 ($F = .845$, $p = .437$, $R^2 = .043$).

Though not an initial goal of this study, problem behaviors were also examined as a predictor of mental health outcomes due to the effects found in Research Question 1 and because

behavioral problems are another primary symptom of ASD. Linear regression was used to predict RADS-2 scores and RCMAS-2 scores from SSIS Problem Behavior adolescent and parent ratings. Adolescent Problem Behavior scores significantly predicted both depression (F = 15.822, p = < .001, R^2 = .264) and anxiety (F = 33.232, p = < .001, R^2 = .430) at Time 1 and at Time 2 (F = 38.490, p = < .001, R^2 = .490; F = 39.282, p = < .001, R^2 = .495). In contrast, parent Problem Behavior scores significantly predicted depression (F = 10.034, p = .003, R^2 = .182) at Time 1, but not anxiety (F = .514, p = .477, R^2 = .011). These results held true at Time 2, with a significant prediction for depression (F = 5.076, p = .030, R^2 = .115), but not anxiety (F = .836, p = .366, R^2 = .021).

Research Question 4B: Are these relationships different depending on adolescent- or parent-report?

Given the differences in mean score differences between reporters, it was hypothesized that the strength of the relationships between social, academic, and emotional variables may vary as well. To test these differences, *t*-tests of regression weights from the regression models in Research Question 4A were conducted. Each of the analyses indicated that the strengths of the relationships between variables were not significantly different between reporters. *T*-scores and significance levels can be found in the following Table 21 (below).

Table 21

Comparison of Parent-Adolescent Regression Weights

	T-Score	*p*
GPA		
SSIS Reporter	1.103	.274
MSPSS Reporter	.345	.731
Difficulty Likert Reporter	-1.351	.181
School Grades		
SSIS Reporter	.921	.359
MSPSS Reporter	-1.037	.302
Difficulty Likert Reporter	-1.166	.247
RADS		
SSIS Reporter	-.264	.792
MSPSS Reporter	-.231	.818
Difficulty Likert Reporter	1.693	.094
RCMAS		
SSIS Reporter	-.190	.850
MSPSS Reporter	1.114	.268
Difficulty Likert Reporter	.530	.598

Research Question 5: Are adolescents' self-reported changes in social skills related to changes in mental health problems?

A final goal of this study was to examine whether or not changes in social skills from Time 1 to Time 2 were predictive of any changes in mental health functioning (i.e. depression and anxiety). To test this, multiple regression was used to predict changes in depression and anxiety from changes in adolescent SSIS scores and adolescent Likert ratings (i.e., using gain scores for each of the predictor and outcome variables; N=17). Prior to running the analysis, the data were examined to ensure that assumptions of linearity, independence of errors, homoscedasticity, unusual points and normality of residuals were met. Multiple regression indicated that adolescent reported social skills changes significantly predicted changes in anxiety, $F = 4.747$, $p = .028$, $R^2 = .422$. Adolescent reported SSIS gains significantly added to

the prediction ($p < .05$), whereas adolescent reported Likert changes did not. Regression coefficients and standard errors can be found in Table 22 (below).

Table 22

Social Skills and Anxiety – Adolescent Report

Variable	B	SE_B	β
Intercept	-.253	1.386	
SSIS Gain Score	-.403	.172	-.528*
Difficulty Likert Gain Score	.219	.211	.234

Note. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized coefficient
* $p < .05$

In contrast, social skills changes did not significantly predict depression changes, $F = 2.484$, $p = .122$, $R^2 = .276$. Adolescent-reported changes in problem behavior were not predictive of either depression changes ($F = 2.376$, $p = .131$, $R^2 = .057$) or anxiety changes ($F = .854$, $p = .361$, $R^2 = .021$).

CHAPTER 5

Discussion

Efficacy of the Online Intervention

One purpose of this study was to examine the effectiveness of an online social skills intervention that utilized video modeling to teach social communication skills. Using a randomized controlled trial design, participants were assigned to intervention and wait-list control groups and pre/post measures were utilized to examine group differences. Results indicated that there were no significant differences between the intervention and wait-list control groups on social skills gains, as measured by any of the social skill measures for either reporter.

Conclusions. In contrast to this author's hypothesis, the results of two separate MANCOVA procedures indicated that based on both parent and adolescent report, social skills scores at Time 2 were not significantly different between groups after controlling for scores at Time 1. Due to the unexpected findings regarding social skills improvement, problem behaviors were examined as well. A MANCOVA procedure examining the intervention effect on the combined problem behaviors subscales revealed a significant difference between the two groups. More specifically, the intervention group displayed fewer problem behaviors at Time 2 after controlling for Time 1 scores. Similarly, an ANCOVA procedure examining the intervention effect on the problem behaviors total score revealed a significant difference between groups. From adolescent perspectives, there were no significant treatment effects, but the ANCOVA results approached significance ($p = .059$) with the intervention group reporting lower total problem behavior scores at Time 2.

Overall, these findings suggest that the intervention had an effect on reducing problem behaviors, but did not increase social skills as intended. These findings raise a question of

whether measures of problem behavior might highlight some social progress prior to it being apparent in social skill measures. Although the intervention group began with fewer reported problem behaviors, their reported problem behaviors at Time 2 were significantly less than the wait-list control group. This finding suggests that it may be worth considering other behavioral outcomes of social skills interventions. Although the participants in this study may not have mastered the selected skills, perhaps the intervention content provided them with the skills to more appropriately regulate their behavior during difficult social interactions.

Additionally, this study highlights the importance of having a comparison group when conducting intervention research. Both the intervention and wait-list control groups demonstrated an increase in reported social skills between Time 1 and Time 2. Without a wait-list control group for comparison, the change over time could easily have been falsely attributed to the intervention. Additionally, these study results highlight the importance of selecting appropriate measures for evaluating intervention effectiveness. Although a comparison between child and parent reports will be more clearly addressed below, it is important to highlight here that measures did not reveal the same effects across parent and child forms. This highlights the importance of selecting measures that are both sensitive to change and valid.

Possible explanatory factors. There are several possible explanations for these results: nature/sensitivity of the instruments, insufficient dosage, weak treatment integrity, and heterogeneity of sample. First and foremost, the intervention was targeted at six very specific social communication skills. The SSIS and the ASSP are long survey measures that serve to gather a broader assessment of social skills than may be appropriate for assessing change in this particular assessment. There is emerging literature on the effectiveness of utilizing the SSIS for progress monitoring, but it may not be appropriate as a measure for a 6-week online intervention.

Similarly, the ASSP has some support for progress monitoring, but may not be appropriate for this particular intervention strategy either.

Measurement. When considering the differences in results found from the SSIS Social Skills reports and the SSIS Problem Behavior reports, it is important to consider the items that are included on the SSIS Social Skills and Problem Behavior scales and more importantly, to remember that the SSIS is not a tool specifically for those with ASD. Many of the items on the Social Skills scale survey more complex social skills than were taught in this intervention (e.g., advocating for oneself) or survey skills that are less observable (e.g. trying to understand someone's feelings). The intervention more specifically taught basic social behaviors, such as how to enter a conversation (i.e. wait for a pause, comment on the current topic) and the behaviors measures on the Problem Behavior scale may simply have been more sensitive to change. As described in the literature review above, various methods have been used to measure intervention effectiveness for those with ASD. The measures, as well as the study design (Wang, Parrila, & Cui, 2012), can influence the conclusions drawn from study results. This finding highlights the importance of clearly selecting a measure that is sensitive to the changes that one expects to find. Direct observation, which has been used as the method for obtaining outcome data in many social skills interventions and video modeling studies, may have proven to be more sensitive to change in this study than the standardized rating scales chosen. Since the Problem Behaviors scale more clearly surveys behaviors, this may explain why change was more clearly observed on this scale that the Social Skills scale.

Likert scale ratings of difficulty may be most appropriate when assessing change in particular skills, but using these scales may present additional challenges for those with ASD. The scale used in this study was a 7-point scale with three anchors/descriptors (i.e., not at all

difficult, somewhat difficult, and very difficult). Although the reliability of this scale was strong (.84 for adolescents, .81 for parents), it's possible that a shorter scale, or one with more anchors/descriptors would be a more valid measure for those with ASD. Individuals with ASD often have difficulty with abstract thinking, and therefore Likert scales may need to be grounded in clearer criteria.

Dosage and integrity. Additional explanations for the lack of group differences are dosage and intervention integrity. Though the intervention was initially intended to be eight weeks long, the intervention group received only six weeks of intervention due to the technological challenges described in the Methods section. The amount of time during which participants had opportunities to view the lessons and practice the skills may simply have been too short. Additionally, intervention group participants completed an average of 4.5 lessons of the possible six. The amount of content to which participants were exposed in those 4.5 lessons may not have been quite enough to provide them with the requisite knowledge to perform better in social situations. Finally, although there were suggestions for practice at the conclusion of each weekly lesson, the nature of the online intervention did not allow for required, structured practice opportunities. Efforts were made to promote a higher level of treatment integrity, but there were limitations within the implementation of the intervention that may have influenced participants' overall exposure to and experience with the intervention (see Limitations below). Overall, one might not expect four lessons with few practice attempts to lead to clear increases in social skills compared to those who do not receive the intervention at all. Although it would be ideal to examine effects for those who complete all six lessons compared to those who complete zero, the sample size was simply not large enough to do so in the current study.

Sample heterogeneity. Additionally, it is important to address the heterogeneity of the

current sample and some of the group differences between the intervention and wait-list control groups. The qualitative feedback provided after each lesson, though not utilized for statistical analysis, was valuable in that in highlighted that some participants already knew the target skills. For participants who already knew these more basic social communication skills, one would not expect to see a change in social skills ratings over time for those participants. Also, many of the above-described analyses revealed that the intervention group reported higher mean social skills and fewer mean problem behaviors at the beginning of the intervention. Random assignment was used to create these groups, but it may have possibly left less room for improvement within the intervention group. Whereas some participants may have already possessed the targeted skills, others may have had impairments in social functioning and challenges with social cognition that interfered with their abilities to interpret the videos in a meaningful way. Alternatively, some participants may have been able to watch the videos and answer the quiz successfully by recognizing cues that were specifically taught, but may have been unable to generalize their knowledge to novel social situations given their social cognition deficits.

In addition to the variability in skills between participants and across groups, there may have been other participant factors that made this intervention less successful than anticipated. Social learning theory suggests that it is important that individuals observe others who are similar to them in order for the best learning outcomes to occur. The videos were made with this theory in mind and a diverse group of students were selected to film the video clips with both males and females acting out each target behavior. It is possible however, that the participants in this study did not identify with the actors in the video and therefore did not benefit as much from the video modeling intervention. This may have been particularly likely for participants who already felt competent with the target skills. Similarly, sociocultural theories emphasize the

importance of individuals' experiences and the specific examples used in the videos may not have been relevant for the study participants' lives.

Practical significance. It is important to consider the clinical significance of the above findings as well. A significant treatment effect was not found on the SSIS, but examination of the descriptive categories in which participants' scores fell did indicate some improvement (see Table 23). The intervention group had fewer participants in the Well Below Average Category and more participants in the Average category by the end of intervention, whereas the wait-list control group had more participants in the Well Below Average category and fewer participants in the Below Average Category by the end of the six-week study. This finding, along with the Problem Behaviors results, highlight the importance of carefully considering the most appropriate way to measure progress when examining intervention effectiveness.

Table 23

Changes in Parent-Reported SSIS Descriptive Categories

	Well Below Average		*Below Average*		*Average*	
	Time 1	*Time 2*	*Time 1*	*Time 2*	*Time 1*	*Time 2*
Intervention	5	3	6	6	8	10
Wait-List	5	9	11	7	6	6

Note. Well Below Average scores fall below 70, Below Average scores fall between 70 and 85, Average scores fall between 85 and 115 (M = 100, SD = 15).

Perspectives on Effectiveness

A second goal of this study was to examine the influence of the reporter on the interpretation of study outcomes. Given the limited research on social skill development and intervention effectiveness from adolescent perspectives, and given this author's thesis findings that highlighted differences in perspectives on social skill difficulty (Hayter [Kuehnel], 2009),

examining both adolescent and parent perspectives was an important part of this project.

To begin, differences in parent and adolescent reports of social skills were examined at both Time 1 to ensure that the expected differences in report were apparent with the current sample. As expected, comparisons of SSIS scores and Likert scores were significantly different between parents and adolescents at Time 1.

It was hypothesized that there would be some improvement in social skills for the intervention group, and additionally, that adolescents and their parents would have different reports of adolescents' social skills improvement from pre- to post-intervention. The results of Research Question 1 indicated that there was no significant social skills improvement for the intervention group in comparison to the wait-list group for either reporter. Further analysis of the Problem Behaviors scale however, revealed that there was a significant reduction in parent-reported problem behaviors for the intervention group compared to the wait-list. Additionally, this effect approached significance based on adolescent report. Therefore, the comparison between intervention group reporters was still conducted.

The MANOVA procedure indicated that adolescents did not report changes that were statistically significantly different from their parents on the SSIS or on the Difficulty Likert scale. Although neither test reached significance, the trends in SSIS and Difficulty Likert ratings were in the expected direction. Descriptive statistics suggested that adolescents tended to have a more positive view of their improvements compared to their parents. In part, the lack of significant findings is expected given the little change in skills over time and the small sample size. With greater skill improvement and a larger sample, a stronger analysis of differences in reporting would be possible. On the SSIS Problem Behaviors scale, it is interesting that perspectives vary significantly between reporters at both Time 1, but there is strong agreement

between reporters in the overall change from Time 1 to Time 2. There is no clear explanation for this finding and further research is warranted.

Conclusions. In general, it appears that adolescents seem to have a more positive view of their social competence and behavioral presentation when compared to their parents' reports. This supports the sociocultural theoretical rationale for exploring multiple perspectives within the current study. Had only parent or adolescent report been measured, the conclusions drawn from this study would have been limited. Additionally, this has important clinical and educational implications when thinking about how to present interventions or therapeutic activities to adolescents with ASD. It is possible that those who have rather positive views of themselves may view a lesser need for services, or that others' suggesting a need for services could damage relationships, motivation, or self-esteem. Those possible outcomes were not investigated within the current study, but the relevance of adolescents' perspectives is highlighted given its contrast with parent perspectives. Other researchers are encouraged to consider the potential impact of highlighting areas of difficulty when adolescents may not view the same challenges, as this could potentially pose difficulties for adolescents, as well as for their relationships with their parents.

In general, the main treatment effects that were found were within the parent report data, and more specifically, when parents were rating problem behaviors. There are a few possible explanations for these findings. Regarding the strength of parent perspectives, parents may be more sensitive to change than adolescents. Given the challenges with social cognition that occur for adolescents with ASD, it is possible that they do not recognize subtle changes in social behavior. Parents, who more likely have typical social cognition skills, may be able to recognize small improvements in adolescents' behaviors that adolescents themselves do not notice. The

results from Research Question 2 did not indicate that parents were more sensitive to change over time, but it is important to remember that only data from the intervention group was used to compare rates of change across reporters. It would be important to examine in future research how perspectives on change over time compare between those who are receiving intervention services and those who are not, to gather additional information regarding adolescents' abilities to accurately evaluate their skill acquisition.

Another possible explanation is that parent perspectives may have been biased given that they were not blinded to group assignment. Regarding the strength of the problem behaviors ratings, it's possible that the negative behaviors are more salient to parents and adolescents. Research has demonstrated that individuals' memory for negative events tends to be more detailed than memory for neutral or positive events (Kensinger, 2011). Some may consider social skills and problem behaviors a continuum of social behaviors, with problem behaviors having negative valence and social skills having positive valence. In that case, the literature on recognition and memory for various events may provide some support for the findings within the problem behavior data. Additionally, it's possible that the nature of the intervention simply helped adolescents learn what not to do, but did not provide appropriate instruction for replacement behaviors. Alternatively, the incorrect behaviors may have been more compelling to study participants than the correct examples. Kochanska's work on production compliance (i.e. "Do") and inhibition (i.e. "Don't") has demonstrated that "Do contexts pose a greater regulatory challenge to young children" (Kochanska, Coy, & Murray, 2001, p. 1093). While this study examined adolescents' behaviors and Kochanska's work has focused on young children, social development processes for those with ASD may be more similar to younger children than typically developing teenagers. This is something that should be more closely examined within

future research.

Influence of Attitudes on Intervention Outcomes

In an effort to understand why the online intervention may be more effective for some adolescents than others, a goal of this study was to examine the influence of attitudes on intervention outcomes. In particular, it was thought that variables such as one's perceived competence for learning, one's interest in the social skills intervention, and one's attitudes about the online system used for intervention might predict the likelihood of intervention effectiveness. Using multiple regression, these variables were examined as predictors of social skills gain from adolescent and parent perspectives, changes in reported difficulty from both adolescent and parent perspectives, and changes in anxiety and depression from adolescent perspectives. None of the regression models proved to be significant however, suggesting that attitudes are not predictive of intervention outcomes for this particular sample. It is important to note, that the sample size required to achieve adequate power for these regressions is much larger than the sample from the intervention group in this study. Therefore, it would be appropriate to re-examine this question with a larger sample size in the future.

Relationships Between Social, Academic, and Emotional Variables

In addition to examining the possible effects of an online social skills intervention, a secondary goal of this study was to explore the relationship between social variables and other academic and emotional variables. Although social impairments are characteristic of those with ASD, not all adolescents with ASD necessarily experience academic or mental health impairments. As individuals with ASD navigate adolescence, their social world changes and becomes more complicated. Struggling during this time may potentially have an influence on other areas of functioning, but it is not well known how this may occur. Some prior research has

demonstrated correlations between social functioning, anxiety, and depression, but more clearly understanding patterns in symptomatology may help providers know how to provide effective services to those with ASD.

Regression models at Time 1. Multiple regression was used in this study to examine whether or not social functioning was predictive of academic or mental health functioning based on both adolescent and parent report. Parent reports of social variables significantly predicted all four scores. More specifically, at Time 1, 23.5% of the variance in GPA, 21.6% of the variance in grades, 18.7% of the variance in depression, and 25.1% of the variance in anxiety were explained by parent ratings of social variables (i.e., SSIS Social Skills, MSPSS, and Difficulty Likert). Overall, adolescent reports of social variables did not predict academic GPA, school grades, anxiety, or depression. However, adolescent reports of problem behavior did predict both anxiety and depression. More specifically, at Time 1, 26.4% of the variance in depression and 43.0% of the variance in anxiety were explained by adolescent ratings of problem behaviors.

An examination of the difference in regression weights of each model indicated that there were no significant differences between reporters. Once again however, the sample size was much too small to run this analysis with confidence in the results given the lack of power.

Regression models of change over time. Finally, an important purpose of this study was examining the influence of change in social skills on changes in mental health outcomes. Given the hypothesis that social skills would be negatively correlated with mental health challenges at a given point in time, it was also hypothesized that improvement in social skills may be predictive of a decrease in mental health problems. Multiple regression indicated that adolescent-reported social skill changes were in fact predictive of anxiety changes, but were not predictive of depression changes. As with the other findings discussed above, the power for this analysis was

low and therefore further analyses with a larger sample are warranted.

Conclusions. Overall, it turns out that parent perceptions of social skills seem to be better at predicting outcomes than the adolescents'. Parent reports of social skills at Time 1 explained 23.5% of the variance in GPA, 21.6% of the variance in grades, 18.7% of the variance in depression, and 25.1% of the variance in anxiety at Time 1. However, adolescents' perceptions of problem behaviors seem to be better at predicting mental health outcomes than parents. Adolescent reports of problem behaviors at Time 1 explained 26.4% of the variance in depression scores and 43.0% of the variance in anxiety scores. Prior research has shown that those with ASD have higher symptoms of depression and anxiety than typical populations (see e.g., Mazurek & Kanne, 2010; Russell & Sofronoff, 2005), but that those with fewer ASD symptoms have higher levels of anxiety and depression (Mazurek & Kanne, 2010). Therefore, it was expected that social skill ratings would be predictive of anxiety and depression. However, the adolescent-report data may be more indicative of a measurement issue. It's possible that because adolescents with ASD lack social understanding, they are not reliable reporters of social skills as measured on the SSIS. Perhaps, however, they more easily understand the behaviors described on the SSIS Problem Behaviors scale and can better evaluate their own skills and report changes on a measure that is more discrete. It would be important for clinicians and researchers in the future to be aware that self-report social skills measures have this limitation.

Finally, it is important to consider the overall mental health quality of the current participants. At Time 1, 74% of wait list participants and 100% of intervention group participants had anxiety scores within the average range. Similarly, 78% of wait list participants and 95% of intervention group participants had depression scores within the normal range. There was little room for clinical improvement within the intervention group and more room for

improvement among the wait list control group. As stated above, with lower baseline social skills, higher baseline problem behaviors, and higher baseline rates of anxiety and depression, the wait list group may show a greater benefit from this intervention than seen within this study.

Limitations

The results and conclusions that can be drawn from this study are limited by several methodological and practical constraints. First and foremost is the small sample size. A power analysis, described in the Methods section, identified the need for a minimum of 128 adolescent participants across the two groups. This sample size was not obtained due to various factors beyond the control of the researcher. The actual number of participants enrolled in the study was much lower than the original estimates given by the recruitment site. This could have been addressed however, by continuing recruitment efforts. Unfortunately, the untimely closure of the website hosting the intervention resulted in the early termination of the intervention and excluded further recruitment. Thus, the resulting sample of 50 did not afford an adequate level of power for many of the statistical analyses and these findings should be interpreted with caution.

An additional limitation of this study is the lack of face-to-face contact with participants during the completion of study measures and during the intervention phase. A primary impetus for this study was to reach adolescents who may not otherwise access services, but doing so in a distant manner presents its own challenges. Many of the measures used in this study can be complicated to complete and are typically explained by the administrator of those measures. Every effort was made to ensure that participants had the resources to complete survey measures accurately, but there are limitations to administering these forms by mail. Additionally, there is no way to verify that the participant who claimed to fill out the measure was in fact the one doing so. It's also possible that, although instructed to complete the measures on their own,

participants may have had help from others to read the questions or to form answers. The presence of another person may have introduced response bias and threats to validity. It is unknown the extent to which the measures were completed as directed.

Similarly, although data were collected on the intervention dosage, there is no guarantee that those who logged into the website and completed the lessons were in fact, the intended participants and not a parent, sibling, or friend. With that said, each of the participants who enrolled in the study did so because either they, their parents, or both parties wanted to participate. Without firsthand measures of intervention integrity, it is difficult to know with any certainty that participants completed each portion of the study as they agreed to.

Two of the steps in the evidence-based practice guidelines for video modeling (described above) are identifying skill deficits and determining whether those challenges are skill or performance deficits. One weakness in this study is that there was no assessment of skills prior to enrollment or participation in the intervention. Although the goals of the intervention were clear in the recruitment advertisement and participants knew what they were signing up for, some of the qualitative feedback from adolescents suggested that the skills being taught were not areas of need for this group (e.g., "I already knew how to do this."). In the future, a screener may be appropriate to determine whether or not participants are a good fit for the intervention.

Another limitation of this study is the lack of observable outcomes. Although the survey measures provide some worthwhile information about outcomes, it would be more ideal to have observable measure of social communicative behavior to more clearly indicate whether or not adolescents could use the taught skills effectively.

The validity of adolescent self-report may seem limited for those with ASD, but a sociocultural perspective, as well as some leading researchers in the field (e.g., Bellini), argue

that individuals' perceptions and construction of meaning are critical. Parent report may also be limited in identifying social skill deficits for adolescents, given the amount of time adolescents spend away from their parents each day, but similarly, their perspective, however limited, is key. Finally, sensitivity to change over an 8-week period is not something that all measures clearly assess.

Finally, other study limitations fall within the limits of the Knoodle online system. Many participants chose not to use the discussion forum, rate the weekly lessons, or provide feedback on whether or not they had practiced the target skills. The reasons for their lack of response are unknown. Although Knoodle did not have the capability to make these components required, perhaps using another course management system with this feature would have ensured greater engagement. Additionally, it would have been ideal to provide differentiated feedback to the weekly quizzes, but this was not possible with Knoodle. Lastly, although the quality of most video clips was strong, the video clips that were not recorded by the drama club were lower quality than those recorded by the drama club. There is no published research (to this author's knowledge) that suggests video quality has a direct effect on the outcomes of video modeling, but it is possible that the quality could affect engagement.

Future Research

First, this researcher plans to re-run these analyses with a larger sample after the wait list group finishes the intervention. It will of course be important to check for differences between the two groups based on the intervention websites, but if there are no significant differences between groups combining the data sets will allow for a more robust analysis of intervention effects. If there are differences between the two groups, this unexpected change in procedures will have provided opportunities for a closer investigation of the necessary intervention

components (e.g., differential feedback). A preliminary analysis of descriptive data from the wait list control group on the Mindflash site reveal a higher percentage of lessons completed, as well as higher weekly ratings. The participants on the Mindflash site will have an opportunity to complete all eight lessons, which will allow for an analysis of the intended treatment package. Also, given that the wait list group had lower mean social skills and higher mean problem behaviors at baseline, floor and ceiling effects can be more clearly ruled out. Additionally, the qualitative feedback provided by participants through weekly lesson ratings can be examined to gather further information about participant satisfaction and how to improve the lessons. These data will all help to refine the intervention package for future research. An enhancement to consider based on the results of the current study and some of the qualitative feedback received from participants is to alter the format for selecting lesson content. Rather than a pre-packaged intervention, a pre-test to generate a course of relevant lessons for individuals may prove more successful.

To gather additional data on the effectiveness of this online intervention strategy, it would be important for researchers to develop sustainable systems of delivery. The unexpected closing of the Knoodle course management site posed a significant challenge to this research project and using a stable delivery system would be wise in the future. Similarly, careful consideration of measures that could be utilized online to accurately gather relevant data would be of importance to future researchers. The distribution of study measures was challenging in this project, and there was a 1-3 week lag time between survey completion and intervention implementation at both Time 1 and 2. A set of useful measures that could be utilized online in closer proximity to intervention implementation would be helpful for future research. Similarly, a screener that identified initial levels of social skills (as described in the Limitations section)

could strengthen future research as well.

Given the discrepancies between reporters seen in this study, it would be important to carefully examine the social skills measures used for progress monitoring in future research in general, and for monitoring online instruction in particular. For example, Bellini & Hopf (2007) suggest, "Future research should also examine the reliability of the ASSP across informants and the concurrent validity of the instrument…The latter could be accomplished by comparing the results of the ASSP with more established social skills measures, such as the Social Skills Rating System. A moderate correlation between the ASSP and these other instruments would be expected, but not a high correlation, as these instruments were designed for general populations and the ASSP was designed specifically for children with ASD" (p. 86). This researcher was able to examine the ASSP and the SSIS and though a there was a high correlation between measures at Time 1 ($r = .850$, $p = < .001$) and at Time 2 ($r = .772$, $p = < .001$), the measures did not reveal similar findings within each of the research questions discussed above. Therefore, further examination of the appropriateness of each measure for particular clinical and research purposes is warranted. Also, examination of teacher report, as compared to parent and child report may yield interesting findings with relevant clinical implications.

Additionally, future research should explore opportunities for direct behavioral observation in distance-based interventions. Though not possible for the current study, future research may examine distance-technology that allows for participant interaction with the researcher to demonstrate learned skills by either self-recording video or video conferences. Additionally, the current study did not address maintenance of learned skills, but future research may examine not only the immediate effects of online strategies, but also the long-term effects. It is not only important to know if a student can learn a skill, but also if the behavior generalizes

and sustains.

Lastly, the introduction and literature review in this dissertation highlighted the need to consider individual deficits, needs, and perspectives when planning interventions. Although the pre-dissertation study was a sincere effort to select target intervention skills that would be of relevance to adolescents with ASD, there may still have been a mismatch between the taught skills and the needs of participants. In the future, researchers should consider how to best match the content to the needs of participants in a controlled manner, prior to increasing the amount of content.

It would be important to gather further information about the role of parents in future research as well. This study did not examine the level of parent involvement, and it is quite possible that involvement varied among participants. While some parents may have watched the videos with their children and prompted practice attempts, other parents may have been quite uninvolved. It would be important for future research to examine the importance of parent involvement and to assess parent's satisfaction with the intervention as well. While some parents prefer to have an active role in intervention or treatment, others prefer to more quietly support their child's independence in treatment. These data would be important for determining how to provide socially valid treatments that maintain effectiveness when more broadly distributed.

Similarly, the role of the researcher is one that needs to be more clearly investigated in future research. While the researcher did not directly interact with any of the participants in this study, there were efforts made to provide feedback to participants through the quiz function. Additionally, the researcher monitored the discussion board and was available to participants by email and occasionally, instant message. These mechanisms were put in place so that

participants were not engaging in the intervention without some oversight from the researcher, who had social skills training experience. Despite some of the positive effects found within this study, the limitations discussed above suggest a need for more possible feedback opportunities and perhaps greater interaction between the researcher and participants in order to assess outcomes. Future researchers should carefully examine these factors prior to more widely implementing online interventions that include little implementer oversight. Though online or computer-mediated interventions have become quite popular and may have far-reaching positive effects, it is still unclear what are the key components of such interventions and this study highlights the need for further empirical researcher prior to any widespread implementation or commercialization.

Implications for Practice

Researchers have suggested that if evidence can demonstrate that computer-based delivery of video modeling is an instructionally sound practice, "the dissemination of quality products to teachers and students becomes a real possibility" (Ayres & Langone, 2005). Teachers play a critical role in providing services to students on a day-to-day basis and could be an effective resource for naturalistic instruction and increasing generalization or practice opportunities. The lack of significant treatment effects on social skills development within the current study has important implications for practice, however. Rushing into widespread implementation of this evidence-based strategy in new delivery formats would not be wise until those delivery methods have been more fully tested with high treatment integrity and found to be effective. Additionally, it is critical to clearly define the role and responsibilities of teachers or other implementers and to understand how their involvement may influence outcomes. It is not yet clear what the critical components of computer-based interventions are, or how the

interventionist influences outcomes, and therefore clear guidelines for implementing computer-based delivery of video modeling have not yet been established. Once the key components are identified, finding ways to ensure treatment integrity would be important. Overall, educators could play a key role in delivering computer-based interventions in the future, but many factors need to be explored prior to widely disseminating any computer-based program.

The role of parents was addressed above for considerations in future clinical research, but it is similarly important to consider the role of parents within clinical practice. This study demonstrated that the input from parents is important, if not critical, in understanding the adolescent experience of those with ASD. While parent report had more predictive power in some instances, adolescent report was more informative in other instances. Together, both perspectives help provide a more complete understanding of the child's functioning, as well as his interaction with those in his environment. Gathering comprehensive data from multiple perspectives has relevance for intervention and treatment when considering how one's family can play a role in providing services. With this intervention, the researcher had little control over whether or not participants chose to engage in practice, or generalization, opportunities. Parents, however, could play a key part in providing those opportunities for adolescents. More generally, if clinicians consider the ways in which families can participate in treatment and intervention services, the opportunities for learning, exposure, and reinforcement could be increased.

Conclusions

Overall, this study examined the effects of an online social skills intervention with video modeling from both parent and adolescent perspectives. Additionally, this study examined the relationships between social skills, academic achievement, and mental health among adolescents with ASD. Although there is substantial literature on the effectiveness of social skills

interventions, and video modeling in particular, there is little research that examines alternative forms of delivery. Positive treatment effects were not observed on social skills ratings, but improvements in problem behaviors were seen for the intervention group. This study certainly does not refute the years of research demonstrating the effectiveness of social skills interventions and video modeling strategies, but rather highlights implications for alternative delivery of such interventions. Also, this study highlighted the importance of carefully choosing measures for evaluating the effectiveness of interventions, as there were mixed results depending on measurement tool and reporter. Finally, this study highlighted the relationships between social skills, problem behaviors, and academic and mental health outcomes that should continue to be examined from both adolescent and parent perspectives. It is important for clinicians and researchers to continue to think about creative ways to serve those with ASD, so that all individuals who desire services can access them, and so those that may be at risk for poor mental health outcomes have access to services to remediate those risks.

APPENDICES

APPENDIX A

Recruitment Letter

Recruitment Letter

Dear IAN Research participant,

Based on your family profile, one or more members of your family may qualify for the study below. You should click on the study link or contact the study team directly, using the information provided, if you are interested in joining. You do not have to participate in this study and your non-participation will neither affect the care you receive from any health provider nor your standing as a participant in IAN Research.

Please note that IAN Research is serving as a resource linking the autism community and researchers. This study is not endorsed by or performed under the auspices of the IAN Research project at Kennedy Krieger Institute/Johns Hopkins.

Name of Study: An Online Social Skills Intervention with Video Modeling for Adolescents with ASD
Institution: Michigan State University, East Lansing, Michigan
Location: Online study; no geographic limitation within the United States
Eligibility Criteria: Children diagnosed with an Autism Spectrum Disorder, in grades 9-12, between 13-18 years of age, who (i) spend more than 50% of their time in general education classes, (ii) have basic computer skills, (iii) have regular Internet access, and (iv) read at or above a fifth grade reading level.
Principal Investigator: Dr. Evelyn R. Oka, Associate Professor, School Psychology & Educational Psychology
Research Contact: Carolyn Hayter, M.A., Doctoral Candidate in School Psychology
Email: adolescencestudy@gmail.com
Phone: 513-ASD-PROJ (513-273-7765)
Study Link:
https://docs.google.com/spreadsheet/viewform?formkey=dGZ0amptcmx3V3RBWW5jM2d0T0p6Qnc6MQ#gid=0

Dear Parent,

I am writing this letter to offer your child an opportunity to participate in a research study through Michigan State University. Many adolescents with autism spectrum disorder (ASD) struggle with interpersonal communication and we are interested in understanding how to effectively support the development of adolescents' social communication skills. The study examines the effectiveness of an online intervention that has been developed to teach social communication skills to adolescents with ASD.

The intervention includes a series of fun videos, online presentations, brief quizzes, and surveys, as well as opportunities to interact with other research participants in online discussions (i.e., other adolescents with ASD). The discussion forums will be carefully monitored throughout the duration of the study to protect participants from possible inappropriate comments, bullying, etc.

Adolescents will be expected to participate in one online lesson per week for a total of eight weeks. Each weekly lesson will last approximately 15-30 minutes. However, adolescents may spend additional time on the intervention website if they choose to view lessons multiple times or if they choose to communicate with other participants on a more frequent basis.

Once enrolled, families will be sent a packet by mail that includes consent forms and questionnaires. Adolescents and one parent of each adolescent will be requested to each complete multiple questionnaires. The questionnaires will take approximately 60 minutes total for each adolescent and parent. More than one child per family may participate in the study, but parents will need to fill out separate questionnaires for each child. When completed, signed consent forms and questionnaires must be returned in a postage-paid envelope.

After consent forms and questionnaires are returned, adolescents will be randomly assigned to two groups. One group will be asked to begin the intervention immediately and the other will be put on a waiting list. Regardless of which group adolescents are in, all adolescents and one parent of each adolescent will be expected to complete a second set of questionnaires after approximately eight weeks. After the second set of questionnaires is returned, all adolescents on the waiting list will begin the intervention. Approximately eight weeks later, a third and final set of questionnaires will be sent to all participants.

Each time parents and adolescents both return completed forms, families will be provided with a $10 gift card for Amazon.com. This will occur after each of the three rounds of questionnaires, allowing for families to earn a total of $30 in Amazon.com gift cards.

Those who participate fully throughout the duration of the study (i.e., parents and adolescents both complete and return all measures, adolescents participate in at least seven of eight intervention lessons) will be entered in a raffle at the conclusion of the study for a pocket video camera. One video camera will be raffled off for every 30 adolescent participants.

If you are interested in joining this study, please click
https://docs.google.com/spreadsheet/viewform?formkey=dGZ0amptcmx3V3RBWW5jM2d0T0p6Qnc6MQ#gid=0
and complete the online enrollment form. If you have any questions about the study, please contact Carolyn Hayter at 513-ASD-PROJ (513-273-7765) or adolescencestudy@gmail.com.

Thank you in advance for your time and assistance. We look forward working with you in the near future.

Sincerely,

Carolyn Hayter, M.A.
Evelyn Oka, Ph.D.

APPENDIX B

Parent Informed Consent

Consent for Participation in Research

You and your child are invited to participate in a research study through Michigan State University. Researchers are required to provide a consent form to inform you about the study, to inform you that participation is voluntary, to explain risks and benefits of participation, and to allow you to make an informed decision. The title of the study is *An Online Social Skills Intervention with Video Modeling for Adolescents with ASD*. Michigan State University graduate student, Carolyn Hayter, and Associate Professor, Dr. Evelyn Oka, are conducting the research. You should feel free to ask the researchers any questions you may have.

PURPOSE OF RESEARCH:

Your child is being asked to participate in a research study on social communication. Your child was selected as a possible participant because he/she has an autism spectrum disorder (ASD). Many adolescents with ASD struggle with interpersonal communication and we are interested in understanding how to effectively support the development of adolescents' social communication skills.

The study examines the effectiveness of an online intervention that has been developed to teach social communication skills to adolescents with ASD. We are recruiting adolescents with ASD in grades 9-12 who are 18 years of age or younger. To be included in the study, adolescents must spend at least 50% of their time at school in general education classes, have basic computer skills, have regular Internet access, and read at, or above, a fifth grade level.

WHAT YOU AND YOUR CHILD WILL DO:

Adolescents and one parent of each adolescent are asked to each complete five questionnaires at the beginning of the study. These questionnaires will take about 60 minutes for each adolescent and parent to complete. After consent forms and questionnaires are returned, adolescents will be randomly assigned to two groups. One group will be asked to begin the intervention immediately and the other will be put on a waiting list. You will receive an email that tells you which group your child has been assigned to. Regardless of which group adolescents are in, all adolescents and one parent of each adolescent will be expected to complete a second set of questionnaires after approximately eight weeks. Parents will have four questionnaires to complete and adolescents will have six questionnaires to complete at this time. After the second set of questionnaires is returned, all adolescents on the waiting list will begin the intervention. Approximately eight weeks later, a third and final set of questionnaires (i.e., four questionnaires for parents and six for adolescents) will be sent to all participants.

The questionnaires that parents will complete ask about adolescents' social skills and social support. Additionally, parents will complete a brief demographic survey. The questionnaires that adolescents will complete ask about their social skills, social support, attitudes toward technology, and their feelings (i.e., relatedness, anxiety, and depression).

The intervention includes a series of fun videos, online presentations, brief quizzes, and surveys, as well as opportunities to interact with other research participants (i.e., other adolescents with

ASD). Adolescents will be expected to participate in and complete 8 weekly lessons that each lasts approximately 15-30 minutes. Until the study ends, adolescents may spend more time on the intervention website if they choose to view lessons multiple times or if they choose to communicate with other participants on a more frequent basis. After adolescents complete the eight weekly lessons, access to the online intervention ends and parents and adolescents will complete the final sets of questionnaires.

POTENTIAL BENEFITS AND RISKS:
This study will help us to learn how to support adolescents' social and emotional development. The views of parents and adolescents are important to help us understand more about the social experience of adolescents with ASD, and your participation may help to improve the way in which schools support students during this time. It is also possible that adolescent participants will develop social skills over the course of intervention, as well as improve their feelings of social support and relatedness.

Having your child spend time online on the Internet may cause concern. While it is important that adolescents complete the lessons on their own, it is also important that parents are confident and comfortable with the content of the lessons. Therefore, parents will be provided access to the intervention website with limited rights. Parents will be able to view all intervention content, but will not be able to read or participate in the discussion forums.

One possible risk of this study is that peer interaction during intervention could lead to negative social or emotional outcomes if negative interactions, rude comments, or inappropriate remarks occur in the online discussions. However, peer interaction may also lead to the development of friendships or increased feelings of social support. A participant agreement form will be shared with participants prior to the start of intervention that details the norms and expectations for communicating in the discussion forums to minimize this risk. Participants must agree to abide by the proposed expectations before beginning intervention. Additionally, the researchers will monitor the discussion forums to ensure that participants are adhering to the stated expectations and they will intervene if needed. Participants may also report directly to the researcher any problems or inappropriate comments they encounter. These will be removed immediately.

A second possible risk is that participants may incorrectly use learned social skills in real-life situations. At the conclusion of each lesson, suggestions for practice will provide appropriate uses of the target skills in real-life contexts to minimize this risk. Additionally, you can support your child's participation by asking him/her about the intervention and encouraging his/her efforts to practice the skills.

A third risk of this study is that it involves spending time to complete the questionnaires and participate in intervention. The intervention has been designed with the perspectives and preferences of adolescents with ASD in mind however, so we hope that this time will be enjoyable and meaningful for participants.

Finally, both parents and adolescents may become more aware of adolescents' skill deficits or weaknesses, but also may become more aware of adolescents' strengths. To minimize the risk of adolescents developing negative feelings about their abilities, participants will be able to view

each lesson multiple times throughout the 8-week intervention and will be allowed to retake quizzes in order to maximize opportunities for success.

PRIVACY AND CONFIDENTIALITY:

The data for this project will be kept confidential to the greatest extent allowable by law. Upon enrollment, all participants will be assigned ID numbers, which will be used in place of names on questionnaires and other hard copy documents. For online activities, participants will be assigned usernames and will be strongly encouraged not to share their full names when communicating with other participants. At the conclusion of intervention, any identifying information in electronic data will be de-identified by replacing names with ID numbers.

Any hard copies of documents, forms, surveys, or rating scales will be stored in a locked filing cabinet for approximately three years and then will be destroyed. Electronic information and data from the online intervention will be stored on the investigators' computers and will be password-protected. It will be stored until the completion of the study, or for approximately 3 years. Only the researchers and the MSU Institutional Review Board will have access to the research data.

The results of this study may be published or presented at professional meetings, but the identities of all research participants will remain confidential. It will not be possible for readers to know who participated in the study. Only the researchers and the MSU IRB will know who participates in the study. Results will be available to you upon request, will consist only of group data, and will not include any identifying information.

The investigator has ethical and legal obligations to report suspected child abuse or neglect, and to prevent your child from carrying out any threats to do serious harm to themselves or others. If keeping information obtained in this study private would immediately put your child or someone else in danger, the investigators would release that information to protect your child or another person.

YOUR RIGHTS TO PARTICIPATE, SAY NO, OR WITHDRAW:

Your participation and your child's participation in this study are entirely voluntary, which means that you are free to choose whether or not you want to participate. You and your child are free to withdraw your participation at any time without consequence. You may also choose not to answer particular questions without consequence. Your non-participation will neither affect the care you receive from any health provider nor your standing as a participant in IAN Research.

COSTS AND COMPENSATION FOR BEING IN THE STUDY:

There is no charge to participate in the study. However, it is possible that you may incur additional charges on your Internet plan if your child spends a large amount of time on the intervention site. The researchers are NOT able to provide compensation for Internet fees.

Each time parents and adolescents both return completed forms, families will be provided with a $10 gift card for Amazon.com. This will occur after each of the three rounds of questionnaires, allowing for families to earn a total of $30 in Amazon.com gift cards.

Those who participate fully throughout the duration of the study (i.e., parents and adolescents both complete and return all measures, adolescents participate in at least seven of eight intervention lessons) will be entered in a raffle at the conclusion of the study for a pocket video camera. One video camera will be raffled off for every 30 adolescent participants.

CONTACT INFORMATION FOR QUESTIONS AND CONCERNS:

If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury (i.e. physical, psychological, social, financial, or otherwise), please contact the researchers: Carolyn Hayter, M.A., by email: adolescencestudy@gmail.com; phone: 513-ASD-PROJ (513-273-7765); or Evelyn Oka, Ph.D. by email: evoka@msu.edu; phone 517-432-0843; regular mail: 439 Erikson Hall, 620 Farm Lane, East Lansing, MI, 48824; website: http://www.educ.msu.edu/cepse/SchoolPsychology/faculty.asp.

If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 207 Olds Hall, 408 West Circle Drive, MSU, East Lansing, MI 48824.

DOCUMENTATION OF INFORMED CONSENT

If you agree to participate in the research study, fill in your name, and sign below.

☐ I agree to participate in this study and consent for my child, _____, to participate in this research study.

_____ _____

Signature Date

You have been given a duplicate copy of this form to keep.

APPENDIX C

Adolescent Assent Form

Adolescent Agreement for Participation in Research

Study Title: *An Online Social Skills Intervention with Video Modeling for Adolescents with ASD*

This is a research study and you are being invited to participate because you are an adolescent in high school with an autism spectrum disorder (ASD). In this study, the researchers hope to learn how to support the development of adolescents' social communication skills.

What will happen if I take part in this study?

If you agree to be in this study, your participation will involve completing multiple questionnaires and completing an 8-week online intervention. The intervention includes a series of fun videos, online presentations, brief quizzes, and surveys, as well as opportunities to interact with other research participants (i.e., other adolescents with ASD). You will be expected to participate in eight weekly lessons that each lasts approximately 30 minutes. Until the study ends, you may spend more time on the intervention website if you choose to view lessons multiple times or if you choose to communicate with other participants on a more frequent basis. After you complete the eight weekly lessons, access to the online intervention ends and you will complete the final sets of questionnaires.

You will be asked to complete five questionnaires at the beginning of the study. These questionnaires will take a total of about 60 minutes to fill out. After completing and returning this form and the questionnaires, you will be randomly assigned to one of two groups. One group will be asked to begin the intervention immediately and the other will be put on a waiting list. Your parent will receive an email that states which group you have been assigned to. Regardless of which group you are assigned to, you will be expected to complete a second set of six questionnaires after approximately eight weeks. This set of questionnaires will also take approximately 60 minutes. After the second set of questionnaires is returned, all adolescents on the waiting list will begin the intervention. Then, approximately 8 weeks later a third set of six questionnaires will be sent to all participants. This set of questionnaires will also take approximately 60 minutes.

The questionnaires that you will complete ask about your feelings, social interactions, and school experiences. The questionnaires are for research purposes only.

Are there any risks to my privacy or me?

Some of the questionnaires ask you to rate yourself and may make you feel uncomfortable. Also, you may at times feel uncomfortable interacting with other participants online. You are free to use the online discussion forums as much or as little as you would like. You may have difficulty applying skills you learn online to real life. We will provide suggestions to help you with this, and you will have opportunities to contact the researcher if you need to.

The data for this project will be kept confidential to the greatest extent allowable by law. Confidentiality means privacy. In other words, information that you share through

questionnaires and online activities will not be shared with your parents or anyone else without your permission. Only the researchers and the MSU Institutional Review Board will have access to the research data.

Upon enrollment, you will be assigned an ID number, which will be used in place of your name on questionnaires and other hard copy documents. For online activities, you will be assigned a username. We *strongly encourage* you not to share your full name when communicating with other participants.

In some instances, the researchers are required to break confidentiality and share information about you with your parents or law enforcement agencies. The researchers are required to report suspected child abuse or neglect, and to prevent you from carrying out any threats to do serious harm to yourself or others. If keeping information confidential, or private, would immediately put you or someone else in danger, the researchers would release that information.

Any hard copies of documents, forms, surveys, or rating scales will be stored in a locked filing cabinet for approximately two years and then will be destroyed. Electronic information and data from the online intervention will be stored on the investigators' computers and will be password-protected. It will be stored until the completion of the study, or for approximately 2 years.

The results of this study may be published or presented at professional meetings, but the identities of all research participants will remain confidential. In other words, it will not be possible for readers to know who participated in the study. Only the researchers and the MSU IRB will know who participates in the study. Results will be available to you upon request, will consist only of group data, and will not include any identifying information.

Are there benefits?

You may learn some new social skills from participating in this intervention. This research could also potentially benefit others with ASD in the future. Your views are important to help us understand what it's like to be a high school student with ASD today. Your participation may help to improve the way in which schools support students with ASD during adolescence.

Can I say "No"?

You may choose to say "no". Participation is voluntary, you may choose not to participate at all, or you may refuse to participate in certain parts or answer certain questions. You may stop participating at any time without consequence.

Choosing not to participate will involve no penalty or loss of benefits to you.

Are there any payments or costs?

It does not cost anything to participate in this study. If you and your parents complete and return all required questionnaires at the beginning of the study, your family will be provided with a $10

gift card for Amazon.com. This will occur after each of the three rounds of questionnaires, allowing for your family to earn a total of $30 in Amazon.com gift cards.

Also, if you complete and return all measures and participate in at least seven of eight intervention lessons, you will be entered in a raffle at the end of the study for a pocket video camera. One video camera will be raffled off for every 30 adolescent participants.

Who can answer my questions about the study?

If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury (i.e. physical, psychological, social, financial, or otherwise), please contact the researchers: Carolyn Hayter, M.A. by email: adolescencestudy@gmail.com; phone: 513-ASD-PROJ (513-273-7765); or Evelyn Oka, Ph.D., by email: evoka@msu.edu; phone: 517-432-0843; regular mail: 439 Erikson Hall, 620 Farm Lane, East Lansing, MI, 48824; website: http://www.educ.msu.edu/cepse/SchoolPsychology/faculty.asp.

If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 207 Olds Hall, 408 West Circle Drive, MSU, East Lansing, MI 48824.

Documentation of Agreement to Participate in Research

If you agree to participate in the research study, fill in your name, and sign below.

☐ I, _____, agree to participate in this research study.

_____ _____

Signature Date

You have been given a duplicate copy of this form to keep.

APPENDIX D

Demographic Questionnaire

Demographic Questionnaire

Person Completing Form:

- ☐ Mother
- ☐ Father
- ☐ Grandmother
- ☐ Grandfather
- ☐ Other (please specify): _____

Child's Birthdate (Month, Day, Year): _____

Child's Grade:

- ☐ 9th Grade
- ☐ 10th Grade
- ☐ 11th Grade
- ☐ 12th Grade

Child's Gender:

- ☐ Male
- ☐ Female

Child's Race/Ethnicity:

- ☐ Hispanic
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White

Does your child have Autism Spectrum Disorder?

- ☐ Yes
- ☐ No

At what age was your child diagnosed: _____

Which of the following most accurately describes your child? Please check only one.

- ☐ Autism
- ☐ Asperger's Disorder
- ☐ Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS)
- ☐ Childhood Disintegrative Disorder
- ☐ Rett's Disorder
- ☐ None

Do any of these characteristics describe your child? Check all that apply.

- ☐ Talented & Gifted
- ☐ ADHD - Attention Deficit Hyperactivity Disorder
- ☐ LD - Learning Disability
  - o Please specify subject area: _____
- ☐ Physical Disability
  - o Please specify: _____
- ☐ Emotional Disorder
  - o Please specify: _____
- ☐ Other: _____

Which of the following best describes your child's class schedule at school? Please choose one.

- ☐ He/she takes all Special Education classes.
- ☐ He/she takes all General Education classes.
- ☐ He/she takes mostly Special Education classes with a few General Education classes.
- ☐ He/she takes mostly General Education classes with a few Special Education classes.
- ☐ He/she is homeschooled.

Has your child ever been retained/held back in school?

- ☐ No
- ☐ Yes
  - o If yes, during what grade(s): _____

Has your child ever been promoted early in school?

- ☐ No
- ☐ Yes
  - o If yes, during what grade(s): _____

Currently, what are your child's typical grades at school? Check all that apply.

- ☐ As
- ☐ Bs
- ☐ Cs
- ☐ Ds
- ☐ Fs

What is your child's cumulative GPA:

_____

Is your child currently receiving another social skills intervention?

- ☐ Yes
- ☐ No

If yes, please describe the intervention (i.e., what activities does he/she do, for how long, and how often).

_____

_____

_____

_____

_____

Has your child received social skills intervention in the past?

- ☐ Yes
- ☐ No

If yes, please describe the intervention and when it occurred (i.e., what activities does he/she do, when did intervention occur, for how long, and how often).

_____

_____

_____

_____

_____

APPENDIX E

Parent Likert Scale Form

*Please rate how **important** you think the following skills are for your child.*

1 not at all important	2	3	4 somewhat important	5	6	7 very important
1. Entering a Conversation	1	2	3	4	5	6	7
2. Exiting a Conversation	1	2	3	4	5	6	7
3. Two-Way Conversations	1	2	3	4	5	6	7
4. Beginning Get-Togethers	1	2	3	4	5	6	7
5. Ending Get-Togethers	1	2	3	4	5	6	7
6. Handling Disagreements	1	2	3	4	5	6	7
7. Handling Teasing	1	2	3	4	5	6	7
8. Asking for Help	1	2	3	4	5	6	7

*Please rate how **difficult** you think the following skills are for your child.*

1 not at all difficult	2	3	4 somewhat difficult	5	6	7 very difficult
1. Entering a Conversation	1	2	3	4	5	6	7
2. Exiting a Conversation	1	2	3	4	5	6	7
3. Two-Way Conversations	1	2	3	4	5	6	7
4. Beginning Get-Togethers	1	2	3	4	5	6	7
5. Ending Get-Togethers	1	2	3	4	5	6	7
6. Handling Disagreements	1	2	3	4	5	6	7
7. Handling Teasing	1	2	3	4	5	6	7
8. Asking for Help	1	2	3	4	5	6	7

APPENDIX F

Adolescent Likert Scale Form

*Please rate how **important** you think the following skills are.*

1 not at all important	2	3	4 somewhat important	5	6	7 very important

1. Entering a Conversation	1	2	3	4	5	6	7
2. Exiting a Conversation	1	2	3	4	5	6	7
3. Two-Way Conversations	1	2	3	4	5	6	7
4. Beginning Get-Togethers	1	2	3	4	5	6	7
5. Ending Get-Togethers	1	2	3	4	5	6	7
6. Handling Disagreements	1	2	3	4	5	6	7
7. Handling Teasing	1	2	3	4	5	6	7
8. Asking for Help	1	2	3	4	5	6	7

*Please rate how **difficult** you think the following skills are.*

1 not at all difficult	2	3	4 somewhat difficult	5	6	7 very difficult

1. Entering a Conversation	1	2	3	4	5	6	7
2. Exiting a Conversation	1	2	3	4	5	6	7
3. Two-Way Conversations	1	2	3	4	5	6	7
4. Beginning Get-Togethers	1	2	3	4	5	6	7
5. Ending Get-Togethers	1	2	3	4	5	6	7
6. Handling Disagreements	1	2	3	4	5	6	7
7. Handling Teasing	1	2	3	4	5	6	7
8. Asking for Help	1	2	3	4	5	6	7

APPENDIX G

Multidimensional Scale of Perceived Social Support Parent Form

Instructions: We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

Circle the "1" if you **Very Strongly Disagree**
Circle the "2" if you **Strongly Disagree**
Circle the "3" if you **Mildly Disagree**
Circle the "4" if you are **Neutral**
Circle the "5" if you **Mildly Agree**
Circle the "6" if you **Strongly Agree**
Circle the "7" if you **Very Strongly Agree**

1. There is a special person who is around when my child is in need.	1	2	3	4	5	6	7
2. There is a special person with whom my child shares his/her joys and sorrows.	1	2	3	4	5	6	7
3. My child's family really tries to help him/her.	1	2	3	4	5	6	7
4. My child gets the emotional help and support he/she needs from family.	1	2	3	4	5	6	7
5. My child has a special person who is a real source of comfort to him/her.	1	2	3	4	5	6	7
6. My child's friends really try to help him/her.	1	2	3	4	5	6	7
7. My child can count on his/her friends when things go wrong.	1	2	3	4	5	6	7
8. My child can talk about his/her problems with family.	1	2	3	4	5	6	7
9. My child has friends with whom he/she can share his/her joys and sorrows.	1	2	3	4	5	6	7
10. There is a special person in my child's life who cares about his/her feelings.	1	2	3	4	5	6	7
11. My child's family is willing to help him/her make decisions.	1	2	3	4	5	6	7
12. My child can talk about his/her problems with his/her friends.	1	2	3	4	5	6	7

This parent report form was adapted from the *Multidimensional Scale of Perceived Social Support* (Zimet, Dahlem, Zimet, & Farley, 1988).

APPENDIX H

Multidimensional Scale of Perceived Social Support Adolescent Form

Instructions: We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

Circle the "1" if you **Very Strongly Disagree**
Circle the "2" if you **Strongly Disagree**
Circle the "3" if you **Mildly Disagree**
Circle the "4" if you are **Neutral**
Circle the "5" if you **Mildly Agree**
Circle the "6" if you **Strongly Agree**
Circle the "7" if you **Very Strongly Agree**

1. There is a special person who is around when I am in need.	1	2	3	4	5	6	7
2. There is a special person with whom I can share my joys and sorrows.	1	2	3	4	5	6	7
3. My family really tries to help me.	1	2	3	4	5	6	7
4. I get the emotional help and support I need from my family.	1	2	3	4	5	6	7
5. I have a special person who is a real source of comfort to me.	1	2	3	4	5	6	7
6. My friends really try to help me.	1	2	3	4	5	6	7
7. I can count on my friends when things go wrong.	1	2	3	4	5	6	7
8. I can talk about my problems with my family.	1	2	3	4	5	6	7
9. I have friends with whom I can share my joys and sorrows.	1	2	3	4	5	6	7
10. There is a special person in my life who cares about my feelings.	1	2	3	4	5	6	7
11. My family is willing to help me make decisions.	1	2	3	4	5	6	7
12. I can talk about my problems with my friends.	1	2	3	4	5	6	7

This adolescent report form is the *Multidimensional Scale of Perceived Social Support* (Zimet, Dahlem, Zimet, & Farley, 1988).

APPENDIX I

Intrinsic Motivation Inventory Perceived Competence for Learning

Please rate the following statements.

	1 not at all true	2	3	4 somewhat true	5	6	7 very true
1. I feel confident in my ability to learn how to talk with peers.	1	2	3	4	5	6	7
2. I am capable of learning how to talk with peers.	1	2	3	4	5	6	7
3. I am able to achieve my goals in learning to talk with peers.	1	2	3	4	5	6	7
4. I feel able to meet the challenge of learning how to talk with peers.	1	2	3	4	5	6	7

This form was adapted from the IMI (Ryan, 1982).

APPENDIX J

Intrinsic Motivation Inventory Interest/Enjoyment

Please rate the following statements.

	1 not at all true	2	3	4 somewhat true	5	6	7 very true
1. I enjoyed doing this study very much.	1	2	3	4	5	6	7
2. This study was fun to do.	1	2	3	4	5	6	7
3. I thought this was a boring study.	1	2	3	4	5	6	7
4. This study did not hold my attention at all.	1	2	3	4	5	6	7
5. I would describe this study as very interesting.	1	2	3	4	5	6	7
6. I thought this study was quite enjoyable.	1	2	3	4	5	6	7
7. While I was doing this study, I was thinking about how much I enjoyed it.	1	2	3	4	5	6	7

This form was adapted from the IMI (Ryan, 1982).

APPENDIX K

Attitude Toward Using Knoodle

Please rate the following statements.

	1 not at all true	2	3	4 somewhat true	5	6	7 very true
1. Using the online system was a bad idea.	1	2	3	4	5	6	7
2. The online system makes work more interesting.	1	2	3	4	5	6	7
3. Working with the online system is fun.	1	2	3	4	5	6	7
4. I like working with the online system.	1	2	3	4	5	6	7

This form was adapted from the *Attitude Toward Using Technology Scale* (Venkatesh, Morris, Davis, & Davis, 2003).

APPENDIX L

Diagnostic Criteria

Table 24

Diagnostic Criteria for Autistic Disorder

A. A total of six (or more) items from (1), (2), and (3), with at least two from (1), and one each from (2) and (3):
    1. qualitative impairment in social interaction, as manifested by at least two of the following:
        a. marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
        b. failure to develop peer relationships appropriate to developmental level
        c. a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest)
        d. lack of social or emotional reciprocity
    2. qualitative impairments in communication as manifested by at least one of the following:
        a. delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime)
        b. in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others
        c. stereotyped and repetitive use of language or idiosyncratic language
        d. lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level
    3. restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:
        a. encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus
        b. apparently inflexible adherence to specific, nonfunctional routines or rituals
        c. stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)
        d. persistent preoccupation with parts of objects

B. Delays or abnormal functioning in at least one of the following areas, with onset prior to age 3 years: (1) social interaction, (2) language as used in social communication, or (3) symbolic or imaginative play.

C. The disturbance is not better accounted for by Rett's Disorder or Childhood Disintegrative Disorder.

Note. From DSM-IV-TR (American Psychiatric Association, 2000, p. 75).

Table 25

Diagnostic Criteria for Rett's Disorder

A. All of the following:
    1. apparently normal prenatal and perinatal development
    2. apparently normal psychomotor development through the first 5 months after birth
    3. normal head circumference at birth
B. Onset of all of the following after the period of normal development:
    1. deceleration of head growth between ages 5 and 48 months
    2. loss of previously acquired purposeful hand skills between ages 5 and 30 months with the subsequent development of stereotyped hand movements (e.g., hand-wringing or hand washing)
    3. loss of social engagement early in the course (although often social interaction develops later)
    4. appearance of poorly coordinated gait or trunk movements
    5. severely impaired expressive and receptive language development with severe psychomotor retardation

Note. From DSM-IV-TR (American Psychiatric Association, 2000, p. 77).

Table 26

Diagnostic Criteria for Childhood Disintegrative Disorder

A. Apparently normal development for at least the first 2 years after birth as manifested by the presence of age-appropriate verbal and nonverbal communication, social relationships, play, and adaptive behavior.
B. Clinically significant loss of previously acquired skills (before age 10 years) in at least two of the following areas:
    1. expressive or receptive language
    2. social skills or adaptive behavior
    3. bowel or bladder control
    4. play
    5. motor skills
C. Abnormalities of functioning in at least two of the following areas:
    1. qualitative impairment in social interaction (e.g., impairment in nonverbal behaviors, failure to develop peer relationships, lack of social or emotional reciprocity)
    2. qualitative impairments in communication (e.g., delay or lack of spoken language, inability to initiate or sustain a conversation, stereotyped and repetitive use of language, lack of varied make-believe play)
    3. restricted, repetitive, and stereotyped patterns of behavior, interests, and activities, including motor stereotypies and mannerisms
D. The disturbance is not better accounted for by another specific Pervasive Developmental Disorder or by Schizophrenia.

Note. From DSM-IV-TR (American Psychiatric Association, 2000, p. 79).

Table 27

Diagnostic Criteria for Asperger's Disorder

A. Qualitative impairment in social interaction, as manifested by at least two of the following:
    1. marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
    2. failure to develop peer relationships appropriate to developmental level
    3. a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest to other people)
    4. lack of social or emotional reciprocity
B. Restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:
    1. encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus
    2. apparently inflexible adherence to specific, nonfunctional routines or rituals
    3. stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)
    4. persistent preoccupation with parts of objects
C. The disturbance causes clinically significant impairment in social, occupational, or other important areas of functioning.
D. There is no clinically significant general delay in language (e.g., single words used by age 2 years, communicative phrases used by age 3 years).
E. There is no clinically significant delay in cognitive development or in the development of age-appropriate self-help skills, adaptive behavior (other than in social interaction), and curiosity about the environment in childhood.
F. Criteria are not met for another specific Pervasive Developmental Disorder or Schizophrenia.

Note. From DSM-IV-TR (American Psychiatric Association, 2000, p. 84).

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