BEYOND SKILLS TO PAY THE BILLS: EFFECTS OF A VOCATIONAL SOCIAL SKILLS INTERVENTION ON PSYCHOSOCIAL FUNCTIONING AMONG YOUNG ADULTS WITH AUTISM

By

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ABSTRACT

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The transition from secondary education to higher education, work, and independent living is a critical period in the development of all youth, and one that elicits unique challenges for young adults with autism spectrum disorder and average to above-average intelligence. Transition service systems, including secondary and postsecondary education, state-federal vocational rehabilitation (VR), and community mental health (CMH) have struggled to address the unique needs of this increasingly identified, yet historically underserved, group. Educational and employment outcomes have been disappointing and disproportionately poor in comparison to other disability groups. Recognizing young adulthood as a critical developmental period, and noting the bidirectional relationships between social functioning, self-efficacy, and psychological wellness, this mixed methods study examined the efficacy of an empirically-derived, manualized, vocational social skills intervention for young adults with high-functioning autism spectrum disorder (HFASD). Results indicated that the Assistive Social Skills and Employment Training (ASSET) program is associated with: (1) immediate, small to medium-sized improvements in social cognition, (2) long-term, small to medium-sized improvements in social communication among participants with higher socioeconomic status, (3) immediate, very large gains in self-efficacy, and (4) long-term, medium to large declines in reported anxiety. Furthermore, results of the qualitative analysis suggested varying degrees of social skills generalization in employment, social, and family contexts up to two years after completing the

program. This study is a unique contribution to the state of the science as it provides validation that vocational social skills training positively impacts psychosocial functioning, including social functioning, self-efficacy, career outcome expectations, and psychological wellness, among young adults with HFASD. Furthermore, these results validate the use of Social Cognitive Career Theory to guide research and interventions with this population. In sum, this study provides level-three (Chan, Bezyak, Ramirez, Chiu, & Sung, 2010) evidence that ASSET can: (1) partially meet the need for manualized, evidence-based strategies to address work-related social skill development among young adults with HFASD, (2) help young adults with HFASD capitalize on the iterative power of bolstered self-efficacy and optimistic career expectations when facing the social challenges inherent to HFASD, (3) mitigate barriers to delivering such services by making them community-based and interdisciplinary, and (4) provide an innovative and efficient mechanism for addressing psychological wellness while targeting transferable skills. Copyright by ANNEMARIE CONNOR 2017 This dissertation is dedicated to my husband, Kenneth James Tsang, and children, James Connor Tsang and Cassidy Connor Tsang, who bore sacrifice with grace, love, patience, and determination. The journey was not possible without you.

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KEY TO ABBREVIATIONS

Autism Spectrum Disorder ASSET Assistive Social Skills and Employment Training CDC Centers for Disease Control and Prevention CMH Community Mental Health HFASD High Functioning Autism Spectrum Disorder LMM Linear Mixed-effects modeling NLTS-2 National Longitudinal Transition Study PDD-NOS Pervasive Developmental Disorder-not otherwise specified SCCT Social Cognitive Career Theory RSA **Rehabilitation Service Administration** SE Self-efficacy Supplemental Security Income SSI SSDI Social Security Disability Insurance VR Vocational Rehabilitation WIOA Workforce Investment and Opportunities Act

ASD

CHAPTER ONE

Introduction

Individuals with autism and without intellectual disability, referred to here as highfunctioning autism spectrum disorder (HFASD), present with unique service needs within the educational, vocational, and mental health systems that serve them. While exhibiting average to above average intelligence, impaired social functioning and psychological factors, including high levels of co-occurring anxiety and depression, have a profound impact on the social and vocational engagement of this group (Cloutier, Kurtz, May, & Hagner, 2014). In fact, older age and higher intelligence (IQ) predict lower self-perceived social competence and higher levels of depressive symptoms for individuals with ASD (Vickerstaff, Heriot, Wong, Lopes, & Dossetor, 2007). Notably, young adults with HFASD are among the least likely of their peers to gain employment (Westbrook et al., 2013) or live independently (Anderson, Shattuck, Cooper, Roux, & Wagner, 2014). Moreover, persistent struggles with social skills (Howlin & Moss, 2012), and anxiety and depression (White & Roberson-Nay, 2009) shape the social and vocational interests, goals, and behaviors of this population, particularly in the critical first two years after high school (Anderson et al. 2014: Shattuck et al., 2012). Both singularly and combined, these factors complicate participation in transition activities and negatively impact post-secondary outcomes.

The research literature enumerates disparate outcomes and elaborates multiple unmet needs related to autism. However, intervention studies, particularly those targeting adults with HFASD, are scant. While tremendous time, money, and resources have been devoted to addressing the medical and behavioral needs of children with autism, the most recent analysis of autism research funding from the Government Accounting Office (Federal Autism Research, 2015) reveals that funding to support research on the needs of adults with autism actually

declined from 2008 to 2013. The lack of research and resources has led some to describe school to work transition as a "confusing maze of misinformation, limited opportunities, insufficient resources and inappropriate or time-limited services" (Gerhardt & Holmes, 1997 as cited by Eaves & Ho, 2007, p. 739). Federal initiatives, including the Workforce Innovation and Opportunity Act (WIOA, 2014) and the National Longitudinal Transition Study-2 (NLTS-2, 2011) have called for improved transition outcomes. In response, service systems and researchers will need to look beyond outcomes, such as degree attainment and employment, and consider innovations in service delivery. Accordingly, this study examined how bolstering work-related social functioning may help students with HFASD go beyond gaining "skills to pay the bills," and ultimately experience improved psychological wellness.

Statement of the Problem

Sparse research on the unique needs of young adults with ASD. Most of the existing research and book literature is focused on toddlers and young children, and the use of applied behavior analysis (ABA) as an evidence-based intervention (Wehman, Smith, & Schall, 2009). While ABA is an appropriate early intervention for children with ASD, and an effective support for those with severe behavioral issues, it is arguably less appropriate for young adults with HFASD whose needs are more behaviorally complex and socially sophisticated. Moreover, individuals with HFASD are more self-aware of their social deficits (Vickerstaff et al., 2007) and, therefore, show significantly higher rates of anxiety (Kuusikko et al., 2008) and depression than individuals with ASD and lower levels of functional behavior (Hillier, Fish, Siegel, & Beversdorf, 2011).

Growing population with disparate postsecondary outcomes. As rates of ASD diagnosis have continued to rise (CDC, 2016), so too will the need to address the psychological

wellness and social integration of children with ASD as they transition to adult life. While social and psychological difficulties are central to ASD (Carpenter Rich, Loo, Yang, Dang, & Smalley, 2009; Hillier et al., 2011), work related social skills, or soft skills, are central to workplace success (Pritchard, 2013). Due, in part, to social skills deficits and mental health challenges, individuals with HFASD have disappointing postsecondary educational and employment outcomes compared to their nondisabled peers (Shattuck et al., 2012). Furthermore, adults with ASD who actually obtain employment are often under employed, working less hours and with fewer responsibilities than their hard skills and educational backgrounds would indicate (Müller, Schuler, Burton, & Yates, 2003; Taylor & Seltzer, 2011).

The National Longitudinal Transition Study (NLTS-2) data paints a similarly bleak picture of postsecondary independent living outcomes for young adults with ASD, indicating that only 17% were living outside of the parental home, a rate lower than other disability groups including emotional, intellectual, and learning disabilities (Newman et al., 2011). These disparities also extend to post-secondary education for young adults with ASD who enroll in college at rates much lower than their cognitive abilities might predict (Shattuck et al., 2012). Such disruptions to the normal acquisition of developmental milestones in young adulthood further isolate individuals with HFASD who may excel cognitively, but struggle socially. Furthermore, transition is a critical period, particularly the first two years following high school, in which the shift from the entitlement services of special education to the eligibility services of adult, community-based services, leaves individuals with ASD vulnerable to service disruption, discontinuation, or disengagement (Anderson et al., 2014; Shattuck et al., 2012). Fittingly, the Interagency Autism Coordinating Committee (IACC, 2011) and multiple authors (Anderson et al., 2014; Shattuck et al., 2012) have called for more research on the transition from special

education and higher education to adult life for youth with ASD. As impaired social communication is a hallmark of the disorder, social skills interventions may be particularly relevant to addressing the transition needs of young adults with HFASD.

Barriers to work. Knowing that social deficits, anxiety, and depression are challenges to the wellness, functional independence, and transition needs of this population, an understanding of what constructs mediate their effects is imperative. Throughout transition, students with ASD, particularly at the high school level, experience limited or absent school-based counseling services for psychosocial adjustment or career counseling (Connor, 2017), and may also face barriers to obtaining and benefiting from state VR counseling services due to lack of student/family involvement and ineffective interagency collaboration (Riesen, Schultz, Morgan, & Kupferman, 2014). At the college level, out-of-state students may have no access to state VR due to residency issues. Other barriers to addressing the psychosocial needs of this population are secondary education curricular content limitations imposed by diploma requirements, rationing of special education interventions or community mental health services for those with the most significant behavioral needs (Connor, 2017), and passive learning styles among students with ASD (Newman, 2007).

Moreover, increased academic opportunities for students with ASD have not translated into improved employment and economic self-sufficiency for the population (Eaves & Ho, 2008). Outcomes are marginally better within the state VR context, but consumers with ASD use more services and incur higher costs, yet receive lower wages and fewer work hours than other disability groups (Cimera & Cowen, 2009). At the individual level, difficulties with social communication, anxiety, stress, and sensory processing have been reported as barriers to finding work appropriate to skill level (Hurbutt & Chalmers, 2004). These barriers should compel

researchers to create and validate innovative solutions to meeting both the soft skill development and psychological wellness needs of this growing population. Tantamount is the need to address these issues while young adults with ASD are still connected with schools and, therefore, more accessible to service providers.

The importance of social functioning. Work-related social skills or "soft skills," have been identified as essential to both the hireability and retention of all workers, particularly as industries expand service roles and adopt more team-based workforces (Lawler & Finegold, 2000). Social competence, or the expression of prosocial behaviors such as empathy and perspective taking, is associated with positive workplace relationships, job tenure, and social involvement (Lane, Menzies, Barton-Arwood, Doukas, & Munton, 2005). Individuals with HFASD are acutely aware of their social difficulties, and experience a widening gap between social capabilities and contextual demands as they transition to work and higher education (Vickerstaff et al., 2007). When further considering that anxiety and depression negatively impact peer relationships (Kim, Szatmari, Bryson, Streiner, & Wilson, 2000), it is apparent that individuals with HFASD often become stuck in a vicious cycle: social skill deficits generate poor outcomes, poor outcomes exacerbate anxiety and depression, and anxiety and depression lead to impaired social interactions.

Need for evidence-based interventions. While interventions targeting social cognition and social functioning in the larger ASD population have become increasingly prevalent, most studies are atheoretical and descriptive, lack experimental control (Laugeson, Frankel, Gantman, Dillon, & Mogil, 2012; Laugeson & Park, 2014), and focus on the needs of young children (Jang et al., 2014). The special education and rehabilitation literature, while identifying the need for interventions that target career self-efficacy, expectations, and job-related social skills, lacks

rigor in identifying manualized interventions for addressing these pressing needs (Alwell & Cobb, 2009). To date, research has not systematically examined work-related social skills interventions as evidence-based practices for young adults with HFASD. Additional interventions that target the work-related social skills and mental health needs of adults with HFASD are needed, and could begin to improve the work, independent living, and mental health disparities experienced by this population. Additionally, rigorous research on the efficacy and effectiveness of novel interventions is essential to ensuring that programs are evidence-based, suited to the population, and fundable.

Summary of the problem. The transition from secondary education to higher education, work, and independent living is a critical period in the development of all youth, and one that elicits unique challenges for young adults with HFASD. Transition service systems, including secondary and postsecondary education, state-federal vocational rehabilitation (VR), and community mental health (CMH) have struggled to address the unique needs of this increasingly identified yet historically underserved group. Educational and employment outcomes have been disappointing and disproportionately poor in comparison to other disability groups. Recognizing young adulthood as a developmentally sensitive window, and noting the bidirectional relationships between social functioning, self-efficacy, and psychological wellness, evidence is needed to inform how policy and practice will address psychosocial adaptation and functional outcomes for young adults with HFASD.

Theoretical Framework

Steeped in constructivism and based on Bandura's (1986) theory of social cognition, the purpose of Social Cognitive Career Theory (SCCT) is to explain three interrelated aspects of career development: how interests are shaped, how educational and career choices are made, and

how academic and career success is achieved (Greenhaus & Callahan, 2006). SCCT provides a framework to describe how social learning constructs in association with personal and environmental factors influence not only career choice, but also work performance.

SCCT has been applied widely to understand how theory links to practice in addressing the vocational rehabilitation needs of individuals with various disabilities, including adolescents (Betz, 2007; Fabian, 2000). SCCT tenets state: (1) career choice, goals, and performance are influenced by the reciprocal interaction of personal, behavioral, and environmental factors, and (2) career development may be helped or hindered by environmental factors including differential socialization. Recognizing that ASD generates differential socialization, adolescents are primed for cognitive and behavioral shaping in relation to career expectancy and skill development, and further noting that SCCT accounts for not only intrapersonal, but also social factors that influence career development, SCCT is the logical choice in framing this study of the employment-related social skills training needs of youth with ASD.

According to SCCT, social skills training can be conceptualized as a learning experience that considers personal inputs (ASD related social functioning), and provides a learning experience (social skills intervention) that impacts self-efficacy and outcomes expectations, which subsequently drive improved social skills and psychological wellness. While Lent and colleagues (2002) proposed interests, goals and tasks as the outcomes of SCCT, this study adapted their framework to include anxiety and depression as psychological outcomes and novel constructs to SCCT (see Figure 1.1).

Figure 1.1

Theoretical Framework: Modified from Social Cognitive Career Theory (Lent, Brown, & Hackett, 1994, 2000, 2002.)



Statement of Purpose

The purpose of this study is fourfold: (1) contribute to the research literature on evidencebased work-related social skills interventions for young adults with HFASD, (2) highlight the multi-disciplinary, multi-outcome, community-based and manualized nature of the intervention as an innovation in service delivery, (3) better understand the relationships between social functioning, self-efficacy, and psychological wellness in this population, and (4) explore participants' awareness of individual changes in psychosocial functioning and outcome expectations over time. Pragmatically, this study seeks to test the preliminary efficacy of ASSET as an innovative and efficient method for impacting work-related social skills among young adults with HFASD. Theoretically, the proposed study seeks to quantitatively describe the relationship between social functioning, self-efficacy, and anxiety and depression, while qualitatively elaborating on these relationships and exploring the influence of self-efficacy on psychological wellness. Aspirationally, this study seeks to encourage innovative service delivery, multi-disciplinary collaboration, and greater attention to the psychosocial needs of young adults with HFASD and their families.

Research Questions and Hypotheses

1. Is ASSET associated with improved *social functioning* in the identified population? It is hypothesized that when compared to baseline (T1), students with HFASD who complete the ASSET program will show significant improvements in *social functioning* (a) immediately post intervention (T2) and (b) at two-month follow-up (T3).

2. Is ASSET associated with improved *self-efficacy* in the identified population? It is hypothesized that when compared to baseline (T1), students with HFASD who complete the ASSET program will show significant improvements in *self-efficacy* (a) immediately post intervention (T2) and (b) at two-month follow-up (T3).

3. Is ASSET associated with improved *psychological wellness (anxiety and depression)* in the identified population? It is hypothesized that when compared to baseline (T1), students with HFASD who complete the ASSET program will show significant improvements in *psychological wellness (anxiety and depression)* (a) immediately post intervention (T2) and (b) at two-month follow-up (T3).

4. Are *self-efficacy* and *psychological wellness* correlated? It is hypothesized that *self-efficacy* is inversely correlated with *anxiety/depression*.

5. Is ASSET associated with improvement in self-perceived, work-related *psychosocial functioning* and *outcome expectations* over time? It is hypothesized that ASSET will improve self-perceived psychosocial functioning as evidenced by alignment of the four outcome measures with qualitative statements. Further, it is hypothesized that participants will report development

in career and independent living goals as captured by interview and focus group data.

Significance of the Study

The research literature is replete with descriptions of disparate post-secondary outcomes for young adults with ASD, yet evidence-based soft skills interventions are lacking. Transition is a critical period for all youth and may be especially pivotal for youth with HFASD. Social isolation and co-occurring mental health problems make this group particularly at risk for service disengagement after high school. Moreover, these students have average to above average intellectual functioning and often possess strong splinter skills, making them less likely to access a functional school curriculum. Consequently, both students and families may lack access to special education and community resources for persons with disabilities.

Accordingly, the results of this study may contribute to the evidence base of transition practice by validating an intervention that can be easily embedded into multidisciplinary community contexts, and made accessible to young adults with HFASD who may otherwise not receive services to address their social and emotional needs. Finally, if validated, the ASSET intervention will provide practitioners with a manualized program that utilizes group process and principles of social cognition to impact work-related social skills and the bidirectional relationships between social functioning, self-efficacy, and anxiety and depression.

CHAPTER TWO

Literature Review

Current Understanding of Autism

Autism was previously classified (DSM-IV-TR) as four separate but related neurodevelopmental diagnoses: autistic disorder, Asperger's disorder, childhood disintegrative disorder, and pervasive developmental disorder not otherwise specified – a blanket diagnosis applied when the other three could not be definitively determined (American Psychiatric Association [APA], 2013; Levy, Mandel, & Schultz, 2009; Pellicano & Stears, 2011). While behaviorally descriptive, these four diagnoses were inconsistently applied across treatment settings, thereby creating confusion among individuals, practitioners, and caregivers (APA, 2013). Recent changes in the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; APA, 2013) eliminated Asperger's disorder, the diagnostic group with the highest functional levels. Autism is now characterized along a continuum, or spectrum, that accounts for variations in severity but not type of autism. Howlin and colleagues (2005) estimated that individuals with autism and without intellectual disability (HFASD) represent approximately 20-25% of all diagnosed cases.

Autism spectrum disorder (ASD) is currently understood as a heritable, neurobehavioral disorder of unknown etiology that is characterized by persistent impairments in social communication and social interaction; repetitive patterns of behaviors; restrictive interests or activities; and sensory processing abnormalities (APA, 2013). Due to the lifelong nature of ASD, early diagnosis and sustained intervention are important to effective management. While ASD is developmental, it is not always identified early. HFASD, in particular, may be difficult to diagnose early, as signs of social impairment may not be observable until social demands

exceed capacities (APA, 2013). Consequently, individuals with HFASD may not receive a diagnosis until adolescence or early adulthood, when social demands become increasingly complex.

Under the new umbrella of ASD, individuals exhibit a broad range of functioning, symptom severity, and intelligence. Impaired social communication and interaction are hallmarks of the disorder, and account for the primary disabling effects of autism, regardless of the individual's intelligence or verbal ability (Carter, Davis, Kiln, & Volkmar, 2005). Functional implications include difficulties understanding non-verbal and abstract verbal interactions with resultant problems in forming friendships and social networks (APA, 2013). Additionally, mental health disorders, particularly anxiety and mood disorders, are common comorbid conditions among youth with ASD (deBruin et al., 2007; Joshi et al., 2010). While estimates of the prevalence of anxiety and depression in the general population vary from as low as 5% to as high as 32% (Merikangas et al., 2010), White & Roberson-Nay (2009) estimated that nearly half of all youth with ASD struggle with anxiety and/or depression. More recently, Croen and colleagues (2015) found that adults with ASD have a 117% higher incidence of anxiety; a 123% higher incidence of depression, and an astounding 433% higher incidence of suicide attempts than their peers when controlling for age, sex, and race/ethnicity. Over the past two decades the reported prevalence of autism has escalated dramatically and so frequently that reporting a proportion this year may be inaccurate the next. Nevertheless, the most recent estimated prevalence of ASD at the time this manuscript was written was one in 68 as reported by the Centers for Disease Control (CDC, 2016), a striking contrast to the one in 1,000 rate reported in 1998 (Bryson & Smith, 1998) when the author of the current study was entering the field. While this may seem like a dramatic rise, it should be noted that the 1998 estimates excluded those with

Asperger's disorder (i.e., the group with the highest incidence). Furthermore, changes in diagnostic criteria as specified in the DSM-5 as well as regional sampling methods may at least partially account for the dramatic rise in prevalence, or proportion of the population that has the diagnosis. In conclusion, the trends do not necessarily indicate that the incidence, or the rate at which new cases occur each year, is growing exponentially. Moreover, medical and behavioral health providers, educators, and families may be doing a better job of early and more accurate identification.

What is well understood is that impaired social functioning is a hallmark of ASD. Evidence is mounting to suggest that difficulty regulating the autonomic, physiological symptoms of heightened arousal cause discomfort and avoidance of social situations in individuals with ASD (Joseph, Ehrman, McNally, & Keehn, 2008). This interplay of physiological symptoms and behavioral reactions is similar to the features of anxiety disorders and may contribute to difficulty reading social cues and responding appropriately to social interactions. Behaviorally, anxiety and depression may be closely related to some of the central difficulties of ASD including poor social communication, difficulty with unexpected changes in routine, and narrow and repetitive interests (Hillier et al., 2011). As a result of repeatedly uncomfortable and frequently failed interactions, the individual may withdraw from social engagement, thereby experiencing fewer opportunities to practice social skills and suffering from increasing anxiety and depression.

Relationship of Social Skills, Self-efficacy, Anxiety and Depression

While essential, social skill development is not innate. Social competence is culturally contextual and is influenced by disability. Developmental disabilities have been shown to impact social functioning in both children and adults. In particular, some of the core features of

HFASD directly impact social functioning. For example, socially awkward behaviors, poor eye contact, sensory processing disturbances, difficulty with perspective taking, literalism, repetitive behaviors, restricted interests, and difficulty reading nonverbal communication each have the potential to disrupt social interaction, particularly in workplace settings where awareness of ASD may be limited or misunderstood

Extrapolating from the work of Moe and Zeiss (1982) and Segrin (1996; 2000), the relationship between social skills, self-efficacy, and psychological wellness can be seen as cyclical. Poor social skills foster low self-efficacy in social situations leading to anticipatory anxiety, increased social isolation, depression, limited motivation to practice social competence and, in turn, meager opportunities to strengthen future social performance. Moreover, individuals with HFASD are cognizant of their social difficulties. For example, Vickerstaff and colleagues (2007) replicated research documenting a negative correlation between intelligence (IQ) and self-perceived social competence among children with HFASD and found that older age and higher IQ predicted lower self-perceived social competence and higher levels of depressive symptoms. Furthermore, as children with HFASD transition from school to work or higher education, social demands become more complex and social deficiencies more noticeable (Hillier et al., 2011; White & Roberston-Nay, 2009). Consequently, young adults with HFASD may choose to socially withdraw rather than risk repeated social failure.

In addition to the social skills deficits inherent to the diagnosis, individuals with ASD experience disproportionate levels of anxiety (Brereton, Tonge, & Einfeld, 2006; Leyfer et al., 2006) and depression (Brereton et al., 2006; Leyfer et al., 2006; Sterling, Dawson, Estes, & Greenson, 2008; Stewart, Barnard, Pearson, Hasan, & O'Brien, 2006; Vickerstaff et al., 2007), two conditions that negatively impact peer relationships (Kim et al., 2000). A review of the

counseling and career development literature indicates that self-efficacy is tied to both work and social performance, and is inversely proportional to affective disorders, such as anxiety and depression. Specifically, low self-efficacy is strongly negatively correlated with high levels of social anxiety among children, adolescents, and adults (Leary & Atherton, 1986; Muris, 2001), and also predicts depression (Bandura, 1997; Muris, 2001). Bandura (1997) posits that low self-efficacy related to feeling unable to effectively cope with stressors, primarily leads to anxiety; whereas, low self-efficacy related to feeling powerless to affect a desired result tends to predict depression. Moreover, self-efficacy has long been known to be a key factor in the effectiveness of behavioral and cognitive interventions for depression (Zeiss, Lewinsohn, & Munoz, 1979).

Although the research literature has not yet identified causal pathways, it is likely that the effects of social skills and psychological factors are bidirectional (White & Roberson-Nay, 2009) and, therefore, interventions targeting any one aspect may impact others. However, it should also be noted that young adults with HFASD often have lifelong struggles with both social skills (Howlin & Moss, 2012), and anxiety and depression (White & Roberson-Nay, 2009), creating a tremendous extended burden on their psychological well-being. Furthermore, anxiety and depression may further impair social function by prompting avoidance behaviors or socially misaligned thinking and behavior. Thus, the current study examines the relationship between social functioning, self-efficacy, and psychological wellness in order to better understand how targeting social functioning may lead to decreased symptoms of anxiety and depression.

Finally, the mental health symptoms that young adults with HFASD experience are not only prevalent but can also be alarmingly severe. For example, one recent cohort study in the United Kingdom found that a staggering 66% of a sample (n = 367) of adults with HFASD self-reported suicidal ideation, 35% had plans or attempts at suicide, and 31% reported depression

(Cassidy et al., 2014). Moreover, those with HFASD and depression have a significantly elevated risk for suicidal ideation and behavior when compared to peers with HFASD and without depression. Knowing that social isolation, exclusion, and unemployment are risk factors for secondary depression, the cyclical relationships of these constructs highlights the need for interventions that not only address mental health, but also social functioning and employability.

Employment as the Proving Ground for Psychosocial Functioning

Results of the National Longitudinal Transition Study ([NLTS-2]; Newman et al., 2011) indicate that youth with ASD experience lower employment rates (37.2%) than any other disability category, and markedly disparate postsecondary employment outcomes when compared to their same age peers (Baldwin et al., 2014; Shattuck et al., 2012). Results of a smaller study of 66 young adults with ASD found that post-secondary employment was a meager 18% for this group, with only 33% of that subset obtaining competitive employment (Taylor & Seltzer, 2011). In contrast, the employment rate of non-disabled young adults, ages 18-24, is dramatically higher (54%) and accounts for a sizable number of individuals who are unemployed due to the pursuit of higher education rather than barriers to work (Pew Research Group, 2012).

Within the state VR context, analysis of the Rehabilitation Service Administration's national data (RSA-911) indicated that VR services improved employment outcomes for consumers with ASD but entailed more services, higher costs, lower resultant wages, and fewer hours worked than other disability groups (Cimera & Cowen, 2009). Another analysis of RSA-911 data, found that participation in sheltered workshops increased service costs, while not significantly impacting employment outcomes for consumers with ASD (Cimera, Wehman, West, & Burgess, 2011). Hurbutt and Chalmers (2004) interviewed a small sample of adults with ASD who had difficulty finding work appropriate to their ability levels, and identified

difficulties with social communication, anxiety, stress, and sensory processing as barriers to gaining and maintaining employment.

Furthermore, the majority of young adults with ASD are not only unemployed, but are also not participating in employment training or post-secondary education in the critical first two years after high school (Shattuck et al., 2012). For example, a secondary analysis of NLTS-2 data indicated that, among 680 youth with ASD, 28% had attended a 2-year college; 1%, a 4-year college; 9.3%, a vocational or technical education program; and 33% had not participated in any post-secondary training (Shattuck et al., 2012). These numbers are disappointing, and represent only slightly higher rates of 2-year and 4-year college attendance when compared to *all* students with disabilities who enrolled in 2-year and 4-year institutions (12.8% and 7.7%, respectively).

Finally, when employment is achieved, individuals with HFASD are prone to short tenure as a result of poor social functioning. In fact, 90% of all job loss can be explained by deficient social functioning (Elksnin & Elksnin, 2001). The damage to self-efficacy and mental health implications that result from unemployment and underemployment can be devastating. Selfefficacy is an action oriented, future focused construct that gives individuals the confidence to pursue interests, move forward with goals, and manage tasks (Lorenz, Frischling, Cuadros, & Heinitz, 2016). Career success leads to increased self-efficacy and, ultimately life satisfaction (Weber, Ruch, Littman-Ovadia, Lavy, & Gai, 2013), whereas repeated job failures negatively impact career self-efficacy and, consequently, life satisfaction. Pragmatically, poor employment outcomes present a barrier to independent living and long-term wellbeing as illustrated by estimates indicating that only 15% of individuals with ASD achieve independence (Howlin et al, 2005).

While the psychological effects of long-term under-employment, unemployment, and job loss have not been extensively studied in the ASD population, substantial research, including individual longitudinal studies, on the general population identifies high social costs, including depression, psychiatric hospitalizations, substance abuse, and violence (Dooley, 2003). Poor employment outcomes foster not only income loss, but also loss of social status, structure, and routine (Jahoda, 1982). Thus, the need for training and supports is critical in the transition years. Specifically, social skills development is vital, as poor social communication has been identified as the most significant barrier to employment for persons with ASD (Chen, Leader, Sung, & Leahy, 2014; Hurlbutt & Chalmers, 2004).

Service System Limitations and Barriers

Despite federal mandates, and the knowledge, skill, and dedication of professionals employed within educational, state-federal, and community settings, several systemic barriers to more fully meeting the unique, complex, and sometimes subtle needs of young adults with HFASD have been identified.

Special Education. Transition-age students with HFASD, depending on their ability to fully participate in the general education curriculum and environment, may or may not receive special education services or Section 504 disability-related accommodations. Even among those who are eligible for services, diploma requirements in some districts limit opportunities for these students to enroll in classes that address life skills, such as social and vocational skills (Connor, 2017). Although early work experience has been identified as an evidence-based transition practice with a moderate level of empirical support, transition youth are less likely than their non-disabled peers to gain access to work experiences (Wagner, Newman, Cameto, Garza, & Levine, 2005). Landmark and colleagues (2010) identified several barriers to early work

experience for transition youth, including a disconnect between academic and vocational opportunities, limited funding for vocational and community-based learning, and limited time to address career development in programs where academic development takes precedence. The emphasis on academic over vocational, social, and life skills development is particularly troublesome for youth with HFASD, who may mirror their peers in terms of academic development, but struggle with soft skills and generalization of learning to adult living contexts (McKenzie, Evans, & Handley, 2010).

Vocational Rehabilitation. The most recent reauthorization of the Rehabilitation Act, the Workplace Innovation and Opportunity Act (WIOA, 2014), mandates that state-federal vocational rehabilitation (VR) offices direct 15% of their budgets to pre-employment training services, or job readiness training, for transition-age youth. Further, the Act calls for increased collaboration between schools, VR, and community agencies in the delivery of service. While the spirit of this legislation is to address disparate outcomes by bolstering service delivery, VR administrators will be challenged to staff such imperatives. The National Council on Disability ([NCD]; 2008) has recognized that far fewer youth who could benefit from VR services are actually receiving such interventions due, in part, to a lack of access to services. Furthermore, a projected shortage of qualified VR counselors (Drew & Peters, 2002; O'Brien & Graham, 2009) in conjunction with historically high counselor caseloads (Cloutier et al., 2014; Kierpiec, Phillips, & Kosciulek, 2010) inhibits the ability of local VR offices to staff and deliver transition services in the schools. Yet, while systems struggle to meet demand, legislation continues to mandate expansion of VR services to greater numbers of students and those with the most significant disabilities (Everson & Moon, 2007; Oertle & Trach, 2007; Plotner, 2009; WIOA, 2014). The increased demand for service to the most significantly disabled in combination with

staff shortages creates a significant barrier to individuals with HFASD who may not meet eligibility requirements of state agencies and concurrently may only receive academic programing in school. Thus, youth with HFASD are at risk of falling through the cracks. In fact, previous research (Connor, 2017) has indicated that some youth with HFASD have been told they are "not disabled enough" to qualify for programming through state agencies such as Community Mental Health (CMH).

In addition to the lack of services, systems also face barriers to hiring qualified providers. Critical shortages of certified rehabilitation counselors within VR systems have resulted in the relaxing of standards for qualified providers of vocational counseling. Concurrent with the passing of WIOA, the Commission on State Vocational Rehabilitation (CSVR) weakened the Comprehensive System of Personnel Development (CSPD) and no longer requires master's-level preservice training and counselor certification in the delivery of vocational rehabilitation services. Ironically, these legislative and policy changes threaten to perpetuate rationing and watering down of services, particularly for students labeled as high functioning. Finally, the 2008 NCD brief summarizes: "both the quantitative and qualitative data reviewed indicated that lack of personnel, service unit credit policies, and dedicated transition units in local rehabilitation agencies limit the impact and effectiveness of VR collaboration with other agencies involved in service delivery" (p. 12).

In addition to staff shortages, VR agencies may lack staff with expertise in autism, and also lack capacity to provide the level of supports necessary for successful employment. In effect, traditional VR approaches may not meet the unique needs of individuals with autism. For instance, Wehman and colleagues (2014) observed that there is a growing demand for VR services among individuals with ASD, yet the effectiveness of VR services in placing such

individuals in competitive employment has actually declined in recent years. Clearly, educational and VR systems will need to find new and empirically validated approaches to serving this growing population.

Need for Evidence-based Transition Interventions

Evidence based practices are defined as effective practices based on rigorous research designs evaluated and ranked through systematic review using quality indicators, such as use of randomization and control (NSTTAC, 2014). Similarly to health care, contemporary rehabilitation policy and service provision will increasingly be driven by empirical validation of intervention feasibility, efficacy, and effectiveness, particularly for subpopulations with the worst outcomes (Chan et al., 2009; Leahy, Tarvydas, Connor & Landon, in press). Accordingly, researchers will need to develop, extend, and validate models that guide the systematic delivery of interventions and drive future research efforts (Chan et al., 2009). Several evidence-based practices (EBPs), including supported employment and motivational interviewing, have been identified within the context of state-federal VR (Leahy et al., 2014); however, models that address the unique work-related social and mental health needs of youth with HFASD have yet to be developed. For instance, the place and train model espoused by supported employment has been shown to be effective for individuals with more severe symptoms and lower adaptive functioning (Wehman et al., 2014), but there are few evidence-based employment interventions targeting adults with HFASD. In fact, only one study of social skills interventions targeting individuals with disabilities used randomized control and attention to fidelity in assessing effectiveness (Murray & Doren, 2013). Furthermore, this study included youth with a number of disability types and was not specifically designed to meet the unique needs associated with ASD.

Moreover, state-federal VR has struggled with serving this population, particularly at the

high school level. For example, person-centered planning has been identified as an evidencebased intervention that is well-suited to effective transition planning (NSTTAC, 2015), yet VR counselors have such limited time to provide school-based interventions that it is unrealistic to expect them to facilitate meetings much less provide ongoing, direct interventions with youth (Cloutier et al., 2014). In fact, Cloutier and colleagues (2014) go so far as to recommend that state offices refer transition youth to private counselors for comprehensive, evidence-based services such as person-centered planning. Thus, both the quality and quantity of vocational intervention during the transition years is lacking at the state agency levels.

Furthermore, within school contexts, transition needs tend to be segregated, and interventions are largely practice-based and rather than evidence-based (Cobb & Allwell, 2009). Despite federal mandates for evidence-based practices in special education programming, including transition-related services, Westbrook and colleagues (2013) described a "remarkable" lack of intervention efficacy documented in the research literature. The Individuals with Disabilities Education Act (IDEA) mandates evidence-based practices (EBPs) in all Special Education programming (Turnbull, Wilcox, & Stowe, 2002). Yet, EBP is not widely substantiated in transition. Cobb and Alwell (2009) described the transition literature as merely descriptive, while Landmark et al. (2010) identified "many opinion-based practices" (p. 174). Test, Fowler, and Kohler (2013) reviewed the transition literature and found only two transition EBPs with a high level of evidence. Landmark, Song Ju, & Dalun Zhang (2010) observed that even "best practices," or those with the greatest number of studies, are not considered EBP. Consequently, they called for the use of effect sizes to make meaningful comparisons feasible. Gersten, Fuchs, Compton, Coyne, Greenwood, and Innocenti (2005) promoted universal quality indicators as benchmarks of the rigor of studies, yet much of the extant literature points to "best
practices", "promising practices," or "substantiated practices," and fails to establish evidencebased practice. NSTTAC (2014) continues to encourage increased research on EBPs addressing barriers to successful transition for youth with ASD.

Ashley, Kriner, Stehle, and Sewell (2012) described weak evidence as one barrier to the development of needed transition programs. This lack of robust evidence regarding transition services has been discussed now for decades. Both the National Council on Disability (1999) and Halpern (1994) identified the segregation of transition planning and services from the broader context of school services as a barrier to the inclusion of transition in policy initiatives. Benz & Halpern (1993) identified the overuse of generalized transition goals as prohibitive, while multiple studies found limited options, supports (Furney, Hasazi, & Destefano, 1997; Wehman & Revell, 1997), knowledge, and involvement in transition (Wehman & Revell, 1997) to be problematic. Furthermore, attitudes can present barriers or create opportunities for the implementation of EBP. Professionals may perceive EBP to be time consuming, academic, and impractical but, when translated effectively, EBPs can be pragmatic. Stahmer & Aarons (2009) found increasing resistance to new EBPs among mature professionals, but general acceptance of EBPs perceived as intuitive, logical, and accepted by colleagues. They also noted the influence of family attitudes, including both advocacy and litigation, on the call for more EBPs in school settings.

However, in a systematic review of the ASD literature, Spain & Blainey (2015) did find preliminary but promising evidence that group social skills interventions for high-functioning adults with ASD are "effective for enhancing social knowledge and understanding, improving social functioning, reducing loneliness and potentially alleviating comorbid psychiatric symptoms" (p. 874). For example, Hillier and colleagues (2011) recognized anxiety and

depression as factors related to social difficulties in individuals with ASD and found that social and vocational skills training was associated with significantly lower anxiety and depression among young adults with ASD. Similarly, Laugeson and colleagues (2012) developed one of the few evidence-based social skills interventions for adolescents with HFASD and reported significant, durable improvements in social functioning over time. While promising, such studies are few in number, and only one (Hillier et al., 2011) addressed work-related social functioning.

Despite the challenges and current limitations, high-level EBPs provide school districts and state agencies with the best assurances of program effectiveness. Cooney, Huser, Small, and O'Connor (2007) extolled EBPs for their ability to limit the use of unproven resources, mitigate the need for development of in-house programs, and increase the likelihood of success. Given the paucity of empirical evidence and the significant needs of young adults with HFASD, it is imperative that high-quality experimental and multivariate correlational research is conducted (Test et al., 2013). Through the establishment of an evidence base of practice for work-related social skills programs, young adults with HFASD will not only gain access to effective social training, but can also safe, effective, non-pharmaceutical treatments for the symptoms of social anxiety and depression. Therefore, replication and extension among multiple researchers are necessary in order to build the evidence base.

Current Social Skills Interventions

In a systematic review of transition planning and coordinating activities for youth with an array of disabilities, Cobb and Alwell (2009) identified 156 intervention studies targeting improvements in four outcome areas: social and communicative skills, functional/life skills, school-based and community-based employment training, and self-determination skills. Among this group, 30 interventions focused on social and communication skill development in

adolescents with disabilities. Although none of the studies focused exclusively on ASD, gains were observed in work-related behaviors (Kohler, 1994), career self-efficacy (Hua, 2002), and social competence (Chadsey-Rusch, 1990). While promising, these studies offer only preliminary evidence of the efficacy of group-based social skills trainings due to issues with study design, and use of diverse samples from multiple disability groups. While helpful in demonstrating the need for further research, many were qualitative designs and one was a single case study. A more recent review by Cappadocia and Weiss (2011) provided ASD-specific, yet still preliminary, evidence on the efficacy of group social skills interventions for children with ASD. However, given the focus on children, none of these interventions targeted workplace social skills.

Perhaps the most targeted and compelling results thus far were reported by Laugeson and colleagues (2014) who described a classroom, group-based, social skills intervention targeting middle school students with HFASD. This teacher facilitated, school-based intervention resulted in gains in social functioning across multiple measures. While the gold standard of randomization and control were not feasible in this classroom intervention, the program does offer an evidence-based, teacher-led intervention for middle school students with HFASD. Only one study identified to date has focused on changes in anxiety and depression following group-based social and vocational skill training (Hillier et al., 2011), and while significant improvements were noted, effect sizes were small. Accordingly, the authors call for increased duration and/or frequency of sessions in order to potentially see greater effect sizes. Furthermore, the intervention appears to be compartmentalized (e.g., employment addressed in week seven) rather than an integrated focus on work-related social skills. Finally, previous related studies have not tested theoretical constructs. Clearly, a contemporary and more rigorous

research focus on group-based social skills interventions is needed to extend the promising results achieved to date, and provide targeted, theory-based information on the work-related social skills needs of young adults with HFASD.

Social Cognitive Career Theory

Social Cognitive Career Theory (SCCT) is an extension and adaptation of social cognitive theory to career development applications. SCCT provides constructs to aid understanding of how individuals develop career and academic interests, make choices, and achieve career and educational successes (Lent et al., 1994). The primary mechanisms that drive interests and choices are: self-efficacy, outcomes expectations, and goals. SCCT posits that skills and abilities influence one's *self-efficacy* and *outcome expectations*, which in turn shape performance, *goals* and, ultimately, career outcomes.

Self-efficacy (SE). SE refers to personal beliefs about one's ability to perform particular behaviors or courses of action, and has been defined as the level of confidence that one has in being able to act in order to affect a desired outcome (Brown et al., 2014). It should be noted that *self-efficacy* is domain-specific and contextual, i.e. *self-efficacy* is not a durable trait but, rather, a perception or belief about a particular task. Furthermore, *self-efficacy* need not align with abilities. In fact, Brown and colleagues (2000) found that self-efficacy was more predictive of career interests and perceived career options than self-assessed abilities. SE has been further divided and measured by subtypes, including general, empathic, and social. Furthermore, because SE is task specific, many other subtypes have and can be developed.

Outcome expectations. *Outcome expectations* (not to be confused with outcome expectancy, or placebo effect) have been defined as "a person's estimate that a given behavior will lead to certain outcomes" (Bandura, 1977, p. 193). According to Bandura, outcome

expectations are related but distinct from self-efficacy. Specifically, self-efficacy is the "perceived ability to do a behavior, whereas outcome expectations are judgments about the likelihood of outcomes that flow from behavior" (Williams, 2010, p. 418). It should also be observed (see Figure 1.2) that outcome expectations do not impact self-efficacy, while self-efficacy does influence outcome expectations.

Figure 2.1 Social Cognitive Career Theory (Lent, Brown, & Hackett, 1994, 2000, 2002.)



For example, if a young adult believes that teaching is a rewarding career (outcome expectation) but has low self-efficacy beliefs regarding ability to manage students, then the individual may not consider education as a viable career choice. This scenario illustrates how self-efficacy is the primary driver of goals, interests, and activities.

Goals. Goal setting helps individuals to organize and direct behavior over time in order to meet predetermined parameters (Lent et al., 1994). In the career development literature, goals are sometimes referred to as career plans or aspirations.

SCCT and disability. Self-efficacy (SE) and outcome expectations (OE) are seen as key

drivers of career success, but the interactive nature of each factor is also inherent to the theory, and points to the utility of skill development, practice, and feedback as a means not only to improve performance, but also to drive self-efficacy and career expectancy. Specifically, work-based skills, such as soft skills, require development through introduction, practice, and feedback; in turn, skill mastery leads to bolstered self-efficacy and more optimistic career expectancy (Lent & Brown, 1996, 2013). Moreover, this cycle is both multidimensional and iterative; that is, as new skills are targeted and mastered, self-efficacy is continually bolstered, and career expectancy becomes more nuanced and skills based.

SCCT has been used to show how vocational rehabilitation practices can be linked to theory so that rehabilitation researchers can use consistent constructs in examining common factors and underlying mechanisms for change (Fabian, 2000). In addition, SCCT has been applied to examining the rehabilitation needs of individuals with various physical, emotional, and developmental disabilities, including adolescents (Betz, 2007; Fabian, 2000). Pragmatically, group interventions targeting SCCT constructs have been shown to be helpful in bolstering career-related self-efficacy among college students with disabilities (Corrigan, Jones, & McWhirter, 2001). Recognizing that adolescents are prime for cognitive and behavioral shaping in relation to career expectancy and skill development, and further noting that SCCT accounts for both intrapersonal and social factors that influence career development, SCCT is the logical choice in framing this study of the relationship between social functioning, and self-efficacy, and psychological wellness.

Furthermore, Fabian (2000) posits that individuals with disabilities are particularly at risk due to environmental factors, such as under-stimulating or segregated learning environments, and lack of access to quality community-based rehabilitation supports and services. Although

expectancy may be negatively influenced by stigma and stereotypes toward persons with disabilities, cognitions are shapeable and may be particularly malleable during adolescence, a developmental period in which physical, cognitive, and emotional growth is pronounced. Thus, targeted approaches to shape career expectancy among transition-age youth are necessary to improve postsecondary outcomes (Fouad & Guillen, 2006; Murray & Doren, 2016). In addition to positive career expectancy, transition-age youth need to develop job-related social skills in order to both obtain and retain employment (Elksnin & Elksnin, 2001). Recognizing that the social, psychological, and cognitive ramifications of disability can be barriers to employment and social integration, this proposal suggests that SCCT be used to guide the research questions and analyses.

High comorbidity of anxiety and depression in the ASD population further complicates the relationship between personal factors, self-efficacy, and outcome expectations. In fact, depression and anxiety are inversely related to self-efficacy, such that strong self-efficacy tends to reduce stress, decrease vulnerability to depression, and drive accomplishment (Tahmassian & Jalali Moghadam, 2011). Conversely, significant levels of anxiety and depression reduce interests, goals, and actions, thereby weakening self-efficacy. Given the seemingly bidirectional relationship between anxiety/depression and self-efficacy, it is apparent that improving functional outcomes relies on addressing mental health, intervening to improve self-efficacy, or some combination of the two.

Innovation

The ASSET social skills intervention is unique in that it addresses work-related social skills and is focused on young adults, rather than children with ASD. Furthermore, the program employs increased duration (1.5-hour sessions vs. 1-hour sessions used by Hillier et al., 2011),

and was designed to spur future focused, goal directed tasks that improve career self-efficacy. For example, the curriculum engages participants in discussion, video review, role-play, and feedback that allows for scaffolding of learning and practice of workplace social behaviors in a safe, group context. With a focus on the development of work-related social skills, adaptive functioning, and self-efficacy to foster successful school-to-work outcomes, the mission and activities of the ASSET program align with the spirit of legislation mandating expanded services for transition youth (WIOA, 2014). Furthermore, while the law is aspirational, ASSET is both pragmatic and innovative in designing an empirically based, disability specific intervention that can be delivered by a variety of professionals in a group format within community contexts. ASSET's collaborative, interdisciplinary origin and iterative, developmental program evaluation ensure that the intervention is well suited to community contexts where service providers struggle with high caseloads (Cloutier et al., 2014; Kierpiec, Phillips, & Kosciulek, 2010), and have limited access to evidence-based and manualized interventions (Westbrook et al., 2013). Lastly, by offering a program design that is easily embedded within school and/or community contexts, ASSET minimizes barriers to service common to youth with disabilities, such as poor social functioning, limited student/family involvement, limited access to transportation, poor interagency collaboration, unrealistic expectations, and difficulty navigating eligibility requirements (Riesen et al., 2014).

In addition, ASSET seeks to partially fulfill family needs. ASD is a highly heritable neurodevelopmental disorder (Levy et al., 2009) and, therefore, students with ASD may have parents and other family members who struggle with similar symptoms and functional deficits. Given the tremendous stress that caregivers face and the lack of a systematic approach to addressing autism related mental health needs, it is unrealistic to expect that families can fully

meet the social skills training needs of their young adult children. Therefore, integrated delivery of service is particularly important for youth and their families as they are accustomed to the entitlement services of special education and may struggle to identify and connect with the multiple agencies that provide adult services.

While negative or unrealistic self-appraisal is associated with disability, it is not innate to disability but, rather, socially constructed. In fact, Fabian (2000) posits that rich, supportive and nonjudgmental learning contexts can foster realistic self-appraisal. In contrast to traditional classroom settings, the ASSET school-based group intervention seeks to disrupt traditional power differentials between the teacher and student, thereby fostering supportive relationships without judgment. In essence, the ASSET group context is designed to mimic professional settings rather than classroom contexts. The professional milieu offers participants a safe and natural environment in which to practice skills, give and receive peer feedback, exercise healthy competition, and enact professional role-play. Furthermore, the ASSET group contexts, thereby creating a favorable environment for successful scaffolding of soft skill development from practice to real-world settings. Finally, the group interaction provides opportunities for vicarious learning (Bandura, 1986) through live and video modeling of positive social behaviors by peers and guest experts in order to bolster participants' self-efficacy.

Literature Summary

As our current understanding of ASD as a heritable and persistent condition of questionable etiology becomes more nuanced and sophisticated, so too must our understanding of the unique needs of individuals with HFASD. The need for intervention research relevant to adults with HFASD and focused on functional issues, such as work and higher education, and

psychological wellness is great. Examining the close and cyclical relationship between social skills, self-efficacy, and psychological wellness, particularly within the critical period around transition, can aid in the development of interventions that address some of the unmet employment and mental health needs of this population. SCCT provides a relevant and well-developed framework for examining these issues and growing the evidence base of practice through use of common constructs. Lastly, although systemic barriers are numerous, recent legislation has brought new attention to the need for pre-employment services for our most vulnerable youth. Consequently, researchers will need to not only generate new knowledge and effectively translate research into practice, but also innovate. Community-based, interdisciplinary, empirically validated, and manualized interventions, like ASSET, will be needed if we are to more fully realize the intent of the latest federal legislation.

CHAPTER THREE

Methods

This chapter provides details on the research design, sample, procedures, intervention, instrumentation, and data analysis plan.

Design

This mixed-method, quasi-experimental, single pooled group, repeated measures time series study uses quantitative data to measure program effects over time (baseline, postintervention, and 2-month follow-up) on work-related social skills, self-efficacy, depression, and anxiety. Exploration of qualitative interview data was used to elaborate on participant perceptions of present levels and change over time in dependent variables.

Sampling

Participants. A purposive sample of 18 students, comprising four intervention groups was recruited across two cohorts. Seventeen young adults ranging from 19 to 23 years of age (M = 20.5; SD = 1.28) with HFASD and without intellectual disability (IQ mean = 95.11; SD = 18.08) participated in and completed the ASSET program in the fall of 2014 and 2015. Basic reading ability (a composite of word fluency and attack subscales) was in the average range, (M = 90.45; SD = 24.03). All participants had a previous diagnosis of Autistic Disorder, Asperger's Disorder, or Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS) according to DSM-IV-TR criteria (APA, 2013). Two participants (11.76%) were female and the remaining 15 (88.24%), male. Nine participants (52.94%) identified themselves as Caucasian; six (35.29%) as Black or African American; and two (11.76%) as Asian. All were enrolled as students in college, high school, or special education career services, and resided with parent/s or caregiver/s at the time of intervention.

While a comparison of data from independent raters on the SRS (self, parent, teacher) would have been ideal, this analysis was not suited to the ASSET dataset. College participants completed self-report exclusively, so no comparative data was available for them. Secondly, few high school students were able to complete the SRS without one-on-one assistance from researchers or parents, and this process was not only unduly time consuming but also introduced potential bias in reporting. For example, one parent was observed telling his son not to answer in the way he had when verbally asked for a response. Finally, very few teacher reports were collected. In fact, when cohort three data collection began, two teachers wrote to say that the data process was too lengthy and that they would no longer complete the SRS and two other measures. For these reasons, it was not possible to generate meaningful correlation data between all three types of reporters and, consequently, averaged scores across all three types of raters were used in all relevant analyses.

Procedures

After obtaining research approval from the Michigan State University Institutional Review Board, participants were recruited from two locations: a disability resource center in a university located in a mid-Western state and a local intermediate school district. The informed consent process included an explanation of the purpose, timeframe, potential risks and benefits of the study. Participation was voluntary and offered at no cost. Potential participants were required to attend an in-person screening interview and to complete descriptive self- and/or other-report (parent, teacher) measures in order to become eligible for the program. Eligibility criteria included: (a) 18–24 years of age; (b) previous diagnosis of autistic disorders, Asperger's disorder, PDD-NOS according to DSM-IV-TR; (c) social problems as reported by caregiver and/or pre-intervention self-assessment measures; (d) no current participation in other work-

related social skills treatment; (e) no history of other neurological disorders; (f) no history of major mental illness (e.g., schizophrenia), (g) composite IQ score > 70 on the Wechsler Abbreviated Scale of Intelligence: Second Edition (WASI-2; Wechsler, 2011), (h) minimum score of 6 on the Autism Spectrum Quotient (AQ-10; Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001), and (i) minimum basic reading composite of 80 or above [(low average to very superior); WJ-ACH-III; Schrank, Mether, & McGrew, 2014).

After baseline assessment, eligible participants were offered an 8-week group intervention followed by three post assessments: one within two weeks of program completion, a second follow-up assessment 8-10 weeks post, and a final 1-2 year assessment and focus group. Each interview/assessment meeting was approximately 120 minutes in length.

Intervention

ASSET targeted work-related social skills (soft skills) development among three cohorts of students with HFASD, ages 18-24, in both special education and college contexts. The ASSET program consisted of eight weekly 90-minute sessions offered in a community-based conference room setting. In fitting with group counseling conventions (Corey, Corey & Corey, 2014), each ASSET group was comprised of 4-5 students from similar educational backgrounds (college students with a career focus, or transition-age youth with an entry-level employment focus). Group sessions were led by a group facilitator with standby support from a research assistant who modified curriculum and procedures based on observations of participants, facilitators, as well as participant and facilitator feedback collected at the end of each session. Facilitators and research assistants had a minimum of a master's degree, and came from the fields of rehabilitation counseling, occupational therapy, and special education. Facilitators were trained and supervised by rehabilitation counseling faculty researcher who attended sessions and

conducted weekly team meetings with all facilitators, research assistants, faculty consultants, and technical support assistants. The intervention team met weekly for 2-4 hours to debrief and ensure fidelity. Two doctoral students and one post-doctoral fellow were involved in curriculum development, group facilitation, and monitoring for treatment fidelity. All lessons were guided by a lesson plan and supplementary materials, including PowerPoint presentations, handouts, agenda, and various supplies related to group activities. An unpublished manual was created and continually revised throughout the pilot. Table 3.1 summarizes curriculum content by week.

	Торіс	Examples of Key Points
1	Introduction	Introduction & set up ground rules
2	Communication	Oral expressions & body language
3	Attitude & Enthusiasm	Ways to convey such attitudes
4	Teamwork	Roles in team activity & essentials of good team player
5	Networking	Build contacts & develop elevator pitch
6	Problem-solving & Critical Thinking	IDEAL problem solving model
7	Professionalism	Professional behaviors & manners
8	Graduation	Review, graduation ceremony & presentation of group project

Table 3.1Summary of ASSET curriculum and examples of key points

The original training curriculum was developed by the U.S. Department of Labor's Office of Disability Employment Policy (ODEP) and published in 2012, namely "Skills to Pay the Bills: Mastering Soft Skills for Workplace Success" (SPB), which was intended to meet the basic soft skills training needs for all youth, including those with disabilities. The SPB curriculum covers six key skill areas of social skills: (a) Communication; (b) Networking; (c) Enthusiasm and Attitude; (d) Teamwork; (e) Problem Solving and Critical Thinking; and (f) Professionalism. Based on the Skills to Pay the Bills framework, each ASSET lesson was customized for the ASD population, and new content was developed based on multidisciplinary team collaboration, the research literature, and other available and relevant resources. The SPB curriculum was a starting point for development of the ASSET curriculum. While the six key skill areas remain the same, the curriculum was adapted to target ASD behaviors and accommodate ASD characteristics. Through an iterative developmental process, the modules and pedagogy have been subtly refined with expert input from professionals in rehabilitation counseling, special education, and occupational therapy.

Pedagogically, each session employed a combination of warm up activities, didactic lessons, role-play, peer and facilitator performance feedback, and socialization, which included a dinner hour. Facilitators used individually directed questions, probing and clarifying statements, and summaries to engage participants in group discussion. Knowing that difficulty generalizing learning across contexts is problematic for this population (McKenzie et al., 2010), topics were covered using a didactic-discussion-practice sequence with explicit instruction about the importance of using learned skills outside of the group context. In addition, each session began with a warm-up activity that not only illustrated the topic, but also got students moving, engaged, and collaborating with peers. In order to provide opportunity to practice work-related social skills in a natural context (White, Koenig, & Scahill, 2007), sessions took place in a professional conference room, not a classroom, and homework was assigned to provide opportunities for practice of skills such as networking, and leaving a professional voicemail/email outside of the group context. Furthermore, sessions were followed by a social gathering, which included sharing a meal and conversation among students, facilitators and, on occasion, parents, high school teacher and graduates of the program.

Instrumentation

Implementation of the ASSET social skills intervention program was the independent variable while specific research hypotheses were developed to measure three dependent variables/constructs: 1) social functioning (social cognition and communication, 2) self-efficacy (social and empathy), and 3) psychological wellness (anxiety and depression); together, these constructs are defined as psychosocial functioning. All participants completed a demographic form identifying information related to age, education, gender, ethnicity, social security benefits, diagnosis, medications, and work related activities and experiences. Appropriate testing accommodations, including providing a reader and scribe, were provided to help participants complete the questionnaires as needed.

Screening instruments. All diagnostic screening assessments were administered, scored, and interpreted by trained doctoral level psychology students with supervision from a licensed psychologist.

Diagnostic screening. ASD diagnosis was confirmed using the Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001) at baseline and, if identified, those with scores <26 would have been excluded. The AQ is a 50-item self/parent report rating scale that measures autistic traits across five subscales: social skills, attention shifting, attention to detail, communication, and imagination. Test-retest reliability (.70) and internal consistency (.82) was acceptable in a validation study using neurotypical college students, and adults and adolescents with ASD (Laugeson, Gantman, Kapp, Orenski, & Ellingsen, 2015). The threshold score is 26 and higher scores indicate stronger autistic traits.

Cognitive assessment. The Wechsler Abbreviated Scale of Intelligence: Second Edition (WASI-II; Wechsler, 2011) was used to assess cognitive functioning. The WASI-II is a norm-

referenced instrument designed to assess cognitive functioning of individuals ages 6-90 years old, and contains four subtests: Block Design, Vocabulary, Matrix Reasoning, and Similarities that when combined form a Full-Scale IQ, Verbal Comprehension Index, and a Perceptual Reasoning Index (McCrimmon & Smith, 2013). Test-retest reliability for the full, verbal, and perceptual scales ranges from .86 to .90 (Irby & Floyd, 2013). Those with WASI-II composite scores of < 70 were excluded with the exception of one individual who demonstrated positive work behaviors and was able to fully participate given accommodations for reading and written output.

Reading assessment. The Woodcock Johnson Tests of Achievement: Third Edition (WJ-ACH-III; Schrank, Mether, & McGrew, 2014) was used to measure individuals' ability to read and comprehend English. The median reliability coefficient alphas for all age groups for the standard battery of the WJ III ACH for tests 1 through 12 ranged from .81 to .94 (McGrew, LaForte, & Schrank, 2014). The WJ III demonstrates construct, convergent, and divergent validity in comparison to other measures of academic achievement (McGrew, LaForte, & Schrank, 2014). For the current study, participants with WJ III composite (combined reading fluency and word attack) scores less than 80 were ineligible to participate, with the exception of the one individual (see above) who scored below 70 on the WASI-II and received a no score on the WJ fluency subtest due to poor decoding skills.

Primary outcome measures. Due to the repeated measures design of the study, outcome measures with strong temporal consistency (test-retest reliability) were preferred. In addition, because all outcome measures in this study are self-report, good discriminant validity was desired (Cone and Foster, 2006). When available, multiple raters (parent, teacher, self) were recruited to assess social functioning.

Social functioning. The Social Responsiveness Scale, Second Edition (SRS-2) was used to measure severity of ASD symptoms and social skill functioning (Constantino, 2012). The SRS-2 is a 65-item rating scale measuring social functioning categorized into five subscales: Social Awareness, Social Cognition, Social Communication, Social Motivation and Restricted Interests, and Repetitive Behavior. Each item is scored on a 4-point Likert-type scale, ranging from 1 (*not true*) to 4 (*almost always true*). A total raw score above 70 is diagnostically significant, with sensitivity value of .78 and specificity value of .94 (Constantino, 2012). Reliability and validity of the SRS-2 is supported by internal consistency reliability ranges from .93 to .97, temporal stability estimates of r = .88, and convergent validity between parent and teacher ratings of r = .72 (Bolte, Poustka, & Constantino, 2008; Constantino et al., 2007).

For the purposes of this study, the *social cognition*, and *social communication* subscales of the SRS were selected as the subscales most relevant to the first research question. The *RRB* (*restrictive interests and repetitive behavior*) subscale was eliminated as it measures disability-related characteristics that were not targeted by the ASSET intervention. The *social motivation* subscale was also eliminated from analysis as it too captures a construct that ASSET does not address. Further, given that participants were adult volunteers who sought out the intervention, social motivation bias was introduced into the study as those who chose to participate likely had inherently greater social motivation than those who did not express interest in ASSET. Thus, the *social cognition* and *social communication* subscales were selected as the most appropriate outcome measures because the intervention directly targets those specific social skill subsets.

Perceived self-efficacy. Self-efficacy was measured using two scales targeting different aspects the of workplace social interactions as described below.

Empathic self-efficacy. The Perceived Empathic Self-Efficacy Scale (PESE), a 6-item

self-report inventory, was used to measure participants' perceived ability to exercise theory of mind in understanding the feelings of others and to be both sensitive and responsive to the emotional states of others (Caprara & Steca, 2005). The PESE uses a five-point Likert-type scale, ranging from 1 (*not well at all*) to 5 (*very well*). Internal consistency reliability estimates have been found to be .78, .80, .81 across three different samples (Giunta et al., 2010).

Social self-efficacy. The Perceived Social Self-Efficacy Scale (PSSE), a 5-item inventory was used to measure participants' self-perceived ability to express opinions, share personal experiences, work cooperatively, and manage interpersonal conflict (PSSE; Caprara & Steca, 2005). Respondents were asked to rate each item on a five-point scale from 1 (*not well at all*) to 5 (*very well*). Internal consistency reliability was .69, .76, and .66 in three different samples (Giunta et al., 2010).

Secondary outcome measures. These measures were used to assess the psychological wellness construct.

Depression. Due to the scarcity of validated and normed measures that specifically assess psychosocial adaptation among young adults with ASD (Gantman et al., 2011), assessment instruments developed for neurotypical populations were employed. The Patient Health Questionnaire-9 (PHQ-9; Spitzer, Williams, & Kroenke et al., 2000), a nine-item self-report inventory, was used to assess depressive symptoms. The PHQ-9 uses a four-point Likert-type scale, ranging from 0 (*not at all*) to 4 (*nearly every day*) with total scores ranging from 0 to 27, and internal reliability estimates of .89 and .96 (Kroenke, Spitzer, & Williams, 2001). Sensitivity is 73%, with high specificity (98%) for diagnosing depression in adults, and score cut points of 5 indicate mild depressive symptoms; 10, moderate; 15, moderately severe; and 20, severe (Cassin et al., 2013).

Anxiety. The General Anxiety Disorder Questionnaire (GAD-7; Spitzer, Williams, & Kroenke et al., 2006), a seven-item self-report measure, was used to measure anxiety. The GAD-7 uses a four-point Likert-type scale to assess frequency of symptoms, ranging from 0 (*not at all*) to 4 (*nearly every day*). Total scores range from 0 to 21, and internal consistency and test-retest reliability were .92 and .83, respectively (Spitzer et al., 2006). Score cut points of 5, 10, and 15 respectively indicate mild, moderate, and severe anxiety. Ten is the threshold of clinical significance.

Data Analysis Plan

Preliminary quantitative analysis plan. As recommended by Cone and Foster (2006), the following preliminary analyses were conducted to examine: (1) characteristics of the data, (2) properties of the measures used, (3) possible confounding variables, and (4) adherence of the data to statistical test assumptions.

Data entry for each variable was audited at random to reconcile paper, Excel, and SPSS entries. Before analysis, all data were checked for errors. Specifically, SPSS 22.0 was used to generate frequency tables and case summaries in order to identify out of range scores, entry errors, and missing data. When missing values were discovered on self-report measures, means of other available indicators were used to replace these values. For example, if two out of 12 responses for the SRS *social cognition* subscale were missing completely at random, then these missing item values were replaced with the mean value for that subtest. Cone and Foster (2006, p. 243) caution that such use of "unweighted means estimation" (Winer, Brown, & Michels, 1991) can produce bias. However, they go on to note that bias is typically small when the remaining items have high internal consistency. Thus, unweighted means estimation was used only within subscales, not across, and only in instances when the majority of items were

complete.

In order to determine whether the data met the underlying assumptions for parametric statistical analysis, all continuous dependent variables were examined for approximate normality of distribution, i.e. skewness and kurtosis, using histograms to inspect the shape of the distributions (Tabachnick & Fidell, 2013, p. 81). In addition, the Shapiro-Wilk test was applied to all measures to ensure approximate normality of distribution. Acceptable limits of skewness and kurtosis were set at ±2 (Field, 2000, 2009; Gravetter & Wallnau, 2014; Trochim & Donnelly, 2006), and all variables were within these limits. Further, trimmed means (5%) were compared with original means to ensure that extreme scores were not strongly influencing group means for each variable (Pallant, 2013). As recommended by the American Psychological Association Task Force on Statistical Inference (Wilkinson et al., 1999), graphical analysis was used in addition to statistical analysis to screen for normality, linear relationships, and extreme scores. Specifically, box plots were examined to identify potential outliers, while histograms, Normal Q-Q plots, and Detrended Normal Q-Q plots were inspected for normality of distributions. Scatterplots were used to visually assess for linear relationships between potential covariates and dependent variables. Based on visual screening, the similarity of mean scores to the 5% trimmed means, and acceptable skewness and kurtosis, four outliers were identified and removed. Mean scores on all measures were calculated by downloading the raw data into Microsoft Excel, restructuring to case format, and computing values. The IBM Statistical Package for Social Sciences (SPSS) 24.0 for Mac and Excel were used to manage raw data and perform all analyses.

The need for multilevel modeling. While dependent samples t-tests revealed some noteworthy preliminary results, the data analysis plan needed to account for: (1) between-

participant factors, such as socioeconomic status, and (2) within-participant comparison of mean differences on the dependent variables as a result of the intervention. Optimally, repeated measure multivariate analysis of variance (RM-MANOVA) would be conducted to assess change over time (T1, T2, T3) using grouped primary and secondary outcome variables. RM-MANOVA allows for analysis of differences in-group means over time while accounting for within-group differences and minimizing the Type I error inherent to multiple ANOVAs (Raykov & Marcoulides, 2010). However, the current dataset (n=17) was small and unbalanced, precluding reliable results from RM-MANOVA (Pallant, 2013).

Although generalized linear models (GLM), such as RM-ANOVA and analysis of covariance (ANCOVA), have been traditionally used to measure behavioral change over time, GLM is most accurate with balanced datasets, i.e. those with equal time intervals, independent samples, equal group sizes, and no missing data (Shek & Ma, 2011). Unfortunately, the use of GLM with unbalanced datasets may result in increased Type I errors and potentially invalid conclusions (Peugh, 2010; Shek & Ma, 2011). Application of GLM to the ASSET dataset proved problematic, as longitudinal data are characteristically unbalanced, i.e., prone to missing data (Davis, 2002). Moreover, longitudinal data tend toward correlation of individual observations over time, thereby violating the assumption of independence imposed by GLM (Diggle, Heagerty, Liang, & Zeger, 2002; Peugh, 2010). Furthermore, *t*-test methods proved to be problematic as they resulted in listwise deletion with substantial loss in effective sample size. When RM-ANOVAs were run for the primary (self-efficacy, social functioning) and secondary (anxiety, depression) outcomes across the three time intervals, poor fit was achieved as the data was not balanced and the general linear model resulted in exclusion of cases. For example, from a total sample size of 17, 42.2% of all cases were excluded in the analysis of general self-efficacy and *depression*; 35.3%, in the analysis of *perceived empathy* and *social self-efficacy; and* 29.4% in the analysis of social functioning.

In effect, use of GLM would have been better suited to a cross-sectional, rather than longitudinal, examination of the ASSET dataset. In response to these constraints, both statisticians (Field, 2013; Hayes, 2006; West, Welch, & Galecki, 2014) and applied researchers (Peugh, 2010; Shek & Ma, 2011) emphasize the utility of using multi-level, mixed-effects modeling in longitudinal studies to overcome limitations of conventional statistical methods, including general linear models (GLM) and ordinary least squares (OLS). According to the SPSS Technical Report on Mixed-effects Linear Modeling (SPSS, 2005; p. 12) the mixed approach is "generally preferred because it is asymptotically efficient (minimum variance), whether or not the data are balanced. GLM, however, only achieves its optimum behavior when the data are balanced." Given the longitudinal designs, relatively small sample sizes, heterogeneity of populations, and missing data inherent to repeated measures in the social sciences, multilevel, linear, mixed-effects models are becoming increasingly popular with applied researchers (Peugh & Enders, 2005).

Applying multilevel modeling to the ASSET dataset. Longitudinal data, by their nature, are multilevel as they include clusters of data over multiple observations (Skrondal & Rabe-Hesketh, 2008). Peugh (2010) offers the example of students from the same school having more correlated scores than students form different schools due to the effects of environment. In the ASSET dataset, clustering of scores occurs within individuals, making the likelihood of correlated scores even greater. Thus, the application of traditional analysis models (GLM), appropriate for cross-sectional data, would likely produce excessive Type I errors and biased parameter estimates, significant threats to statistical validity.

More specifically, longitudinal data are considered two-level data, with Level 1 capturing the repeated observations within individuals, and Level 2 predicting the outcomes observed in Level 1. West and colleagues (2014) describe this succinctly by stating: "Repeated-measures data sets can be considered to be a type of two-level data, in which Level 2 represents the subjects and Level 1 represents the repeated measurements made on each subject" (p. 175). Figure 3.1 illustrates the multilevel nature of the ASSET dataset.





This type of multi-level model is termed a "mixed model" or, more specifically, a "mixed effects" model because it includes the usual fixed effects captured by linear regression, and one or more random effects. The random effects terms in the model provide additional consideration of the error term by attributing some variation to a random factor or covariate (West et al., 2014). Whereas ANOVA would address the differences in group mean scores between time one, two, and three, a mixed-effects model also considers how individual variation within the sample impacts assessment of the intervention. For example, Figure 3.2 provides an example of the marked individual variability in baseline scores (intercepts) and rate/direction of change (slopes) in social cognition outcomes: some start high and decline dramatically, others start in the midrange and change modestly, while other start low and increase or decline. On average, scores decline.



Figure 3.2 *Example of individuality in SRS baseline and outcome*

A mixed-effects approach seeks to account for individuality by assessing variance for each individual rather than reducing all variance to a mean score. This is particularly helpful in repeated measures data wherein the influence of this individuality is repeated over time through correlated scores. The inclusion of a random intercept for each participant effectively eliminates any issues associated with the non-independence introduced when taking repeated measures on the same subjects over time (Winter, 2013).

Further, an *intraclass correlation*, or ICC, can be calculated by dividing the between subject variance by the total variance (Twisk, 2006). The ICC indicates how much variance is distributed within the repeated observations versus how much is distributed between subjects. Peugh (2010) describes the ICC as conceptually similar to the R² and eta-squared indicators of effect size values in regression and ANOVA, respectively. The ICC is an important consideration in LMM because an ICC of zero indicates that there is no Level 2, or individual, contribution to the model variance and, therefore, a simpler, non-hierarchical model is called for (Twisk, 2006). In effect, any amount of intraclass correlation is justification for using LMM. One substantial benefit of LMM was that the long format data structure effectively increased the study's sample size from 17 to 51 by using the measurement occasions, rather than the number of people, as the units of analysis. This approach allowed for the inclusion of demographic variables as controls for change over time. Mixed effects data must be configured into long format as opposed to the wide format traditionally used with generalized linear models. For the ASSET dataset, each case (*ID*) was "stacked" so that each case had three observations, one for each time point (Peugh & Enders, 2005). In this data structure, repeated measurements are collapsed into one dependent variable. Figure 3.3 provides an illustration of this data structure.

Figure 3.3 *Data structure in long format*

	di 💦	🔏 Cohort	💰 GRP	💑 т	SRS_soc	SRS_cog	SRS_com
1	C14F001ND	Cohort 1	1	2	67.67	58.00	76.00
2	C14F001ND	Cohort 1	1	3	66.00	62.00	69.00
3	C14F001ND	Cohort 1	1	99	60.67	62.00	61.00
4	C14F002AW	Cohort 1	1	2	53.67	55.00	55.00
5	C14F002AW	Cohort 1	1	3	55.67	58.00	58.00
6	C14F002AW	Cohort 1	1	99	49.67	51.00	49.00
7	C14F004AC	Cohort 1	1	2	48.67	44.00	46.00
8	C14F004AC	Cohort 1	1	3	51.33	59.00	48.00
9	C14F004AC	Cohort 1	1	99	55.00	51.00	60.00
10	C14F005JD	Cohort 1	1	2	57.33	56.00	60.00
11	C14F005JD	Cohort 1	1	3			
12	C14F005JD	Cohort 1	1	99	61.67	62.00	61.00

While linear regression assumes that each observation is independent, the single group, repeated measures design of this study assumes correlation of scores nested within individuals (Heck, Thomas, & Tabata, 2014). Using a general linear model approach, such as repeated measures ANOVA, with nested data, as in the current study, violates the assumption of independence imposed by "single level," non-nested, data (Bliese & Hanges, 2004; Hayes, 2006). Mixed approaches account for this by allowing for inclusion of random effects into the

model. These random effects account for the random intercepts (or baseline scores) and slopes (change over time) of each individual in the sample. The linear mixed model (LMM) can be seen as an extension of the general linear model (GLM). It differs from the GLM in that the LMM allows for correlated and non-constant variability, thereby providing modeling of variance and covariances, not just means (Albright & Marinova, 2015). In sum, the mixed approach includes both the fixed effects (time) discerned by linear regression and the random effects introduced through individual variability across repeated observations. Consequently, mixed effects offer a "more comprehensive picture of developmental change across time" (Shek & Ma, 2011; p. 43).

Selection of covariates. A series of Pearson product moment correlations between relevant demographic characteristics and dependent variables was conducted to explore potential demographic covariates. The following constructs were examined as potential confounders on the primary and secondary outcomes: socioeconomic status (SES), and clinically comorbid anxiety, ADHD, and/or depression as identified on the demographic form at intake.

In order to estimate SES, participation in the Medicaid program was explored for use as a proxy, but only one participant reported Medicaid enrollment. However, eight participants (47.1%) reported receiving some form of social security income (disability insurance or supplemental security), and recipients of such benefits are automatically eligible for Medicaid in the majority of states, including Michigan (U.S. Department of Labor, 2017). Moreover, the Center for American Progress (Fremstad & Vallas, 2013) reports that, for most beneficiaries, this supplemental income actually accounts for most or all of their income. Therefore, participants who indicated receiving Medicaid and/or social security income were considered to have low socioeconomic status. Additionally, correlations were used to examine how social functioning, self-efficacy, anxiety, and depression might be interrelated.

Multilevel modeling procedures. Model consideration, building, and testing was informed by strategies suggested by Singer and Willet (2003), elucidated by Hayes (2006) and Peugh (2010), and applied by Shek and Ma (2011). After clarification of the research question(s), Peugh recommends: (1) choosing the appropriate parameter estimator, (2) determining if multilevel modeling is necessary, (3) building the Level 1 model, (4) building the Level 2 model, (5) multilevel effect size reporting, and (6) likelihood ratio testing.

(1) Choice of appropriate parameter estimator. Authors vary on their suggestions regarding the use of maximum likelihood estimators (Peugh, 2010; Twisk, 2006). However, this study is primarily focused on examining fixed parameters rather than estimating variances of the random effects; therefore, the choice of restricted versus full information estimation was inconsequential. In conclusion, *full information maximum likelihood* (FIML; ML in SPSS 24.0) was chosen as it is necessary for model comparison.

(2) Confirmation of need for multilevel modeling. Due to this study's repeated-measures design, it is apparent that participants are the level-2 analysis unit and that outcomes on the dependent variable measures can be intuitively expected to vary significantly across individuals. In order to confirm this, null, "unconditional means" (Peugh, 2010, p. 101), or "random intercept only" (Hayes, 2006, p. 7) models were estimated. The null model is equivalent to a *random effect* ANOVA (Peugh, 2010). As applied to the ASSET dataset, the null model parses out the total outcome score into variation within participants over time, and idiosyncratic variation between participants in order to give a better estimate of outcomes. Results of the null model are used to calculate the *intraclass correlation* (ICC). In essence, the ICC is a measure of the dependency of the data (Field, 2013) and, therefore is a key consideration in deciding whether or not to use multilevel modeling. The individuality of participants is quantified by the ICC. An

ICC = 0 indicates no level-2 individual contribution to the model variance and, therefore, no need for LMM (Twisk, 2006). The ICC is defined as:

ICC = $\tau_{00}/(\tau_{00} + \sigma^2)$.

(3) Building the Level 1 model. Peugh (2010) notes that the confirmatory null model, described above, captures the change in each participant's outcomes using a flat regression line with a slope of zero. This feature of the null model makes it difficult to interpret. Without including *Time* as a predictor, the null model simply tells us that individuality is significant in our sample and that multilevel modeling can capture this variance. Adding a level-1 *Time* predictor to the null model allows for modeling of each participant's change in the dependent variable over time using a regression line with a non-zero slope (Peugh, 2010), thereby capturing change within subjects.

Unlike the null model, the new model is now conditional on time. *Time* is the key variable in this study as it represents the ASSET intervention. The combined equation captures how each participant's outcome score changes over time by modeling a grand-mean rate of change plus a residual term that captures individual differences in the outcome change about the grand mean. Slopes from Level 1 were tested to determine whether they were random, and if the covariance between random intercepts and slopes contributed to the models. For models that converged with random intercepts and slopes, covariance structures were also compared. As recommended by Twisk (2006), unstructured and autoregressive (AR[1]; first order process; current value based on value immediately preceding) structures were tested as they assume correlation between measurement times, a common characteristic of repeated measures data.

(4) *Building the Level 2 model.* Building on Level 1, Level 2 models retained any level-1 fixed and random effects occurring within-participant, and allowed for the addition of level-2

covariates that influence between-participant variation and produce main effects. *Time*, as measured in the Level 1 models, was the primary variable of interest in this study; therefore, Level 2 models incorporating the covariate *SES* were only relevant for outcomes significantly correlated with *SES*, i.e. the social function and self-efficacy outcomes. No relationship between SES and the psychological wellness outcomes was identified.

(5) Multilevel effect size reporting. Peugh (2010) explains that multilevel effects can be parsed out in terms of global effects (change in variance explained by the all independent variables in the model), and local effect (change in the dependent variable associated with individual predictor variables). Since changes in social function, self-efficacy, and psychological wellness as predicted by the ASSET intervention, as opposed to global changes in variance, are the outcomes of interest in this study, local effect sizes were reported to provide standardized estimates of intervention effects. Readers interested in learning about global effects in LMM are referred to Snijders and Bosker (1999). In order to compute the local effects, a proportional reduction in variance statistic (*PRV*) was computed based on the following equation described by Peugh (2010):

$PRV = (var_{null} - var_{MainEffect}) / var_{null}$

where *PRV* represents the proportion of variance reduction, and *var*_{null} is the variance estimate from the null (no predictor) model, and *var*_{MainEffect} is the variance estimate from the Level 2 model, conditional on *Time* and including any relevant covariates.

In addition, as detailed by Hedges (2007), LMM effect size estimates comparable to Cohen's *d*, were computed by converting standard error estimates from LMM output generated in SPSS to standard deviations for each time point (post, baseline) and predictor. Conversions were calculated in Excel by using the following:

$$SD = SE * \sqrt{n}$$

LMM effect size estimates were then simply computed using Cohen's (d = b / SD). This allows for meaningful comparison of ASSET with other social skills interventions in the literature.

(6) Likelihood ratio testing. Likelihood ratio testing (LRT) was used to statistically test whether the addition of *Time* as a main effect significantly improved explanation of variance when comparing null and Level 1 models. Likewise, LRT was used to assess the significance of adding covariates and changing covariance assumptions. As recommended by Field (2013), deviance values (changes in -2 log likelihood between models) and changes in the number of estimated parameters were computed for each change in the model. The deviance values were then assessed for significance based on the χ^2 distribution.

Quantitative analysis summary. Due to the unbalanced, dependent nature of the ASSET dataset, along with substantial intraclass correlation of within and between variance, a linear, multilevel, mixed approach proved to be ideal. Multilevel modeling accounts for the correlated errors that result from repeated measures designs and, therefore, is better suited to the ASSET dataset. While repeated measures ANOVA would have accounted for correlated errors, it would have resulted in listwise deletion of entire cases when data from one time point were missing. Conversely, the mixed approach resulted in retention of cases and deletion of only time points with missing data. Due to the tendency of participants to complete fewer assessments over time, unbalanced data is often an issue; therefore, LMM is particularly suited to longitudinal designs (Heck et al., 2014). Furthermore, the ASSET dataset exhibited high intraclass correlations for each dependent variable; therefore, controlling for individuality was important. LMM allowed for the use of *participant* as a random factor in the model, in effect, redefining the residuals as the distance between each data point and the mean for that participant, rather than

the distance between each data point and the grand mean. By modeling *participant* as a random

factor rather than entering it as a fixed factor, degrees of freedom are retained, non-independence

is accounted for, and individuality is controlled for (Albright & Marinova, 2015; Singer &

Willet, 2003). In effect, by using both within and between-participant variance, LMM gave a

better estimation of how the intervention influences individual performance, not just group

means. Table 3.2 offers a comparison of features of the analytic approaches considered for this

study.

Table 3.2

Features of the analytic approaches considered				
Allowances	Dependent	Repeated	Linear	
	Samples <i>t</i> -	measures	Mixed	
	Test	ANOVA	Effects	
			Models	
Examination of group mean differences	\checkmark	\checkmark	\checkmark	
Hierarchical structuring of data effectively increases power		\checkmark	\checkmark	
Examination of within and between-participant differences		\checkmark	\checkmark	
Examination of covariates		\checkmark	\checkmark	
Handles missing data			\checkmark	
Specification and computation of random effects increases			\checkmark	
generalizability to population				
Specification of non-constant variability and correlation of				
error terms inherent to repeated measures designs with				
single pooled group			\checkmark	
Examination of intraclass correlation (ICC)			\checkmark	

Qualitative data analysis plan. Based on pragmatic philosophy and action research orientation, this qualitative phase is designed to provide insight into the relationship between *outcome expectations, self-efficacy*, and *psychological wellness* with the overarching aim of better understanding how and for whom the ASSET intervention works. Using an *intervention mixed methods framework*, the qualitative data were used to expand, clarify, and deepen understanding of the quantitative results and, fundamentally, to help explain the results of the intervention (Fetters, Curry, & Creswell, 2013). The quantitative and qualitative datasets were

integrated at the design level through convergence, as opposed to sequential approaches (Creswell, 2009). Specifically, quantitative and qualitative data were collected in parallel and analyses for both were conducted after the cohort one and two interventions ended. This is in contrast to sequential designs, in which collection and/or analysis of one dataset influences that of the other (Creswell, 2009; Fetters et al., 2013).

Data were generated through follow-up focus groups with graduates of ASSET who entered the program in the first two cohorts (2014, 2015). To facilitate discussion and maximize familiarity, two groups were interviewed: one comprised of ASSET college students (n = 3), the other of ASSET high school students (n = 2). The aim of the qualitative analysis was to expand, clarify, and deepen understanding of the quantitative results. Accordingly, theory-based coding, derived from SCCT constructs, was used in the first layer of qualitative analysis. A second layer used pragmatic codes, including the identification of program and career *outcome expectations* themes that deepened understanding of the change in *self-efficacy* scores over time. Further layering occurred at the group level, with coding completed by stakeholder group, and then holistically. Layers were compared and contrasted in the final analysis. Cross-checking with faculty and doctoral students with experience in qualitative analysis was used to assure credibility of the analysis and to promote transferability of the results (Creswell, 2009).

Results of the qualitative analysis are reported in chapter four using what Fetters and colleagues (2013) describe as a contiguous approach to integration, meaning that the qualitative results are reported separately from the quantitative results. Appendix E contains the focus group protocol and questions.

Summary of Analysis by Research Questions

To answer research questions 1-3. Is ASSET associated with improved work-related social

functioning, self-efficacy, and *anxiety* and *depression* in the identified population? The efficacy of ASSET to improve social functioning, self-efficacy (primary outcomes), and psychological wellness (secondary outcomes) will be tested using linear mixed-effects modeling to examine changes over time and the influence of demographic covariates.

To answer research question 4. Are *self-efficacy* and *psychological wellness* correlated? The relationship between *self-efficacy* (empathic and social), anxiety, and depression was tested using correlation analysis. The relationships between *empathy* and *social self-efficacy* (as measured by the PESE and PSSE), *anxiety* (as measured by the GAD-7) and *depression* (as measured by the PHQ-9) was investigated using Pearson product-moment correlation coefficients. Preliminary analyses were performed to ensure no violations of the assumptions of normality, linearity, and homoscedasticity.

To answer research question 5. How does ASSET improve participants' self-perceived *psychosocial functioning* (social functioning, self-efficacy, and psychological wellness) and *outcome expectations* over time? Focus group transcripts were analyzed using layered, content analysis with theory-based coding derived from SCCT constructs. Resultant themes were then compared with quantitative results and alignment or discordance was assessed to triangulate the data. Finally, cross-checking was used to help ensure representativeness.

CHAPTER FOUR

Results

The purpose of this study was to investigate the effects of a vocational social skills training intervention on the perceived work-related social functioning, self-efficacy, and psychological wellness of a sample of young adults with HFASD. In order to measure these effects and potentially generalize findings to the population represented by this sample, multilevel, linear mixed-effects models (LMM) were applied so that the fixed effects (group mean differences) of the intervention could be described, while the random effects (variance of the distributions of means) could be modeled to represent the theorized normal distribution of scores of the population of young adults with HFASD. LMM was specifically chosen as the preferred method of analysis not only for its ability to model population variance and thereby improve generalizability of findings, but also for its fundamental suitability to the ASSET dataset, i.e. the ability to retain cases in unbalanced datasets, and compatibility with correlated repeated measures data (West et al., 2014). Following the sequence outlined by Smith and colleagues (2007), these results: (1) complete the pilot phase of the validation of the ASSET curriculum, (2) provide preliminary level-three, quasi-experimental evidence of associated outcomes (Chan et al., 2009), and (3) set the stage for multi-site testing of ASSET using randomized and controlled trials.

Demographics and Characteristics of the Sample

A total of 19 individuals were screened and 17 (89.47%) were eligible to participate. One individual was screened out due to a schedule conflict with the group meeting times, and the second exhibited disruptive behaviors (e.g., spitting), acculturation issues, and relative immaturity (freshman college student) for participation at the time of the intervention. This

individual will be invited to be re-screened in a future cohort. One participant dropped out after two sessions, making the retention rate 94.4%.

Seventeen young adults ranging from 19 to 23 years of age (M = 20.5; SD = 1.28) with HFASD and without intellectual disability (IQ mean = 95.11; SD = 18.08) participated in and completed the ASSET program in the fall of 2014 and 2015. Basic reading ability (a composite of word fluency and attack subscales) was in the average range, (M = 90.45; SD = 24.03). All participants had a previous diagnosis of Autistic Disorder, Asperger's Disorder, or Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS) according to DSM-IV-TR criteria (APA, 2013). Two participants (11.76%) were female and the remaining 15 (88.24%), male. Nine participants (52.94%) identified themselves as Caucasian; six (35.29%) as Black or African American; and two (11.76%) as Asian. All were enrolled as students in college, high school, or special education career services, and resided with parent/s or caregiver/s at the time of intervention. Table 4.1 summarizes the sample characteristics.

T arricipani acmographics, baseline si	<i>ans, and asability</i> c	nur ucier isites	
Demographic Covariates $(n=17)$	<i>n</i> (%)	Mean (SD)	
Age		20.50 (1.28)	
Gender			
Male	15 (88.24)		
Female	2 (11.76)		
Race			
White	9 (52.94)		
Black	6 (35.29)		
Asian	2 (11.76)		
Education			
Some High School	9		
Post-secondary	8		
Employment Status			
Full-time	0		
Part-time	5 (29.4)		
Unemployed, looking	2 (11.8)		
Unemployed, not looking	8 (47.1)		
Work-based learning	1 (5.9)		

Tal	ble	4.	1
1 11	$\mathbf{v} \mathbf{v}$		

Participant demographics, baseline status, and disability characteristics
Table 4.1 (cont'd)

Volunteer	1 (5.9)	
Average hours worked per week	3	
Cash benefits (SSI/SSDI/TANF)		
Yes	9	
No	8	
Baseline Neurocognitive Status and		
Disability-related Variables		
Diagnosis		
Autistic Disorder	10 (58.8)	
Asperger's Syndrome	6 (35.3)	
Pervasive Developmental	1 (5.9)	
Disorder-NOS		
Age, in years, at onset		
pre-school	3 (17.6)	
6-10	5 (29.4)	
11-18	2(11.8)	
post-secondary	0	
unknown	7 (41.2)	
Comorbidity		
Physical and/or learning	9 (52.9)	
Mental health	8 (47.1)	
WASI-II	` '	95.11 (18.08)
WJ-III Reading Level		90.45 (24.03)
(fluency/attack)		

Preliminary Data Screening and Analyses

Descriptive statistics. Table 4.2 summarizes mean scores and standard deviations organized by construct (social function, self-efficacy, psychological wellness) and associated outcome measures. It should be noted that the *social cognition* and *social communication* subscales of the SRS measure dysfunction. Therefore, a decline in scores indicates improved social functioning. Moreover, multi-rater (parent, teacher, self) was included as available among participants enrolled in high school. Multi-rater data was not recruited among college-enrolled participants.

Table 4.2

Construct	Baseline		Post		Follow-up	
	(n = 16))	(<i>n</i> = 9)		(<i>n</i> = 11)	
	М	SD	М	SD	М	SD
Social function						
SRS social cognition	60.11	6.83	52.31	9.10	55.82	7.11
Social communication	63.38	7.53	57.81	10.74	59.00	11.77
Self-efficacy						
PESE (empathy)	2.79	0.68	3.85	0.66	2.88	0.92
PSSE (social)	2.80	0.71	3.89	1.01	3.02	0.73
Psychological Wellness						
GAD-7 (anxiety)	12.81	4.05	9.67	2.00	8.09	1.30
PHQ-9 (depression)	16.38	4.26	14.89	5.21	13.64	2.29

Dependent variable means and standard deviations at baseline, post-intervention, and two*month follow-up*

Scale Reliability. Tests of scale reliability (Table 4.3) were conducted on each outcome measure in order to ensure that they consistently reflected the constructs of interest in the ASSET dataset. All results indicated good reliability ($\alpha > .70$) as defined by Kline (1999).

Tests of scale reliability					
Instrument	Cronbach's α	Number of	Ν		
		subscales/items			
SRS	.92	6	17		
PESE	.82	6	17		
PSSE	.86	5	17		
GAD-7	.85	7	17		
PHQ-9	.83	10	17		

Table 4.3

Normality. The assumptions for linear mixed effects models are: (1) independent variables are linearly related to dependent variables, (2) errors have constant variance, (3) errors are independent, and (4) errors are normally distributed (Heck et al., 2014). Scatterplots of each outcome were plotted over time to visualize the overall direction of the raw data and assess linearity. Plots with similar trends across individuals are often indicative of data that can be readily fitted to a model (Twisk, 2006). However, as suggested by Diggle and colleagues (2002), visualization of the variation between individual responses may be difficult. Therefore,

standardized residuals were plotted against predicted values for each dependent variable. Finally, visual inspection was performed in order to identify any potential heteroscedasticity, which is a threat to the statistical validity of LMM. Heteroscedasticity, a violation of the assumption that the spread of outcome scores is approximately equivalent at each observation (Field, 2013), was suspected in the *anxiety* variable. Consequently, a Levene's test was performed with significant results, F(2, 33) = 11.74, p < .01. Thus, the assumption of homoscedasticity was violated and robust analysis techniques (bootstrapping) were applied to all *anxiety* analyses. Levene's tests for all other dependent variables were non-significant: *social cognition*, F(2, 33) = 0.33, p = .72, *social communication*, F(2, 33) = 2.06, p = .14, *empathic self-efficacy*, F(2, 33) = 0.47, p = .63, *social self-efficacy*, F(2, 33) = 0.57, p = .62, *depression*, F(2, 33) = 1.95, p = .16. Thus, homoscedasticity was assumed for these outcomes.

Screening potential covariates. Based on clinical observations of participants, SES was suspected as a Level 2 covariate. As both IQ and comorbid mental health diagnosis could also be potential confounders, they too were tested for correlation with the dependent variables. As illustrated in Table 4.4, a series of Pearson product moments was generated to test the suitability of potential covariates.

I curson pro	unci mo	menus							
	Cog	Com	Emp	Soc	Anxiety	Depression	SES	CMD	IQ
			SE	SE					
Cog	-	.75**	37**	44**	.43**	.24	.57**	.11	.43**
Com		-	-44*	47**	.36*	.27	.52**	.08	16
Emp SE			-	.80**	09	.14	.52**	17	003
Soc SE				-	.01	01	.58**	.07	.12
Anxiety					-	.54**	17	.29	.001
Depression						-	.13	.05	33*
SES							-	.17	.59**
CMD									.51**
								-	-

Table 4.4Pearson product moments

Table 4.4 cont'd

*p < .025, **p < .005 (multiple testing correction $\alpha/2$); Cog = social cognition, Com = social communication, Emp SE = empathic self-efficacy, Soc SE = social self-efficacy, CMD = comorbid mental disorder, IQ = intelligence quotient.

Both *SES* and *IQ* were *demographic* factors identified as potential covariates (see Table 4.4). Specifically, *SES* was significantly correlated with *social cognition, social communication, empathy self-efficacy,* and *social self-efficacy,* and IQ was significantly correlated with *social cognition* and *depression.* Comorbid mental health disorders (*CMD*) was also screened as a potential confounder, but it did not show a significant linear relationship with any of the dependent variables. However, in the final LMM models, *SES* proved to be the only significant covariate, acting as a significant predictor of social functioning. Therefore, SES is the only covariate reported in the model summaries (Tables 4.6 and 4.7) found in chapter four.

Hypothesis Testing

Dependent samples t-tests and linear mixed-effects modeling was used to test quantitative hypotheses, and both qualitative and quantitative results were synthesized to answer research question five as a mixed methods question. Use of paired *t*-tests was considered a preliminary analysis, as the use of multiple *t*-tests results in increased Type I error when considering the relationships between dependent variables and *Time*. Best fit of LMM was determined using likelihood ratio testing against a chi-square critical value. In addition, covariance structures, including the SPSS system default and most parsimonious structure (identity), as well as autoregressive (AR[1]) and compound symmetry were compared. AR(1) and compound symmetry structures were selected for their suitability to repeated measures data; i.e., each assumes correlation of scores between measurement occasions. Specifically, AR(1) assumes that the correlation of scores between measurement occasions becomes less over time, while

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compound symmetry assumes constant correlation. Selection of a covariance structure was only relevant in models that converged with both random intercepts and slopes, which occurred only in the *social self-efficacy* model (see Table 4.10).

Research question 1: Is ASSET associated with improved social functioning? A primary aim of this study was to first determine whether or not ASSET improved work-related social skills. It was hypothesized (H1) that, when compared to baseline (*T1*), students with HFASD who complete the ASSET program will show significant improvements in *social functioning* (a) immediately post intervention (*T2*) and (b) at two-month follow-up (*T3*). H1 was tested using dependent samples *t* tests and LMM on the *social cognition* and *social communication* subscales of the SRS (composite scores of self, teacher, and parent report). As detailed in chapter three, the SRS can be used as one component in the diagnosis of autism. Scores at or above 70 are considered clinically significant. Therefore, a decrease in SRS scores is indicative of improved social function in the current study.

Preliminary analyses, social functioning. Separate dependent samples *t* tests ("paired samples" in SPSS) were performed to explore group mean differences between baseline and post, and baseline and follow-up. Dependent variables were later more comprehensively analyzed using linear mixed-effects modeling (LMM). Table 4.5 reports results of *t* tests displayed by baseline and post, and baseline and follow-up averages on the *social cognition* and *social communication* subscales.

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Baseline to post Baseline to follow-up М SD df t d М SD df t d -2.53* -1.04 Social cognition -3.98 5.88 13 -0.7 -2.17 7.22 11 -0.3 Social -3.48 9.51 13 -1.37 -4.299.79 11 -1.52 -0.4 -0.4 communication

Table 4.5 Social functioning dependent samples t tests, mean differences, standard deviations, and effect sizes

*p < .025, **p < .005 (multiple testing correction $\alpha/2$); Cohen's d = 0.2 (small), d = 0.5 (medium), d = 0.8 (large).

On average, ASSET participants showed improved *social cognition* scores after the intervention (post). This difference, -3.98, 95% CI [-7.37, -.58], was statistically significant, t (13) = -2.53, p = .03, and represented a medium to large effect, d = -0.7. While improvements in social cognition continued through the follow-up period, -2.17, 95% CI [-6.76, 2.42], the overall effect, from baseline to follow-up, was small (d = 0.3) and did not reach statistical significance, t (11) = -1.04, p = .32.

Although participants' thinking about social interactions improved significantly, gains in *social communication* were small (d = 0.4) both at post, -3.48, 95% CI [-6.75, 2.42], and follow-up, -4.29, 95% CI [-10.51, 1.93]. While clinically relevant, these improvements were not statistically significant, t(13) = -1.37, p = .20; t(11) = -1.52, p = .16.

LMM results, social cognition. LMM was used in order to account for individual variance in the sample and to examine SES as a potential confounder. As indicated by Figure 4.1, there was notable between-participant variation in individual baselines and responses over time in *social cognition*. This individuality was later captured through the inclusion of random intercepts and SES as a covariate in the Level 2 model.

Figure 4.1 Social cognition scores by individual



It is noteworthy that, despite having confirmed ASD diagnoses, none of the participants' scores fell within the clinically significant range (>70).

Figure 4.2 represents the level-1, within-participant variation, or variation over time, which is

notably less varied. This variation over time is the main effect or primary outcome of interest in

Figure 4.2 *Social cognition scores by time*



the study. Noting that the between-participant variability is greater over time, it is visually clear that a multilevel model can more comprehensively assess the overall impact of the intervention.

Table 4.6 shows the continuum of models tested: (1) a null, random-intercepts-only, model used to establish the need for LMM, (2) a Level 1, main effects, model conditioned on *Time*, (3) a final Level 2 model that include SES as a potential covariate, and (4) a Level 2 model with interaction that proved to be non-significant.

Table 4.6

11-1-1		1 - 1	
moaei	summaries:	sociai	cognition
			0

Parameters	Null	Level 1: main	Level 2:	Level 2: interaction
	(unconditional)	effects	covariates	
Regression c	coefficients (fixed	effects)		
Intercept	57.23** (1.63)	5949** (1.80)	63.81**(1.98)	63.50* (2.14)
(γοο)				
Time (b_{10})	-	-4.16* (1.63)	-3.91* (1.62)	-2.46 (2.42)
post				
Time (b_{20})	-	-3.19 (1.71)	-2.94 (1.71)	-3.45 (2.59)
follow-up				5.50th (0.00)
SES (b_{01})	-		-8.14** (2.47)	-7.52* (3.00)
Interaction	-		-	-2.48 (3.22)
(b_{11})				721 (2.40)
Interaction	-			./31 (3.40)
(<i>D</i> 21)				
Variance con	mponents (randon	n effects)		
Residuals	23.53** (6.38)	19.36** (5.24)	19.48** (5.29)	18.76** (5.12)
(σ ²)				
Intercepts	35.26* (15.63)	33.95* (14.48)	17.45* (9.00)	17.75* (9.01)
(τοο)				
Deviance	290.260	283.809	275.523	274.526
statistic	2	_	<i>.</i>	
Estimated	3	5	6	8
parameters				
Likelihood r	atio testing			
Δdf	-	2	1	2
χ^2 Test	-	6.45*	8.29*	4.00
Statistic				

Note: Parameter estimate standard errors listed in parentheses *p < .05, **p < .01

The Level 1 model that included both random slopes and intercepts failed to converge. While the Level 1 model with random intercepts and conditioned on *Time* was significantly better than the null, $\chi^2(2) = 6.45$, p = .04, a Level 2 model with random intercepts, conditioned on *Time*, including *SES* as a categorical covariate, demonstrated the best fit with the data, $\chi^2(1) =$ 8.29, p < .001. As expected, given the relatively small sample size, a model with random slopes *and* intercepts failed to converge. Therefore, a detailed analysis of the random effects, which might yield greater description of the larger population, was not possible in this sample. However, the main effects were of primary interest in this study, and random intercepts were accounted for in all models run. Additionally, no significant cross-level effects (interaction) were observed. Again, this can be due to sample limitations (Twisk, 2006). Thus, while some models in this study captured significant demographic covariates, none captured significant interaction. Results of the entire range of models, from null to Level 2 interaction, are reported to demonstrate how the final model was chosen for each dependent variable.

Results of the null model were used to compute an intraclass correlation (ICC), which showed that 60% (i.e., ICC = $\tau_{00}/(\tau_{00} + \sigma^2) = 35.26 / [35.26 + 23.53] = .60$) of the variation in social cognition occurred between participants. While the ICC (.60) for social cognition is high, ICCs exceeding .40 are common in longitudinal social research (Peugh, 2010; Spybrook, Raudenbush, Liu, Congdon, & Martinez, 2008). Thus, the need for the need for multilevel modeling was supported. In conclusion, the use of GLM methods to examine this dependent variable would have led to substantial Type I error and threats to inferential validity. Specifically, ignoring the dependency among observations of individuals across time in this repeated-measure design could have resulted in underestimation of standard errors of regression coefficients and overestimation of the significance of the independent variables (Cohen, Cohen,

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West, & Aiken, 2003). Therefore, multilevel modeling of *social cognition* was continued to include Level 1 and Level 2 models.

Final model. The final, best-fitting model was a Level 2 model with *Time* and *SES* included as predictors. The Level 1 model conditioned on *Time*, indicated significant overall change in *social cognition*, F(2, 28.37) = 3.52, p < .05. Specifically, ASSET was associated with statistically significant improvements in social cognition, b = -3.91, t (28.60) = -2.41, p < -2.41.05, at post; however, improvements at follow-up were no longer significant, b = -2.94, t (29.21) = -1.72, p = .10. Results further showed a significant grand-mean social cognition score at baseline ($\gamma_{00} = 63.81, p < .01$) that, on average, significantly improved at post, $b_{10} = -3.91, p < .01$.05. However, this improvement was not significant at follow-up, $b_{20} = -2.94$, p = .10. Variance component estimates showed: (a) significant variance in observed versus predicted social *cognition* scores within participants (level-1 residual; $\sigma^2 = 19.48$, p < .01), and (b) significant variation in social cognition outcomes between participants at baseline (τ_{00} = 17.45, p < .05). Converting the intercepts variance estimate to a standard deviation (i.e., $\sqrt{17.45} = 4.18$), and assuming normal distribution of intercepts residuals, suggests that 95% of participants' social cognition scores at baseline were likely to fall between 55.62 and 72.00 (i.e., 1.96 deviations from the mean intercepts estimate; $63.81 \pm 1.96[4.18]$), indicating that some participants did have clinically significant social cognition scores at baseline.

By extending the final analysis from paired *t* tests to LMM, 17% more variance was captured, [*PRV* = (23.53-19.48)/23.53 = .17], and consequently the LMM results were able to examine the influence of ASSET and SES. In order to help explain some of the significant variance between individuals at baseline and around the grand mean of the Level 1 model, *SES* was added to build a Level 2 model, and fit was significantly improved, χ^2 (1) = 8.29, *p* < .01. In

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this subgroup analysis, *SES* showed a highly significant relationship with *social cognition*, F(1, 16.91) = 10.83, p < .01. Figure 4.3 details the comparative subgroup analysis between higher and lower SES participants. This supplemental analysis revealed a significant overall association between ASSET and *social cognition* in the higher SES group, F(2, 15.11) = 3.57, p = .05, but an insignificant overall association in the lower SES group, F(2, 12.36) = 1.33, p = .30.

Figure 4.3 Social cognition scores by time and socioeconomic status



When examining these changes over time, ASSET was associated with a statistically significant improvement, b = -4.68, t (14.94) = -2.54, p < .05, in social cognition in the higher SES group at the post-intervention evaluation. This medium sized (d = -0.5) effect was no longer significant at follow-up, b = -1.10, t (15.34) = -.55, p = .59. In contrast the lower SES group, on average, showed small to medium improvements (d = -0.3) at post, b = -4.48, t (12.56) = -1.49, p = .16, and follow-up, b = -3.40, t (12.56) = -1.13, p = .28, but these changes were not statistically significant.

Based on the significant influence of SES as a categorical covariate, b = -8.14, t (16.91) = -3.29, p < .001, on average, participants with lower SES were described by self and others as

having clinically significant *social cognition* dysfunction (63.81 + 8.14 = 71.95), while participants with higher SES, on average, showed subclinical symptoms (63.81 - 8.14 = 55.6). This difference in social cognition as predicted by SES represents a medium effect (d = 0.5). Finally, it should be noted that, although SES clearly showed a moderating effect on social cognitive outcomes, multilevel modeling failed to detect a significant interaction at post, b = -2.48, t (28.61) = -0.77, p = .45, or follow-up, b = 0.73, t (29.22) = 0.22, p = .83. Based on consultation and review of the LMM literature (Bell, Ferron, & Kromrey, 2009; Twisk, 2006; Wang & Ware, 2013), this failure to detect an interaction is likely due to a lack of power as a result of testing an eight-parameter, nine-level model with a relatively small sample. Yet, Wang and Ware (2013) provide reassurance that, while the use of multilevel models with relatively small samples like the ASSET dataset may fail to fully explain random variances or effects beyond two levels, they are well-suited, if conservative, in examining fixed effects.

LMM results, social communication. To further explore hypothesis one regarding associations between ASSET and social function, the *social communication* subscale of the SRS was examined. Like the *social cognition* subscale, the cut score for clinical significance is 70, with scores of 70 or greater indicating disability related dysfunction in social communication. Thus, declines in *social communication* scores are considered positive outcomes.

As indicated by preliminary dependent samples *t tests* (Table 4.4), participants' *thinking* about social interactions improved significantly, but gains in *social communication* were small (d = 0.4) both at post, -3.48, 95% CI [-6.75, 2.42], and follow-up, -4.29, 95% CI [-10.51, 1.93]. While clinically relevant, these improvements were not statistically significant, t(13) = -1.37, p = .32; t(11) = -1.52, p = .16

To examine whether accounting for individual variability would give a clearer picture of

the influence of ASSET on social communication, combined parent, teacher, and SRS *social communication* subscale scores were evaluated. First, a null model was examined to determine if LMM was appropriate. As indicated by Figure 4.4, there was notable between-participant variation in individual baselines and responses over time in social communication.

Figure 4.4 *Social communication scores by individual*



This individuality was later captured through the random intercepts equation of the model. It is noteworthy that, despite having confirmed ASD diagnoses, most scores fell below the clinically significant range (>70).

Figure 4.5 (below) represents the level-2, within-participant variation, or variation over time, which is notably less varied. This variation over time, which can be seen to increase, is the main effect or primary outcome of interest in the study, and is later captured by the Level 2 model.



Figure 4.5 *Social communication by time*

Table 4.7 shows the continuum of models tested: (1) a null, random-intercepts-only model used to establish the need for LMM, (2) a Level 1, main effects model conditioned on *Time*, (3) a Level 2 model that include SES as a potential covariate, and (4) a Level 2 model with interaction that proved to be non-significant. A Level 1 model that included both random slopes and intercepts failed to converge, and the Level 1 model with random intercepts and conditioned on *Time* was just below the threshold of significance for improved fit, χ^2 (1) = 3.80, *p* = .05. Therefore, a Level 2 model with random intercepts, conditioned on *Time*, and including *SES* as a categorical covariate was used to examine outcomes.

Model summaries: social communication							
Parameters	Null (unconditional)	Level 1: main effects	Level 2: covariates	Level 2: interaction			
Regression coefficients (fixed effects)							
Intercept	60.92** (1.96)	63.09** (2.24)	67.50** (2.62)	66.31** (2.77)			
(γοο)							
Time (b_{10})	-	-3.23 (2.05)	-2.82 (2.07)	-1.55 (3.06)			
post							

 Table 4.7

 Model summaries: social communication

Table 4.7 (cont'd)

Time (<i>b</i> ₂₀)	-	-4.03 (2.16)	-3.59 (2.18)	04 (3.28)
follow-up				
SES (b_{01})	-	-	-8.45 * (3.31)	-6.02 (3.88)
Interaction (bu)	-	-	-	-2.42 (4.08)
Interaction (b_{21})	-	-	-	-6.13 (4.31)
(= =1)				
Variance cor	nponents (random eff	ects)		
Residuals (σ^2)	35.25** (9.45)	30.84** (8.29)	31.46** (8.56)	30.02** (8.15)
Intercepts (τ_{00})	50.47*(22.06)	51.60* (21.90)	32.52* (16.07)	31.23* (15.31)
Model				
summary				
Deviance statistic	307.453	303.651	298.328	296.341
Estimated	3	5	6	8
parameters				
I ikelihood r	atio testing			
A df	1110 iestiliz	1	1	2
Δu_j	-	2 20	1 5 2 2 *	∠ 1.09
χ Test Statistic	-	3.00	3.34	1.70
Statistic				

Note: Parameter estimate standard errors listed in parentheses. *p < .05, **p < .01

Results of the null model were used to compute an intraclass correlation (ICC), which showed that 59% (i.e., ICC = $\tau_{00}/(\tau_{00} + \sigma^2) = 50.47 / [50.47 + 35.35] = .59$) of social communication variation occurred between participants. Thus, the need for multilevel modeling was supported. In conclusion, the use of GLM methods to examine this dependent variable would have led to substantial Type I error and threats to inferential validity. Therefore, multilevel modeling of *social communication* was continued to include Level 1 and Level 2 models.

Final model. The final, best-fitting model was a Level 2 model with Time and SES

included as predictors. The Level 1 model, with *Time* as the only predictor, failed to show a significant relationship between ASSET and social communicative gains at post, b = -3.23, t (28.97) = -1.58, p = .13, or follow-up, b = -4.03, t (29.37) = -1.87, p = .07. In order to help explain some of the significant variance between individuals at baseline and around the grand mean of the Level 1 model, *SES* was added to the Level 2 model, and fit was significantly improved, χ^2 (1) = 5.32, p < .05. This new Level 2 model indicated significant change in *social communication* over time as predicted by SES, F (1, 16.88) = 6.54, p < .05. However, when tested for interaction, the model was not able to capture a significant effect, F (2, 28.61) = 1.02, p = .38.

Results further showed a significant grand-mean *social communication* score at baseline (γ_{ss} = 67.50, p < .01) that, on average, improved non-significantly at post, b = -2.82, t (28.43) = -1.36, p = .18, and follow-up, b = -3.59, t (28.98) = -1.65, p = .11. On average, these improvements were small (d = -0.2). Variance component estimates showed: (a) significant variance in observed versus predicted social communication scores within participants (level-1 residual; $\sigma_{2} = 31.46$, p < .01), and (b) significant variation in social communication outcomes between participants at baseline (τ_{ss} = 32.52, p < .05). Converting the intercepts variance estimate to a standard deviation (i.e., $\sqrt{32.52} = 5.70$), and assuming normal distribution of intercepts residuals, suggests that 95% of participants' *social communication* scores at baseline were likely to fall between 56.34 and 78.67 (i.e., 1.96 deviations from the mean intercepts estimate; 67.50 $\pm 1.96[5.70]$), indicating that only a portion of the sample reported clinically significant social communication dysfunction at baseline.

Extending the final analysis from a null to Level 2 model captured an additional an additional 11% of the residual variance, [PRV=(35.25-31.46)/35.25 = .11], and enabled analysis

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of SES as a categorical covariate that offered some meaningful results. To further explore the influence of SES on these outcomes, a comparative subgroup analysis was performed between higher and lower SES groups. Figure 4.6 details the subgroup analysis.



Figure 4.6 Social communication by time and socioeconomic status

This supplemental analysis showed that ASSET was associated with a statistically significant improvement, b = -6.21, t (17.18) = -2.12, p < .05, in *social communication* in the higher SES group at follow-up. This improvement represented a small to medium sized (d = -0.4) effect. However, improvements measured at post among the higher SES group, while small to medium in effect size (d = -0.3), had not yet reached statistical significance, b = -3.99, t (16.77) = -1.42, p = .17. In contrast, the lower SES group, on average, made only marginal and statistically non-significant improvements at post, d = -0.1, b = -1.81, t (11.68) = -.64, p = .53, and follow-up, d = 0.0, b = -.32, t (11.81) = -.11, p = .92.

Based on the significant influence of SES as a categorical covariate, b = -8.45, t (16.88) = -2.56, p < .05, on average, participants with lower SES were described by self and others as having clinically significant social communicative dysfunction (67.50 + 8.45 = 75.95), while

participants with higher SES, on average, showed subclinical symptoms (67.50 - 8.45 = 59.05). This difference in social communication as predicted by SES represents a medium to large effect (d = -0.6). Finally, as discussed in the social cognition section of this manuscript, it should be noted that, although subgroup analysis clearly showed a moderating effect of SES on social communicative outcomes, multilevel modeling failed to detect a significant interaction at post, b = -2.42, t (28.78) = -0.60, p = .56, or follow-up, b = -6.13, t (29.35) = -1.42, p = .17.

Research question 2: Is ASSET associated with improved *self-efficacy*? H2: It is hypothesized that when compared to baseline (T1), students with HFASD who complete the ASSET program will show significant improvements in *empathic* and *social self-efficacy* (a) immediately post intervention (T2) and (b) at two-month follow-up (T3).

H2 was tested using paired *t* tests and LMM on the *perceived empathic self-efficacy* (*PESE*) and *perceived social self-efficacy* (*PSSE*) measures. As detailed in chapter three, PESE measures ability to exercise theory of mind in understanding the feelings of others and to be both sensitive and responsive to the emotional states of others (Caprara & Steca, 2005), while the PSSE measures self-perceived ability to express opinions, share personal experiences, work cooperatively, and manage interpersonal conflict (PSSE; Caprara & Steca, 2005).

Preliminary analyses, self-efficacy. Separate dependent samples *t* tests were performed to explore group mean differences between baseline and post, and baseline and followup. Dependent variables were later more comprehensively analyzed using linear mixed-effects modeling (LMM). Table 4.8 reports results of *t* tests displayed by baseline and post, and baseline and follow-up averages on the *empathy self-efficacy* and *social self-efficacy* subscales.

	Baseline to post			I	Baseline to follow-up					
	М	SD	df	t	d	М	SD	df	t	d
Empathic self-efficacy	0.93	0.57	14	6.35**	1.6	0.13	0.68	11	0.64	0.2
Social self-efficacy	1.16	0.89	14	5.07**	1.3	0.35	0.69	11	1.78	0.5

Self-efficacy dependent samples t tests, mean differences, standard deviations, and effect sizes

Table 4.8

*p < .025, **p < .005 (multiple testing correction $\alpha/2$);.Cohen's d = 0.2 (small), d = 0.5 (medium), d = 0.8 (large).

On average, ASSET participants showed significantly improved *empathic self-efficacy*, 0.93, 95% CI [-1.25, -.618], and *social self-efficacy*, 1.16, 95% CI [-1.65, -.670], after completing the ASSET intervention (post). These improvements in empathic, t (14) = 6.35, p < .001, and social self-efficacy, t (14) = 5.07, p < .001, were statistically significant. Specifically, ASSET was associated with a very large effect on *empathic self-efficacy*, d = 1.63, and *social self-efficacy*, d = 1.30, at post. While improvements in empathic, 0.13, 95% CI [-.56, .31], and social self-efficacy, .35, 95% CI [-.78, .08] were still measured at follow-up, these effects were small (d = 0.3) and did not reach statistical significance, t (11) = .64, p = .54; t (11) = 1.78, p = .10, respectively.

LMM results, empathy self-efficacy. As detailed in chapter three, The PESE uses a fivepoint Likert-type scale, ranging from 1 (*not well at all*) to 5 (*very well*). First, PESE scores were evaluated with a null model to determine the appropriateness of using LMM. As indicated by Figure 4.7 (below), there was notable between-participant variation in individual baselines and responses over time.

Figure 4.7 *Perceived empathic self-efficacy by individual*



This individuality was later captured through the random intercepts and/or slopes equation of the model. Figure 4.8 represents the level-2, within-participant variation, or variation over time, which is notably less varied. This variation over time is the main effect or primary outcome of interest in the study, and is later captured by the Level 1 model.





Noting that the between-participant variability is greater than the within-participant variability over time, it is visually clear that a multilevel model can more comprehensively assess the overall impact of the intervention.

Table 4.9 shows the continuum of models tested: (1) a null, random-intercepts-only, model used to establish the need for LMM, (2) a Level 1 model conditioned on *Time*, (3) a Level 2 model that included SES as a main effect, χ^2 (1) = 3.56, p = .06. and (4) a Level 2 model with interaction that proved to be non-significant, χ^2 (2) = 4.73, p = .19. A random slopes and intercepts model failed to converge. The Level 1 model conditioned on *Time* had the best fit to the ASSET data, χ^2 (2) = 25.08, p < .001, as it was the only model to reach significance.

Table 4.9

11 11	•	.1 •	10 00
Model	summaries:	empathic	self-efficacy

Parameters	Null	Level 1: main	Level 2:	Level 2: interaction
	(unconditional)	effects	covariates	
Regression coeff	ficients (fixed effec	ts)		
Intercept (γ_{00})	3.13** (.18)	2.79** (.18)	2.48** (.23)	2.56** (.24)
Time (b_{10})	_	.89** (.15)	.88** (.15)	.73** (.23)
post			~ /	~ /
Time (b_{20})	-	.15 (.16)	.13 (.16)	04 (.25)
follow-up				
SES (b_{01})	-		.60 (.30)	.44 (.33)
Interaction	-	-	-	.27 (.30)
(b_{11})				
Interaction	-	-	-	.30 (.33)
(<i>b</i> ₂₁)				
T 7 ·				
Variance compo	nents (random effe	PCts)	17** (05)	17** (05)
Residuals (σ^2)	.41** (.11)	.1/** (.05)	.1/** (.05)	.1/** (.05)
Intercepts (τ_{00})	.35* (.18)	.40* (.16)	.31* (.13)	.30* (.13)
Model summary				
Deviance statistic	105.255	80.179	76.622	75.452

Note: Parameter estimate standard errors listed in parentheses. p < .05, p < .01

Table 4.9 (cont'd)

Results of the null model were used to compute an intraclass correlation (ICC), which showed that 46% (i.e., ICC = $\tau_{00}/(\tau_{00} + \sigma^2) = .35/[.35 + .41] = .46$) of empathic self-efficacy variation occurred between participants. Thus, the need for multilevel modeling was supported. In conclusion, the use of GLM methods to examine this dependent variable would have led to substantial Type I error and threats to inferential validity. Therefore, multilevel modeling of *empathic self-efficacy* was continued to include Level 1 and Level 2 models.

Final model. The final, best-fitting model was a Level 1 model with *Time* as the only significant predictor. In building the Level 1 model, both random slopes and intercepts were considered. However, the only Level 1 model that reached convergence was a random intercepts model conditioned on *Time*. In order to help explain some of the significant variance between individuals at baseline and around the grand mean of the Level 1 model, *SES* was added to create a Level 2 model, but fit was not significantly improved, χ^2 (1) = 3.56, p = .06. As shown in Table 4.8, the Level 1 model captured an additional 59% of the residual variance, [$PRV = (\sigma^2_{null} - \sigma^2_{final}) / \sigma^2_{null} = (.41-.17)/.17 = .59$] in comparison to the null model, thus explaining most of the variance in the data. This Level 1 model had the best fit, χ^2 (2) = 25.08, p < .01, and indicated significant improvement in *empathic self-efficacy* over time, F (2, 28.08) = 19.67, p < .01.

Results further showed a significant grand-mean empathic self-efficacy score at baseline

($\gamma_{00} = 2.79, p < .01$), which indicated that, on average, participants felt that they were able to recognize the needs of others "moderately well" before receiving the intervention. Despite already starting at a relatively high average, *empathic self-efficacy* significantly improved at post, b = .89, t (27.83) = 6.00, p < .01. This improvement represented a very large effect size (d = 0.9) at post. In contrast, changes in empathic self-efficacy between baseline and follow-up, while positive, were very small (d = 0.1) and statistically insignificant b = .15, t (28.26) = .91, p = .37. Variance component estimates showed: (a) significant variance in observed versus predicted empathic self-efficacy outcomes between participants at baseline ($\tau_{00} = .40, p < .05$). Converting the intercepts variance estimate to a standard deviation (i.e., $\sqrt{.40} = .63$), and assuming normal distribution of intercepts residuals, suggests that 95% of participants' *empathic self-efficacy* scores at baseline were likely to fall between 1.56 and 4.02 (i.e., 1.96 deviations from the mean intercepts estimate; 2.79 ±1.96[.63]), indicating that *empathic self-efficacy* perceptions ranged from "slightly well" to "well" at baseline.

LMM results, social self-efficacy. As detailed in chapter three, the PSSE uses a fivepoint Likert-type scale, ranging from 1 (*not well at all*) to 5 (*very well*). First, PSSE scores were evaluated with a null model to determine the appropriateness of using LMM. As indicated by Figure 4.9 (below), there was notable between-participant variation in individual baselines and

Figure 4.9 *Perceived social self-efficacy by individual*



responses over time. This individuality was later captured through the random intercepts and/or slopes equation of the Level 1 model.

Figure 4.10 represents the level-2, within-participant variation, or variation over time, which is notably less varied. This variation over time is the main effect or primary outcome of Figure 4.10 *Perceived social self-efficacy by time*



interest in the study, and is later captured by the Level 1 model. Noting that the betweenparticipant variability is greater than the within-participant variability over time, it is visually clear that a multilevel model may more comprehensively assess the overall impact of the intervention.

Table 4.10 shows the continuum of models tested: (1) a null, random-intercepts-only, model used to establish the need for LMM, (2) a Level 1 model conditioned on *Time*, (3) a Level 2 model that includes SES as a covariate, and (4) a Level 2 model with interaction failed to converge. The Level 1 model conditioned on *Time* had the best fit to the ASSET data, χ^2 (3) = 107.34, *p* < .001, as it was the only one to reach significance.

Table 4.10

|--|

Null	Level 1: main	Level 2: covariates						
(unconditional)	effects							
Regression coefficients (fixed effects)								
3.24** (.16)	2.80** (.17)	2.53** (.22)						
-	1.11** (.18)	1.10** (.18)						
-	.28 (.18)	.26 (.18)						
-	-	.50 (.28)						
-	-							
-	-							
ents (random effect	s)							
.61** (.16)	.28** (.16)							
.17 (.14)	.29* (.13)							
112.594	85.251	82.439						
3	6	7						
	2							
-	3	I						
-	27.34**	2.81						
	Null (unconditional) <i>ients (fixed effects)</i> 3.24** (.16) - - - ents (random effect .61** (.16) .17 (.14)) 112.594 3	Null (unconditional)Level 1: main effectsients (fixed effects) 3.24^{**} (.16) 2.80^{**} (.17)- 1.11^{**} (.18)28 (.18)						

Note: Parameter estimate standard errors listed in parentheses; *p < .05, **p < .01

Results of the null model were used to compute an intraclass correlation (ICC), which showed that 22% (i.e., .17 / [.17 + .61] = .22) of the variation in social self-efficacy occurred between participants. Thus, the need for multilevel modeling was supported. In conclusion, the use of GLM methods to examine this dependent variable would have led to substantial Type I error and threats to inferential validity. Therefore, multilevel modeling of *social self-efficacy* was continued to include Level 1 and Level 2 models.

Final model. The final, best-fitting model was a Level 1 model with *Time* as the only significant predictor. In building the Level 1 model, both random slopes and intercepts were considered. Extending the final analysis from a null to Level 1 model captured an additional 87% of the residual variance, [*PRV* = (.61-.08)/.61], thus explaining most of the variance in the data. As shown in Table 4.9, this Level 1, main effects model had the best fit, χ^2 (3) = 27.34, p < .01, and indicated significant improvement in *social self-efficacy* over time, *F* (2, 24.80) = 19.82, *p* < .01. Results further showed a significant grand-mean *social self-efficacy* score at baseline ($\gamma_{00} = 2.80, p < .01$), which indicated that, on average, participants felt "moderately well" that they were able to express opinions, share personal experiences, work cooperatively, and manage interpersonal conflict before starting the ASSET program.

Despite already starting at what seems like a relatively high average for the population, social self-efficacy significantly improved at post, b = 1.11, t (35.98) = 6.11, p < .01, representing a very large effect size (d = 0.9). However, improvement at follow-up was very small (d = 0.2) and no longer statistically significant, b = .28, t (20.99) = 1.59, p = .13. Variance component estimates showed: (a) non-significant variance in observed versus predicted social self-efficacy scores within participants (level-1 residual; $\sigma^2 = .08$, p = .62), and (b) nonsignificant variation in social self-efficacy outcomes between participants at baseline ($\tau_{00} = .20$, p = .12). Converting the intercepts variance estimate to a standard deviation (i.e., $\sqrt{.20}$ =.45), and assuming normal distribution of intercepts residuals, suggests that 95% of participants' *social self-efficacy* scores at baseline were likely to fall between 1.92 and 4.31 (i.e.,1.96 deviations from the mean intercepts estimate; 2.80 ±1.96[.45]), indicating that *social self-efficacy* performance perceptions ranged from "slightly well" to "well" at baseline.

Research question 3: Is ASSET associated with improved *psychological wellness*?

H3: It is hypothesized that when compared to baseline (T1), students with HFASD who complete the ASSET program will show significant improvements in psychological wellness (a) immediately post intervention (T2) and (b) at two-month follow-up (T3).

H3 was tested using paired *t* tests and LMM on the General Anxiety Disorder Questionnaire (GAD-7) and Patient Health Questionnaire-9 (PHQ-9) measures. As detailed in chapter three, the GAD-7 is a self-report measure of anxiety with cut points of 5, 10, and 15 respectively indicative of mild, moderate, and severe anxiety (Spitzer et al., 2006). Ten is the threshold of clinical significance. The PHQ-9 is a self-report measure of depression with cut scores of 5 indicative of mild depressive symptoms; 10, moderate; 15, moderately severe; and 20, severe (Cassin et al., 2013). Again, 10 is the threshold of clinical significance.

Preliminary analyses, psychological wellness. Separate dependent samples t tests using multiple testing correction ($\alpha/2$) were performed to explore group mean differences between baseline and post, and baseline and follow-up. These dependent variables were later more comprehensively analyzed using linear mixed-effects modeling (LMM). Table 4.11 (below) reports results of t tests displayed by baseline and post, and baseline and follow-up averages on the *GAD-7* and *PHQ-9* measures.

Table 4.11Psychological wellness dependent samples t tests, mean differences, standard errors, and effect

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sizes											
	Baselin	ne to po	st			Baseline	to follo	w-up			
	М	SD	df	t	d	М	SD	df	t	d	
Anxiety	-0.08	0.29	14	-1.02	-0.3	-0.37	0.58	11	-2.22	-0.6	
Depression	-0.05	0.46	10	-0.40	-0.1	-0.09	0.47	11	-0.67	-0.2	
* $p < .025$, ** $p < .005$ (multiple testing correction $\alpha/2$). <i>BCa</i> bootstrap GAD-7; Cohen's $d = 0.2$											
	· ••		0 11								

⁽small), d = 0.5 (medium), d = 0.8 (large).

Although, on average, ASSET participants showed a trend of decreasing *anxiety* between baseline and post, -0.08, 95% CI [-0.22, 0.07], and between baseline and follow-up, -0.37, 95% CI [-0.74, -0.03], none of these changes were statistically significant when evaluated with dependent samples *t* tests. However, the improvement in anxiety between baseline and followup approached significance, t(11) = -2.22, p = .05, $\alpha = .025$, while changes between baseline and post, t(14) = -1.02, p = .33, were decidedly non-significant.

Similarly, ASSET was associated with declining *depression* between baseline and post, -.05 95% CI [-3.61, 0.25], and between baseline and follow-up, -.37, 95% CI [-0.74, -.003], yet neither the post assessments, t(10) = -.40, p = .70, nor the follow-up assessments, t(11) = -.67, p = .52, were statistically significant. In terms of clinical significance, ASSET was associated with small improvements in anxiety at post (d = -0.3) and medium improvements (d = -0.6) at followup. This trend differed for depression outcomes, in which ASSET was associated with very small improvements both at post (d = -0.1) and follow-up (d = -0.2).

LMM results, anxiety. As detailed in chapter three, the GAD-7 (Spitzer et al., 2006) uses a four-point Likert-type scale to assess frequency of symptoms, ranging from 0 (*not at all*) to 4 (*nearly every day*). First, GAD scores were evaluated with a null model to determine the appropriateness of using LMM. As indicated by Figure 4.11, there was notable between-Figure 4.11 *Anxiety by individual*



participant variation in individual baselines and responses over time. This individuality was later captured through the random intercepts and/or slopes equation of the Level 1 model.

Figure 4.12 represents the level-2, within-participant variation, or variation over time, which is

Figure 4.12 *Anxiety by time*



notably less varied. This variation over time is the main effect or primary outcome of interest in the study, and is later captured by the Level 1 model. It is noteworthy that although at least 75%

of all scores were clinically significant at baseline, at least 75% off all scores fell *below* the level of clinical significance by follow-up. Noting that the between-participant variability is greater than the within-participant variability over time, it is visually clear that a multilevel model can more comprehensively assess the overall impact of the intervention.

Table 4.12 shows the continuum of models tested: (1) a null, random-intercepts model used to establish the need for LMM, (2) a Level 1 model conditioned on *Time*, (3) a Level 2 model that includes SES as a covariate, and (4) a Level 2 model with interaction. A random slopes and intercepts model failed to converge. The Level 1 model conditioned on *Time* had the best fit to the ASSET data, $\chi^2(2) = 14.74$, p < .01.

Table 4.12

11 11	•	•
Model	summaries:	anxietv

inedet standartes. e				
Parameters	Null	Level 1:	Level 2:	Level 2: interaction
	(unconditional)	main effects	covariates	
	(unconditional)	main circus	covariates	
Regression coefficie	ents (fixed effects)			
Intercept (γ_{00})	11 48** (87)	12.71**(.87)	12.94**	13.50** (1.26)
11100 pt (100)		12./1 (.0/)	(1, 21)	15.50 (1.20)
			(1.21)	
Time (b_{10}) post	-	-1.27 (.71)	-1.26 (.71)	-1.81 (1.05)
Time (h_{20}) follow-	-	-3.31** (.78)	-3 30** (78)	-5.29 * * (1.15)
			5.50 (.70)	5.2) (1.15)
up				
SES (b_{01})	-	-	44 (1.6)	-1.50 (1.73)
Interaction (b_{11})	-	-	-	1.03 (1.33)
Interaction (ba)				3.29 * (1.45)
Interaction (<i>b</i> ₂₁)	-	-	-	3.27 (1.43)
Variance componen	ts (random effects)			
Residuals (σ^2)	5.80** (1.68)	3.64 * (1.05)	3.64 * * (1.05)	2.97** (.85)
Internets (-)	10.07*(4.69)	0.00*(2.05)	0.05*(2.92)	2.57 (.00)
Intercepts (τ_{00})	10.27* (4.68)	9.08* (3.85)	9.05* (3.83)	9.69* (3.92)
Model summary				
Design of statistic	221.059	206.216	206.241	201 ((1
Deviance statistic	221.058	206.316	206.241	201.001
Estimated	3	5	6	8
parameters				
r				

Table 4.12 (cont'd)

Likelihood ratio testing							
Δdf	-	2	1	2			
χ^2 Test Statistic	-	14.74**	0.08	4.58			
Note: Parameter estimate standard errors listed in parentheses. VC = variance components.							

p* < .05, *p* < .01

Results of the null model were used to compute an intraclass correlation, which showed that 29% (i.e., ICC = $\tau_{00}/(\tau_{00} + \sigma^2) = 3.64/[3.64 + 9.08] = .29$) of anxiety variation occurred between participants. Thus, the need for multilevel modeling was supported. In conclusion, the use of GLM methods to examine this dependent variable would have led to substantial Type I error and threats to inferential validity. Therefore, multilevel modeling of *anxiety* was continued to include examination of Level 1 (within-participant) and Level 2 (between-participant) models.

Final model. The final, best-fitting model was a Level 1 model with *Time* as the only significant predictor. In order to help explain some of the significant variance between individuals at baseline and around the grand mean of the Level 1 model, *SES* was added to build a Level 2 model, but fit was not significantly improved, χ^2 (1) = 0.08, p = .78. Thus, the Level 1 model showed the best fit, χ^2 (2) = 14.74, p < .05, and indicated significant change in *anxiety* over time, F(2, 24.87) = 9.08, p < .01. By extending the final analysis from paired *t* tests to LMM, 32% more variance was captured, [*PRV* = (5.80-3.64)/5.80 = .32], and consequently the model was able to identify a statistically significant association between ASSET and improved anxiety at follow-up that was not revealed through dependent samples *t* tests. Results further showed a significant grand-mean *anxiety* score at baseline (γ_{∞} = 12.71, p < .01) that, on average, approached significant at follow-up, b = -3.31, *t* (25.13) = -4.26, p < .01. These improvements represented a medium to large effect (d = -0.6) at follow-up and a small (d = -0.3), but statistically nonsignificant, reduction in anxiety at the earlier post-intervention evaluation.

Variance component estimates showed: (a) significant variance in observed versus predicted social cognition scores within participants (level-1 residual; $\sigma^2 = 3.65$, p < .01), and (b) significant variation in anxiety between participants at baseline ($\tau_{\infty} = 9.08$, p < .05). Converting the intercepts variance estimate to a standard deviation (i.e., $\sqrt{9.08} = 3.01$), and assuming normal distribution of intercepts residuals, suggests that 95% of participants' *anxiety* scores at baseline were likely to fall between 6.81 and 13.76 (i.e., 1.96 deviations from the mean intercepts estimate; 12.71 ±1.96[3.01]), which ranges from mild to moderate.

LMM results, depression. As detailed in chapter three, the PHQ-9 uses a four-point Likert-type scale, ranging from 0 (*not at all*) to 4 (*nearly every day*) with total scores ranging from 0 to 27 (Kroenke, Spitzer, & Williams, 2001). While results of preliminary analysis using multiple *t* tests revealed small effects and non-significant results, the analysis was extended to LMM in order to explore if additional variance could be explained. As indicated by Figure 4.13,



Figure 4.13 Depression by individual

there was notable between-participant variation in individual baselines and responses over time. This individuality was later captured by including random intercepts and slopes in the Level 1 model. Figure 4.14 represents the level-2, within-participant variation, or variation over time, which is notably less varied than the between-participant variation. This variation over





time is the main effect or primary outcome of interest in the study, and is later captured by the Level 1 model. It should be noted that, while the upper range of *depression* can be seen to decrease over time, the lower range scores all remain at or above the level of clinical significance (10 or greater). Noting that the between-participant variability is greater than the withinparticipant variability over time, it is visually clear that a multilevel model can more comprehensively assess the overall impact of the intervention.

Table 4.13 shows the continuum of models tested: (1) a null, random-intercepts model used to establish the need for LMM, (2) a Level 1 model conditioned on *Time*, (3) a Level 2 model that includes SES as a covariate, and (4) a Level 2 model with interaction. A random slopes and intercepts model failed to converge. As indicated by likelihood ratio testing (see Table 4.13), none of the models improved fit in comparison to the null. Therefore, results are discussed only for the null LMM model and *t* tests.

Moael summe	iries: aepression			
Parameters	Null	Level 1: main	Level 2:	Level 2: interaction
	(unconditional)	effects	covariates	
Regression co	oefficients (fixed effe	cts)		
Intercept	15.58** (.98)	16.00** (1.03)	15.36** (1.45)	15.00** (1.45)
(γοο)				
Time (b_{10})	-	51 (1.18)	55 (1.18)	2.22 (2.13)
post				
Time (b_{20})	-	-1.07 (1.04)	-1.10 (1.03)	84 (1.66)
follow-up				
SES (b_{01})	-	-	1.19 (1.94)	1.89 (1.99)
Interaction	-	-	-	-3.90 (2.55)
(b_{11})				
T 7 •				
Variance com	ponents (random ef	tects)	1.00 (6.00)	1.00 (7.75)
Residuals	7.89** (2.39)	1.11 (7.41)	1.22 (6.90)	1.20 (7.75)
(σ ²)	1 0 57 * (5.01)	0.00 (5.00)	0.07 (5.55)	7.52 (5.07)
Intercepts	12.57* (5.81)	8.22 (5.88)	8.07 (5.55)	7.52 (5.96)
(700)				
Model				
summary				
Deviance	216 735	213 918	213 544	211 276
statistic	210.755	213.910	213.344	211.270
Estimated	3	6	7	9
parameters	5	0	,	,
purumeters				
Likelihood ra	tio testing			
Δdf	-	3	1	2
γ^2 Test	-	2.81	.37	2.27
Statistic				

Table 4.13Model summaries: depression

Note: Parameter estimate standard errors listed in parentheses. *p < .05, **p < .01

Results of the null model were used to compute an intraclass correlation, which showed that 61% (i.e., ICC = $\tau_{00}/(\tau_{00} + \sigma^2) = 12.57/[12.57 + 7.89] = 0.61$) of variation in *depression* scores occurred between rather than within participants. Thus, the need for multilevel modeling was supported. The use of GLM methods to examine this dependent variable would have led to substantial Type I error and threats to inferential validity.

Final model. While the Level 1 model, which added *Time* as a main effect, yielded insignificant improvement in model fit, $\chi^2(3) = 2.81$, p = .42, final results of LMM were non-significant for *depression*. In order to help explain some of the significant variance between individuals at baseline and around the grand mean of the Level 1 model, *SES* was added as a Level 2 covariate, but fit was not significantly improved, $\chi^2(1) = 0.37$, p = .35., F(1, 18.45) = .378, p = .55. However, given the high ICC, it was hypothesized that some other covariate, other than *Time* or *SES*, may account for changes in depression over time. Therefore, psychiatric comorbidity was built into a Level 2 model, but also did not improve fit, $\chi^2(1) = 0.286$, p = .59, F(1, 15.63) = .001, p = .98. Therefore, no further modeling was warranted.

However, some information can be gleaned from the null model. Results of the null model showed a significant grand-mean *depression* score, $\gamma_{00} = 15.58$, p < .01, indicating moderately severe depression (Cassin et al., 2013), on average, across ASSET participants at baseline. The variance, $\tau_{\infty} = 12.57$, p < .05, of individual mean *depression* scores (averaged across all three observations) varied significantly around the grand mean. Significant differences were also observed between each participant's observed and predicted *depression* scores over time, $\sigma_2 = 7.89$, p < .01. The significance of these random effects indicates that ASSET participants showed wide individual variation in depressive symptoms at baseline and highly variable rates of change after the intervention. Next, the level-2 variance estimate was converted to a standard deviation to aid in interpretation. Converting the intercepts variance estimate to a standard deviation (i.e., $\sqrt{12.57} = 3.55$) and assuming approximate normality of distribution of the residuals, we can conclude that 95% of participants had mean *depression* scores between 8.62 and 22.54 (i.e., 1.96 deviations from the mean intercepts estimate; 15.58 ±1.96[3.01]), ranging widely from mild to severe.

Research question 4: Are *self-efficacy* **and** *psychological wellness* **correlated?** The

relationship between *self-efficacy* (empathy and social), anxiety, and depression was tested using Pearson product-moment correlation analysis. Results are summarized in Table 4.14.

 Table 4.14

 Pearson product-moment correlations among self-efficacy and psychological wellness variables

 Empathic SE
 Social SE
 Anxiety
 Depression

			T IIIII C C J	2.01.001011
Empathic SE	-	.80**	09	.11
Social SE		-	00	01
Anxiety			-	.52**
Depression				-

*p < .05, **p < .01. Empathic SE = empathic self-efficacy, Social SE = social self-efficacy.

While the correlation between anxiety (as measured by the GAD-7) and depression (as measured by the PHQ-9) was positive and large, r = .52, n = 39, p < .001, the relationships between self-efficacy and self-reported *anxiety* and *depression* were negligible to small, and not statistically significant.

Research question 5: Is ASSET associated with improvements in participants' self-

perceived *psychosocial functioning* (social functioning, self-efficacy, and psychological wellness) and *outcome expectations* over time? It was hypothesized that ASSET would improve self-perceived psychosocial functioning as evidenced by alignment of the four outcome measures with qualitative statements. Further, it is hypothesized that participants will report development in career and independent living goals as captured by interview and focus group data.

To test hypothesis five, and expand, clarify, and deepen understanding of the quantitative results, two focus groups with graduates of the program were conducted: one with high school participants (n = 2) and one with college participants (n = 3). Focus group transcripts were analyzed using layered, content analysis with theory-based coding derived from SCCT constructs. Cross-checking was used to help ensure representativeness. Using a mixed methods
approach, the qualitative analysis was then integrated with the quantitative findings to see if results were aligned, discordant, or novel.

Social functioning. Content analysis revealed that social functioning, including both communication and cognition, was the most frequently discussed topic in both focus groups. Social cognitive flexibility, i.e. shifting thoughts and actions based on context rather than rote adherence to rules (Geurts, Corbett, & Solomon, 2009), emerged as a prominent subtheme. Cognitive inflexibility and associated repetitive behaviors have long been considered one of the more troubling features of autism (Van Eylen et al., 2011). Notably, cognitive inflexibility has been most consistently observed and measured in the population using natural observation and behavior rating scales, such as the Behavior Rating Inventory of Executive Function (BRIEF), while neurocognitive assessment results have been less consistent (Van Eylen et al., 2011). Thus, it was noteworthy to hear several examples from ASSET focus group participants that illustrated flexibility in social cognition within functional contexts, such as job interviews and work. Furthermore, participants were able to link their flexible behaviors to training experiences in the ASSET program. For example, one college participant, pseudonym Gayle, first discussed how the training prepared her for job interviews by stating, "I already knew what I was going to say beforehand and the whole making eye contact thing, and remembering that really helped." However, Gayle did more than remember what was taught and practiced; she exhibited shifting of social cognition in situ when she was able to "feel more comfortable like asking for an alternative when [the interviewer] asked a question that I couldn't answer." Another college participant and recent college graduate, pseudonym Chris, described shifting his social behaviors situationally with coworkers when he shared, "I don't drink that much but that's what we do with coworkers." He went on to demonstrate awareness of some of the social subtleties of socializing

with coworkers outside of the office at "bar events" where they "hang out and drink and stuff." Chris seemed to be able to capitalize on the social benefits of such activity while understanding the need to exhibit restraint: "They're pretty cool. I make sure not to drink too much. I don't wanna get too bad but I make sure everyone's hanging out, having a good time with everyone." When probed, he shared that this socialization outside of the office improved working relationships in the office: "We talked a lot better, hanging out, a lot better, get work done more effectively as a result. Cuz we actually know each other somewhat." Finally, one participant, pseudonym Ed, who had recently graduated high school and taken a 32 hour/week job in retail, exemplified his social flexibility when he described meeting "a lot of good people" at work but understanding that socialization needed to be brief and that work tasks take precedence: "We all have some good short conversations while we're working. You know, we always, we joke around a bit but we always focus on getting the work done first."

In contrast, other stories illustrated struggles with social cognitive flexibility. Gayle recounted a recent job loss that resulted from her inability to shift the pace of her customer interactions from the time pressured style of working in fast food, which she was accustomed to, to a more individualized customer service approach in a new sales job. She observed, "So like I'm used to working in the fast-paced environment where...rushing is okay and I, like [the manager] basically said, I was going too fast or like I contributed kind of a weird atmosphere." She recounted being aware of incidents in which she knew the supervisor wanted her to slow down (she recognized the need for flexibility), yet she was unable to inhibit her impulse to "zoom into the back to get it before like my boss...actually talked to me about like getting it." She concluded that "he might've been prepared to go back there and get it but I just kinda like went back there." Unfortunately, Gayle's difficulty in shifting her style of customer interaction

led to her dismissal. In response to this story, a second college student, pseudonym Harry, stated that he is "fine with generally whatever speed" his work is at, yet qualified "just as long as it's constant and doesn't take like sudden jumps." Thus, Harry too seemed most comfortable pacing his work and workplace social expectations at the rate suited to him rather than the situation. In addition, Harry also shared a realization that eye contact serves a social communicative purpose when he shared that he learned that "constant eye contact just makes it feel like you are engaged, like always engaged in the conversation at hand."

While all participants shared successes and struggles regarding workplace relationships, only one focused on difficulties in managing feelings of attraction to coworkers or customers in the workplace. This 23-year-old high school participant, pseudonym Carl, was enrolled in a school-to-work transition program designed as a bridge year between completing high school and entering the workforce. As his internships took place on a college campus where he was in the presence of his typically developing peers, it is perhaps not surprising that he expressed frustration regarding wanting to not just date, but find a wife. In several instances, Carl linked the concept of a romantic relationship to establishing an independent life as an adult. He noted: "Yes. In fact, I met someone at, I met...an employee that I, that I started taking a liking to but she already had a guy after I told her I had a crush on her." He illustrated his struggle with social cognitive flexibility when he went on to conclude: "In fact, said to myself, yeah. I can't find a wife, I guess I'll just have to stay a bachelor. Just have to stay a bachelor." It is notable that when asked about how he felt about sharing his feelings with this employee he said he felt good but then went on to conclude that he would never find companionship. Moreover, when the conversation transitioned to a discussion about independent living, Carl expressed additional frustration regarding living with family, and not being able to find suitable roommates. Yet he

also described the idea of living alone as unattainable, and remaining at home as intolerable due to rigid family routines and being "a lot annoyed by [aunt]...cuz of her overprotection." He mentioned three possible roommates, and demonstrated awareness of why the thought them to be unsuitable when he explained that it might not work out because one friend was "into a lot of fantasies," another was a "guy like into girlie stuff," and a third is not interested and when asked "did not give a specific answer." This participant's conclusion, again, was that he needed a wife in order to live safely and comfortably as an adult. He reflected, "Yes, in fact, if I was to find a girl, know what I would not do? Would not go on a date with her. I would just plan marriage right away. I would just force her into marriage." These issues could jeopardize Carl's employment prospects and are being addressed by the transition staff at his internship site who will be implementing behavioral programming to address his perseveration on female coworkers. Carl's situation illustrates how misreading of social cues by individuals with autism can lead to social and even legal predicaments. For example, Post and colleagues (2014) observed that certain ASD-related characteristics, including difficulty accurately interpreting verbal and nonverbal cues of people uninterested in socially engaging, potentially perseverating on an individual of interest, and disregard for social or legal repercussions of persistent behavior, can be perceived as stalking. Thus, while Carl is able to perform the duties and functions of his internship, his difficulty with social cognition and communication leave him vulnerable to job loss and the potential for criminal justice involvement.

Yet participants, including Carl, gave examples of prosocial behaviors. For example, Ed noted that others describe him as having "a really good work ethic," "always polite," and "a good team player." Carl recounted an experience at work in which he found a cell phone and made sure that it was returned to its owner. Moreover, improvements in social interaction were noted

not just in work settings but also by family. Chris reported that his "parents definitely noticed a difference," and saw him as "more social, more active than [he] used to be." He stated that he "interact[s] on [his] own a lot better than I used to." He even ran and won a seat on a computer programmers' board and attributed his willingness to engage to the intervention: "I would not have run for that without EPASS and ASSET helping, improving that."

Overall, participants shared that they valued being explicitly taught about expectations for social behavior in the workplace. Chris's statement was representative: "Knowing what you're supposed, expected to do, how to react to certain situations...and even what not to do." He went on to describe social scenarios, including "how to hang out with [co-workers] and like do interviews even, job interviews and stuff like that" as topics he "didn't really know before the programs." Harry felt that his social communication skills improved through participation in ASSET and its companion program EPASS (Employment Preparation and Assistive Skills Support). He observed, "The real world is very team based and that requires a lot of good communication skills and knowing how, knowing like appropriate reactions and expectations and... while I was familiar with some of the stuff that was covered, ASSET and EPASS in particular helped me kind of focus on stuff that I was doing that I didn't quite realize what I was doing or stuff that people might not have liked very much."

In conclusion, these qualitative results both confirm and expand the quantitative findings on social functioning. That is, while participants made gains in both social cognition and communication, it seems that knowing and doing are two different things. Both the quantitative and qualitative results point to the need for additional supports in helping some participants take the social skills they learned in group (social cognition) and more fully apply them to social interactions (communication) with employers, co-workers, and customers over time. Gayle

illustrated this point when stating that concepts like teamwork were more concrete and therefore easier to implement, whereas "communication was just kind of something I didn't exactly understand that well." Others, such as Harry, shared experiences in which both teamwork and social communication became more fluid. For example, he described teamwork as "still not [his] first choice," but expressed an understanding that some work "realistically can't be done alone." Further, he noted that after getting to know team members "interactions are just made easier, more bountiful." Thus, both the quantitative and qualitative results show the tremendous variation in responses among a group of individuals who were otherwise narrowly screened and selected for participation.

Self-efficacy. In alignment with Bandura's (1986) description of self-efficacy as domain specific, the majority of comments related to self-efficacy were specific to job seeking and workplace interactions as addressed by the intervention. For example, Chris talked about feeling "more confident" and socially engaged at work: "I talk to coworkers a lot more, hang out with them, doing stuff for them. Like even giving birthday gifts and stuff." In addition to his confidence in his ability to socially engage at work, Chris poignantly described a new-found confidence in his ability to have a satisfying career: "I feel a lot more confident after going through these programs, like doing the work, succeeding in the workplace. I heard a lot of like bad stories, like I might not be able to get a job after graduation so I feel confident I can succeed." He summed this up by saying he felt "more ambitious." Harry also expressed increased work-related self-efficacy, but as a college student with limited work experience was not as specific as the others in his descriptions; he simply stated: "I feel more confident interacting in a more professional setting."

Gayle described having bolstered confidence in her ability to work on a team: "I was able

to better conclude that I was good at teamwork. So like that was something I was more confident in saying that I knew." She also mentioned networking and interviewing as activities she felt confident and capable engaging in: "I feel I can do interviews very easily...I don't see myself struggling at all. I feel more confident in the idea of networking. I haven't been to a job fair or anything yet but I feel like I can be easily prepared for that."

However, as previously noted, while Gayle exited ASSET feeling more confident in her ability to communicate, her difficulty with customer communication made her realize that perhaps communication was something she didn't "exactly under[stand] that well." Thus, while her self-efficacy was necessary for her to even give the sales job a try, her confidence was based on a more concrete, basic form of communication that might be described simply as being polite. Gayle recalled watching videos on professionalism in ASSET and thinking quite rigidly that "they were just talking, like people would be talking to each other and asking how their day was or like just standard communication that is probably more basic and I just took that for like what communication was meant to be instead of what it was actually." Despite this setback, Gayle demonstrated resilience and a willingness to learn from the experience of losing a job when she stated, "I'm really good at getting the job and I know what I need now to like stay in the job. So I don't see myself running into too many obstacles. Or if they are obstacles...I know how to solve them, if I were to get into the workforce."

In addition to work-related self-efficacy, one participant demonstrated generalization of his confidence outside of the workplace. Chris observed: "I feel confident professionally and personal as well. Like hanging out with people. Hanging out with friends, confident speaking up more with my friend group. I used to always stay silent all the time. I bring stuff up more, be involved in the conversations a lot more with friends."

In contrast to these responses from the college focus group, the two high school respondents shared much more concrete, task-specific examples of augmented self-efficacy. For example, when asked about changes in self-confidence, Ed shared that he was "very confident" in his ability to sweep and stock the store "very well." In the course of the interview, it became apparent that Carl needed clarification on the definition of confidence. After clarification, he too listed specific work tasks (cleaning sinks and toilets) as skills he had confidence in performing well. It is noteworthy that neither high school focus group participant mentioned social functioning as an area of increased confidence.

In sum, focus group responses regarding self-efficacy were much more circumscribed and task specific than the questions on the perceived empathy and social self-efficacy measures administered at baseline, post, and follow-up. In fact, Chris was the only focus group participant who described gains in *social* self-efficacy, and Gayle was the only one to specifically describe continued feelings of confidence in her ability to understand the feelings of others and to be both sensitive and responsive to the emotional states of others, i.e. *empathic* self-efficacy. For example, Gayle shared being "able to assess the situation" and "more clearly understand" problems experienced by coworkers and a supervisor. Given that the quantitatively measured improvements in both social and empathy self-efficacy were highly significant at post but no longer statistically significant at follow-up, the qualitative findings appear to confirm that the apparent influence of ASSET on social and empathic self-efficacy, while large immediately after the intervention, may have continued to diminish over time. However, a more circumscribed self-efficacy related to confidence in being a "worthy" part of the workforce and performing jobrelated tasks remained prominent 1-2 years post.

Psychological wellness. Most reports of anxiety seemed to be situational rather than

pathological in nature, describing understandable feelings of being "nervous" in job interviews, or "a little stressed out" by semester deadlines or work demands. Gayle was the only focus group participant to describe more significant symptoms of anxiety, including somatic complaints. When describing her first day in the sales position she eventually lost, she said "I was just very sick that day and I think it was like because I was anxious, like just, like just constantly like feeling like I was gonna puke or something." Gayle could not identify why she felt this way but, when an interviewer asked if it might be due to not knowing what to expect, Gayle concluded "that's the only way I can like make sense out of it." She also recalled that her anxiety was noticed by her supervisor and mentioned as one of the reasons she was let go. She remembered, "Sometimes I'd be nervous with typing in someone's order... I was really nervous so I would just double tap everything, so like it caused me to like stay on the computer typing longer than I should've." This contrasts with her interview experiences, in which she was overly prepared, in a scripted manner: "I had the confidence to speak and like I had questions memorized so like I didn't feel nervous at all."

In sum, with the exception of Gayle, very little was mentioned about significant anxiety and nothing indicative of depressive symptoms. In fact, both Chris and Harry reported that their family members observed improvements in affect. For instance, Harry mentioned overhearing "some conversations, like [Harry] just looks like he's more lively, upbeat, more talkative..." Interestingly, both high school participants seemed to interpret questions about feeling sad, tired, or lonely in a completely literal fashion. For example, Ed answered, "Well, I can get a little bit tired at work." Soon after he explained, "I don't really work by myself, just a few other people," when asked about feelings of loneliness. These qualitative results align with the quantitative results, which indicated steady declines in both anxiety and depression, on average, over time.

Outcome expectations. Participants across both groups expressed expectations to achieve fulfilling work and independent living. Furthermore, most noted that their career expectations shifted to become "higher," yet more "specific," "realistic" and achievable after the interventions. Harry expressed this sentiment when he discussed a recent job advancement: "I am still kinda like a cog in the grand machine of making the game, but I feel like I'm a little less replaceable." Ed gave an example that illustrates this shift well when he spoke about being able to compartmentalize his restricted interests in the arts to leisure rather than career: "Well, I've always wanted to be an actor and artist but turns out, everything I ever wanted to be was right here in front of me." He went on to talk about his involvement in community theater and continuing to draw and share his art with family and friends. Carl also shared a dramatic shift in career goals. He previously wanted to be an entrepreneur but after the intervention and with the help of his vocational rehabilitation counselor he became open to considering jobs that were available in his community rather than building his own business. Finally, while expectations seemed realistic, participants also felt optimistic and even "ambitious" about work they previously might not have felt "really worthy of."

Finally, all participants expressed a desire to live independently but also had questions about how to achieve this. Carl talked about "learning to live my own" by doing more chores around the house, yet he also stated that he is "afraid of living in a house alone unless I have a wife." Both Gayle and Harry, who are still college students, had expectations to live independently but had not yet developed plans. While the other participants stated that they could depend on their families for assistance with this transition, both Gayle and Carl, who selfreported lower SES, struggled to identify an appropriate support network. Gayle said she was unsure if her mother could help her and Carl identified teachers as individuals that he could ask

for help.

As transportation provides access to both employment and independent living, participants were also asked to discuss community mobility. Chris stated, that he would "have a car and a license probably...within a year and a half," as he has chosen to live in a city where he can access public transit until that time. Similarly, Carl is using the public bus system independently and has no plans to drive. Interestingly, Ed explained, "I was about 18" when I went to driver's ed and... huh. Not really sure why I didn't get a permit." Although Ed knows how to use the public bus system, his parents drive him to and from work. Both Gayle and Harry expressed fears about driving, including something happening to the vehicle or not knowing how to communicate effectively with other drivers on the road. Thus, Gayle plans to live in a large city where she will have access to public transit. Harry is the only participant who currently holds a driver's license but he stated that he rarely needs to drive himself anywhere. Moreover, he is "paranoid" that "If I do need to use a car and I go to the lot and it, oh, no, just so happens to be gone, how long? I wouldn't know." He also expressed trepidation about other drivers and poor road conditions.

Fit of qualitative results with quantitative findings. In an expansion of the quantitative results, focus group data from participants of higher socioeconomic status described greater skills generalization, more social cognitive flexibility, and greater job-related success including more hours worked per week, job retention, and securing employment within the field of interest. In addition, this subgroup expressed higher work-related social self-efficacy and overall confidence in their ability to succeed in their chosen career fields. In contrast both Gayle and Carl reported lower SES and multiple job experiences with limited tenure. One had recently been let go from a position related to her field of study and the other required behavioral

intervention for appropriate workplace interaction. Therefore, when interpreting the results of this study, it should be noted that privilege, status, and developmental opportunities, not just disability and the ASSET intervention, have shaped the work-related social, self-efficacy, and psychological wellness status of each participant in the study. Finally, these qualitative results align with SCCT and augment the quantitative findings by illustrating how each focus group participant reconsidered their interests, reset their goals, and altered their career actions after participating in the ASSET program.

Results summary

In sum, ASSET was associated with improved self-perceived psychosocial functioning as evidenced by alignment of the four outcome measures with qualitative statements. However, this conclusion is conditional because higher SES participants exhibited relatively greater gains in social function, as measured by the SRS, and were able to share examples of successful application of learned skills to work settings, whereas lower SES participants reported, not just their successes, but also some social difficulties in their workplaces. Lastly, all ASSET participants reported bolstered career expectations and various degrees of development in career and independent living goals at the 1-2-year follow-up focus group.

CHAPTER FIVE

Discussion

This chapter uses the study data, theoretical framework, and the literature to: (1) summarize and explain the major findings, (2) integrate these findings with the existing literature, (3) consider limitations, (4) draw implications to practice and research, and (5) state conclusions.

Major Findings and Interpretations

The primary objective of this study was to determine if the ASSET social skills intervention is associated with significant improvements in social function, self-efficacy, and psychological wellness. Quantitative results confirmed that, on average, ASSET participants made statistically significant and clinically meaningful improvements in social cognition, empathic and social self-efficacy, and anxiety after completing the eight-week intervention. Qualitative results confirmed and expanded our understanding of these results by giving a longterm (1-2 years post intervention) perspective on participants' ongoing psychosocial development. The qualitative data aligned well with SCCT constructs and illustrated how each focus group participant reconsidered their career outcome expectations, broadened their interests, reset their career and independent living goals, and altered their career actions using a growth orientation after participating in the ASSET program. Although our sample may have been too small to show significant correlations between self-efficacy and psychological wellness, these constructs did show a positive relationship. Specifically, participants showed very large, immediate improvements in self-efficacy, and steady gradual improvements in psychological wellness. Notably, reduction in anxiety and depression appeared to have continued 1-2 years post, as focus group participants verbally described no depressive symptoms and only normal,

situational anxiety when interviewed. This was a striking contrast to baseline, in which at least 75% of the sample reported clinically significant anxiety and 100% of the sample reported clinically significant depression. However, as discussed below, self-selection bias may have influenced focus group results. A detailed discussion of these results, including time-related trends and subgroup analyses for the higher and lower socioeconomic groups, is provided below and organized by outcome.

Social cognition. On average, ASSET was associated with a small to medium (d = -0.3) sized and statistically significant improvements in social cognition between baseline and post. However, these gains were no longer statistically significant at follow-up. Moreover, subgroup analysis revealed that SES had a moderating effect on social cognitive outcomes. Results revealed that the significant improvements at post may be further explained by the medium-sized (d = -0.5) gains made specifically by the higher SES group immediately after participating in ASSET. It should be noted that the results of the subgroup analysis are hypothesis generating rather than confirming. Future research is needed to validate the observed differences in social cognitive change that the lower versus higher SES participants experienced after participating in ASSET (Wang & Ware, 2013).

It was further observed that participants with lower SES started ASSET with clinically significant social cognitive dysfunction, while participants with higher SES, on average, showed subclinical symptoms at baseline as measured by the SRS. In addition, while the higher SES group exhibited nonsignificant regression of social cognitive gains between post and follow-up, the lower SES group showed a continued trend of improvement. Finally, both higher and lower SES focus group participants shared successes and struggles with social cognition, particularly social cognitive flexibility, at the 1-2-year post-ASSET focus group. In sum, these results

suggest that while the higher SES group made immediate and statistically significant gains in social cognition after participating in ASSET, both groups were able to articulate ongoing improvement long after completing ASSET.

While generating an additional moderation hypothesis, these results also partially support hypothesis one. Compared to baseline (T1), students with HFASD who completed the ASSET program, on average, showed small to medium, statistically significant improvements in *social cognition* (a) immediately post intervention (T2), and (b) small to medium-sized, but statistically non-significant, improvements at two-month follow-up (T3).

Social communication. While, on average, the ASSET intervention was associated with clinically small improvements in social communication at post and follow-up, these changes were not statistically significant. However, SES proved to be a significant moderator of the relationship between ASSET and social communication. When subgroup analysis was performed, a small to medium-sized (d = -0.4) and statistically significant improvement in *social* communication was measured among the higher SES group at follow-up but not at post. While similar at baseline, the SES group trends diverged over time, with the higher SES group showing a trend of small to medium improvement between baseline and post, and baseline and follow-up, and the lower SES group showing a small decline in social communication at post, and no appreciable change between baseline and follow-up. Results of the focus group largely align with this trend. While lower SES participants were able to articulate social communication lessons taught in ASSET, some almost verbatim, their anecdotes of social engagement detailed struggles with social interaction that, for one, led to job loss and, for another, led to the need for behavioral intervention. These results suggest that improvements in social communication occur after growth in social cognition. Thus, it seems fitting that social communication did not

significantly improve until the eight-week period after the intervention, when participants had opportunities to apply social cognitive gains within natural social contexts beyond the training setting.

In sum, these results partially support hypothesis one and generate new hypotheses regarding the influence of SES on social communication in this population. Compared to baseline (T1), higher SES students with HFASD who completed the ASSET program, on average, showed small to medium-sized, but statistically nonsignificant, improvements in *social communication* (a) immediately post intervention (T2), and (b) small to medium-sized, statistically significant, improvements at two-month follow-up (T3).

Social implications. The disparate outcomes in both *social cognition* and *social communication* between the lower and higher SES groups, point to the need for examination of additional strategies to address the social skills needs of youth with HFASD and lower socioeconomic status. This group did make small gains in social cognition, which given more time and training, may have continued to improve. Further, the slight decline in perceived social communication skills at post may point to an increased self-awareness of social communication deficits among the lower SES group as a result of the intervention.

While one interpretation of these findings could be that the intervention was associated with decreases in social communicative ability, a previous feasibility study of ASSET (Sung et al., 2017) revealed high levels of satisfaction among participants. Thus, it seems more likely that, like the participants in Hillier and colleagues' (2011) study, ASSET group members simply became more self-aware of their social communication needs and abilities after learning about some of the nuances in workplace communication. In addition, based on the trend of gradual and steady gains in social cognition among lower SES participants in conjunction with their

relatively low, clinically significant, *social cognition* scores at baseline, it can also be speculated that the lower SES group may simply have not had enough time and/or treatment to significantly improve social cognitive skills. In turn, without sufficiently developed social cognition, it would not be expected that this group would have made gains in social communication.

Again, it should be noted that knowing and doing are two different things. Similar to the association between self-awareness of social deficits and heightened anxiety and depression in the HFASD population (Vickerstaff et al., 2007), there may be an inverse association between social cognition and social performance (i.e., communication). In effect, the more that individuals with HFASD learn about social skills, the more likely they may be to recognize their own deficits. Thus, while self-awareness is a necessary first step in reshaping behavior, this group would likely benefit from additional interventions that build on their increased selfawareness and, ultimately, improve their communicative performance. Our results indicate that this conclusion may be particularly salient to young adults with HFASD from lower SES backgrounds, who may need more extensive interventions, including longer duration and more individualized services, in order to practice and apply newfound social skills knowledge to performance contexts. Hillier and colleagues (2011) drew similar conclusions when they found a lack of significant improvement in their participants' self-reported peer relationships. Specifically, they noted that the training may have impacted participants' self-awareness of deficits in social behavior and, therefore, the lack of improvement could actually be suggestive of increased knowledge and understanding. Our results, augment this conclusion by affirming that additional social skills training and/or more targeted training, such as social communication training, may be necessary specifically within the lower SES subgroup of the population. Finally, as the higher SES group was comprised of individuals who were enrolled in college and those

who were transitioning from school to work, the robust response of the higher SES group is likely due to not just educational attainment, but also to a multitude of potential social advantages and opportunities afforded by higher SES. For instance, greater exposure to a variety of social contexts, including professional settings, as well as increased parental investment in educational opportunities may contribute to differing trajectories between individuals from higher and lower SES groups. Therefore, individuals with HFASD and lower SES may benefit from additional family supports, such as psychoeducational and career development interventions, to augment opportunities for expanded social opportunities and increase outcome expectations.

In contrast, the higher SES focus group participants described how social communication became more fluid, comfortable, and "bountiful" in both work, home, and community settings. As the higher SES group also showed earlier gains in *social cognition* at post, followed by significantly improved *social communication* at follow-up, it seems that these participants were able apply gains in social knowledge to performance contexts. Knowing that difficulty generalizing learning is problematic for this population (McKenzie, Evans, & Handley, 2010), this is an important finding. Again, it should be noted that, although the lower SES group seems to have made gains in social awareness, they had greater difficulty with social performance. Therefore, individuals with HFASD and lower SES may require greater intensity, duration of intervention, and more individualized treatment approaches to realize comparable gains to their higher SES peers.

Empathic self-efficacy. Even having started ASSET with relatively high empathic self-efficacy scores ("moderately well" at baseline), on average, ASSET participants demonstrated very large (d = 0.9) improvements in empathic self-efficacy at post. However, some decline

occurred between post and follow-up, and the original gains, though still positive, were no longer significant at follow-up, having effectively returned to baseline levels. Further, no significant differences were noted between the higher and lower SES groups. The qualitative results of the 1-2-year post-intervention focus group partially supported the quantitative trend of loss in empathic self-efficacy gains over time. Notably, only one focus group participant specifically described continued feelings of confidence in the ability to understand the feelings of others and to be both sensitive and responsive to the emotional states of others by being "able to assess the situation" and "more clearly understand" problems experienced by coworkers and a supervisor. While empathic self-efficacy did show a long-term return to baseline, this baseline status was a rating of "moderately well." Thus, while the gains in self-efficacy were not durable, participants reported maintenance of moderate empathic self-efficacy over time. In essence, on average, participants seem to have experienced a temporary boost in perceived empathic self-efficacy from "moderately well" to "well" levels immediately after completing ASSET. The study's theoretical framework may shed light on this trend, as SCCT posits that learning directly impacts self-efficacy (Lent et al., 2002). Therefore, the boost in self-efficacy measured immediately after the ASSET intervention may be indicative of the learning that took place.

In sum, these results partially support hypothesis two. Compared to baseline (T1), students with HFASD who completed the ASSET program showed statistically significant and clinically very large improvements in *empathic self-efficacy* (a) immediately post intervention (T2), but (b) not at two-month follow-up (T3).

Social self-efficacy. As indicated by the PSSE, on average, participants started ASSET already feeling "moderately well" that they were able to express opinions, share personal experiences, work cooperatively, and manage interpersonal conflict. While this baseline average

seems relatively high for the population, average improvement immediately post-intervention was clinically very large (d = 0.9) and statistically significant, but like empathic self-efficacy, declined to near baseline levels at follow-up. There was no significant difference between lower and higher SES participants on the PSSE.

In sum, these results partially support hypothesis two. Compared to baseline (T1), students with HFASD who completed the ASSET program showed significant and clinically very large improvements in *social self-efficacy* (a) immediately post intervention (T2), but (b) not at two-month follow-up (T3). Once again, the qualitative data appeared to back this trend of declining social self-efficacy months to years after completing ASSET. Specifically, only one focus group comment was analyzed as being specific to *social* self-efficacy in the 1-2 year post-intervention focus group interview.

Self-efficacy implications. On average, ASSET participants demonstrated dramatic gains in both empathic and social self-efficacy immediately after participating in ASSET followed by regression almost back to baseline. These self-efficacy trends suggest that, while the semantics of feeling "moderately well" versus "well" are arguable, it is clear that participation in ASSET was associated with increased feelings of both empathic and social self-efficacy in our sample. This finding aligns with the study's theoretical framework, i.e. learning experiences, like ASSET, directly impact self-efficacy beliefs (Lent, Brown, & Hackett, 1994, 2000, 2002.) Yet, while the large, these gains in *social* and *empathic self-efficacy* were fleeting, leaving us to speculate whether or not the boost in self-confidence had any appreciable impact on functional outcomes. The qualitative results shed some light and pointing to gains in career-related self-efficacy that seem likely to impact participants' work participation. Specifically, at the 1-2-year follow-up focus group, participants described lasting feelings of work-related

confidence, optimism, and even ambition. For example, despite reporting "hearing bad stories" about employment outcomes among their peers with autism, ASSET participants expressed long-term confidence not just in their ability to better assess social situations but, most notably, in their ability to "succeed in the real world."

Anxiety. On average, ASSET participants began the program with self-reported, clinically moderate levels of anxiety as measured by the GAD-7, and experienced steady declines in self-reported symptoms at both post and follow-up. These effects were medium to large (d = -0.6) at follow-up, while small (d = -0.3) and statistically non-significant at post. The lack of statistical significance at post may have been due to high variance. Furthermore, the final model indicated that the average decrease in anxiety from baseline to follow-up was not only statistically significant, but also clinically significant, as scores fell from the clinically moderate to mild range.

In sum, these results partially support hypothesis three. Compared to baseline (T1), on average, students with HFASD who completed the ASSET program showed clinically medium to large, but statistically nonsignificant, improvements in *anxiety* (a) immediately post intervention (T2), and (b) statistically significant yet clinically small improvements at two-month follow-up (T3). In addition, this trend of decreasing anxiety over time is supported by the qualitative, 1-2-year follow-up focus group results, in which all but one anecdote related to anxiety was categorized as normal, situational anxiety that did not interfere with work or social functioning (Simpson, 2010).

Depression. Estimated marginal means at baseline, post, and follow-up revealed a trend of steady and growing declines in mean *depression* scores over time. While these changes were not statistically significant, they are descriptive of group mean change over time. Specifically, as

measured by multiple dependent *t*-tests, group mean *depression* scores declined, on average, 0.05 points between baseline and post, and 0.09 points between baseline and follow-up. While not statistically significant, these changes represent a small to medium effect size at post (d = -0.4), and a medium to large effect size at follow-up (d = -0.7).

In sum, these results, while promising, do not support hypothesis three. Compared to baseline (T1), students with HFASD who completed the ASSET program showed medium-sized but statistically nonsignificant improvements in *depression* (a) immediately post intervention (T2), and (b) and large but statistically nonsignificant gains at two-month follow-up (T3).

Psychological wellness implications. Baseline levels of both anxiety and depression were striking in our sample of young adults with HFASD. Yet, improvements, particularly in anxiety, were also notable. While at least 75% of all anxiety scores were clinically significant at baseline, at least 75% dropped *below* the level of clinical significance by follow-up. Although these steady and meaningful declines in anxiety among our participants show the promise of group based social skills interventions in improving psychological wellness, the high baseline anxiety scores also mirror and highlight the prevalence and intensity of anxiety in this population. The literature estimates that nearly half of all young people with ASD struggle with anxiety and depression (White & Roberson-Nay, 2009), and our sample exceeds these findings. Across three observations between baseline and follow-up, on average, 54% of participants selfreported clinically significant anxiety on the GAD-7, and 100% self-reported clinically significant depression as measured by the PHQ-9. Strikingly, on average, participants' depressive symptoms were reported to be moderately severe before the start of the intervention. However, there was also large variation in scores, ranging from mild to severe, among this group of young adults. Moreover, improvements in depression, though statistically nonsignificant

showed a large (d = -0.7) effect size at follow-up. Given this large effective size, the multiple testing correction imposed on the *t* tests, and the fact that multilevel modeling was not possible, it is speculated that additional within-participant data (reassessment at time four, five, etc.) may have provided additional power to detect significant change, particularly in light of the fact that the qualitative analysis did not identify any statements indicative of depressive symptoms.

While the quantitative improvements cannot be extrapolated to be long-term trends, the qualitative data does suggest continued improvement in psychological wellness, at least among the focus group participants. Notably, only one instance of debilitating anxiety was recounted at the focus group, and none of the participants described feelings of depression, even when probed. However, these results should be interpreted with caution. In addition to a myriad of potential confounders, the possibility of self-selection attrition (Shadish, Cook, & Campbell, 2002) should not be overlooked in the 1-2-year post-intervention focus group. Not only was the focus group months to years after the ASSET intervention had ended, it was also a research-only activity with no intervention component. Therefore, the individuals who did choose to take part in the focus group may have been internally motivated individuals. Moreover, as both anxiety and depression have a negative impact on social and vocational engagement in this population, particularly during adolescent transition (Anderson et al., 2014; Shattuck et al., 2012), it seems unlikely that individuals experiencing significant symptoms of depression and/or anxiety would self-select to participate in this optional activity. Thus, transferability of these qualitative findings to the larger HFASD population should be done cautiously, particularly when considering the alarmingly high rates of suicidal ideation and intentionality in this population (Cassidy et al., 2014; Raja, Beidel, & Murray, 2008).

Relationship between self-efficacy and psychological wellness. While the inverse

relationship between anxiety/depression and self-efficacy has been well documented in the literature (Tahmassian & Jalali Moghadam, 2011), no significant correlations were identified within our sample. The only statistically significant correlation identified was that between anxiety and depression, which, not surprisingly, showed a large, positive relationship. It was speculated that this anomaly may be due to the fact that both anxiety and depression steadily declined, while both social and empathic self-efficacy increased sharply at post and then declined approximately to baseline at follow-up. In conclusion, a larger sample or more within-participant observations over time may be needed to detect significant correlations between self-efficacy and psychological wellness.

In sum, hypothesis four was not supported. While *self-efficacy* did exhibit a negative relationship with *anxiety/depression*, this relationship was weak and statistically nonsignificant.

Self-perceived, long-term psychosocial functioning and outcome expectations.

ASSET was associated with improvements in self-perceived psychosocial functioning as evidenced by alignment of the trends in social and psychological outcome measures with qualitative statements. However, hypothesis five can only be described as *conditionally* supported based on convergence of the quantitative and qualitative results. This conclusion is conditional because higher SES participants exhibited relatively greater gains in social function, as measured by the SRS, and were able to share examples of successful application of learned skills to work settings, whereas lower SES participants reported, not just their successes, but also some social difficulties in their workplaces. Lastly, all focus group participants reported bolstered career expectations and various degrees of development in career and independent living goals one-two years after completing ASSET. However, it should be assumed that not only ASSET, but also other learning experiences and social supports, while not social skills training per se, likely had an influence on focus group participants' self-perceived, long-term psychosocial functioning and outcome expectations.

Psychosocial implications. According to SCCT, efficacy can influence one's career thinking, behaving, and feeling, and even shape outcome expectations (Lent et al., 1996). While quantitative measures of career outcome expectations were not used in this study, focus group questions were used to target this construct. In response, 1-2-year follow-up focus group participants from both higher and lower SES groups expressed expectations to achieve fulfilling work and independent living. Furthermore, most noted that their career expectations shifted to become "higher," yet more "specific," "realistic" and achievable after the interventions. Although their expectations were high, some participants also described potential barriers to successful career engagement. These barriers included poorly developed independent living skills (e.g., learning to perform self-care tasks without prompting or monitoring), fear of driving, and dependence on family for transportation despite having working knowledge of the public transit system. Overall, participants expressed optimism about their future prospects, and pride in their accomplishments. However, these results, particularly the focus group findings, must be interpreted with great caution. While focus group participants indicated that they had not participated in any additional social skills training since completing ASSET, their reported changes could be the result of any number of confounding factors, including but not limited to maturation, mentoring, or other treatments.

Integration of Findings with the Literature

In comparison to other social skills training programs designed for adolescents and young adults with HFASD, ASSET has both parallel and distinguishing features. Four comparable studies, based on manualized social skills interventions of varying emphases, approaches, and

durations are discussed here in order to illustrate ways in which ASSET converges, diverges, and adds to the extent literature.

Three of these programs had similar sample sizes consisting of 13-17 participants, 2-5 of which were female (Gantman et al, 2011; Herbrecht et al., 2009; Hillier et al., 2007). Only one program, studied by Hillier and colleagues in 2011, had a substantially larger sample (n = 42) with multiple interventions occurring across sites. While comparison of this manualized intervention across sites may have provided useful results, such comparisons are rarely performed in autism research (White et al., 2007). Based on the scarcity of such examinations of manualized interventions, this seems to be a logical next step for the ASSET program. With the exception of Gantman and colleagues (2011) who used a randomized controlled trial, the other studies, like ASSET, were quasi-experimental in design. In comparing methodology, ASSET is the only study that reports use of linear mixed-effects modeling to account for unbalanced data, although missing data is specifically noted as a problem by Hillier et al. (2011), and Herbrecht et al. (2009).

A decade ago, White and colleagues (2007) observed that many autism intervention studies did not report effect sizes or data, such as standard deviations and change scores, that could be used to calculate effect sizes. Without such metrics, meaningful comparison of the intervention literature is unlikely. Thankfully, two of the four studies offered as comparisons to ASSET did include sample size calculations and are detailed below. As calculated using Cohen's *d*, ASSET is associated with: (1) small to medium effects on social cognition at post, (2) small to medium effects on social communication at follow-up among higher SES participants, (3) very large effects on self-efficacy at post, and (4) medium to large effects on anxiety at follow-up. In comparison, Herbrecht and colleagues found large effects (η^2) in the areas of

social and adaptive competence, social behavior, and peer interaction. However, it should be noted that seven of this study's 17 participants received the same training two years prior. In considering the implications of these findings, it would be interesting to know if there was any significant dosage effect from repeating the intervention. Again, this may point to an area for future study with ASSET. Such dosage effects may be particularly relevant to the lower SES subset of the ASSET group, as their improvements in social functioning only approached significance.

Hillier and colleagues (2011) also reported effect sizes (*d*), and found small, positive effects on both anxiety and depression. Given that their intervention was delivered in one-hour sessions over eight weeks, comparable to ASSET's eight-week/1.5-hour format, it is noteworthy that ASSET resulted in larger effect sizes for both anxiety. Therefore, it is speculated that the increased duration of the individual sessions potentially contributed to the increased effect sizes. This comparison is particularly relevant to Hillier et al. (2011) as their study is the only other intervention besides ASSET to target vocational social skills, in part, *and* measure both anxiety and depression. It is also noteworthy that they delivered content using a format described by McMahon and colleagues (2013) as a social skills support group. In contrast, ASSET, as well as Herbrecht and colleagues (2009) and Gantman and colleagues (2011), followed a structured learning approach, which incorporates didactic learning in conjunction with peer and facilitator feedback (McMahon, Lerner, & Britton, 2013).

Given the relatively small samples and reliance on general linear modeling in most comparable studies, the use of covariates and control variables is also limited. In fact, McMahon and colleagues (2013) observed that the current social skills literature has only just begun to assess moderation and mediation of outcomes. Herbrecht and colleagues (2009) conducted the

only other comparable study, besides ASSET, to consider demographic covariates as potential confounders. Specifically, they examined IQ and medication. Noting their observation that more complex social skills development, as is the case in vocational contexts, is dependent upon higher cognitive and verbal capacities, future examination of the ASSET datasets should control for IQ. While our initial assumption was that limiting eligibility to high functioning individuals would control the influence of cognitive variability, our quantitative findings and qualitative observations indicate that even among this circumscribe group, there is tremendous variability in social, adaptive, and emotional function. Furthermore, while psychiatric comorbidity was ruled out as a potential covariate in ASSET, Herbrecht and colleagues (2009, p. 334) found "some hints" that participants who were medicated had better results. Again, this may indicate another area for future consideration.

Additionally, some autism researchers, including Herbrecht et al. (2009) have used alpha levels of .10 to compensate for issues like attrition, data loss, and difficulty recruiting adequate sample sizes with this population. It should be noted that had we set alpha at .10, *social cognition, social communication,* and *social self-efficacy* would have reached levels of statistical significance at follow-up for both lower and higher SES groups; similarly, *anxiety,* would have yielded statistically significant results at post, not just at follow-up. However, introducing the possibility that our conclusions could be wrong in up to one out of ten occasions was not considered to be conservative enough to assess ASSET as a potential evidence-based practice. Further, results of our previous pilot study (Sung, Connor, Chen, Lin, Kuo, & Chun, 2017), suggested that the use of additional within-participant observations (T3) could be used to explore changes in not only self-efficacy and social functioning over time, but also psychological constructs, such as anxiety and depression, which are highly comorbid with autism. Thus, the

current study expanded the sample size, collected follow-up quantitative data at T3, and incorporated a 1-2-year follow-up focus group to better understand long-term impacts of the program. In sum, the pilot study not only established preliminary efficacy, but also verified that the program is acceptable to participants, and feasible for an array of professionals who can potentially facilitate and deliver the ASSET intervention within community contexts.

In terms of data collection, both the ASSET pilot and the current ASSET study are the only comparable studies that used mixed methods designs to better incorporate participant perspectives. In the pilot study, qualitative data was elicited to inform the iterative, developmental design of the curriculum, assess participant satisfaction, and probe facilitator's experiences in order to assess feasibility of the program. In the current ASSET study, qualitative data were instrumental in confirming and expanding the quantitative results, and providing a longer-term (1-2 years post program completion) perspective on changes in psychosocial status, career outcome expectations, and functional independence among focus group participants. Given some of the measurement challenges with this population, as noted in the limitations section, other studies have used trained observers to document participant change (e.g., Hillier et al., 2007). As video data was collected throughout the cohort two and three ASSET interventions, such observational coding and measurement of participant behavior is a future consideration.

Other features that make the ASSET intervention and this study unique include the examination of individual level factors, such as socioeconomic status and psychiatric comorbidity, which provide another level of specification in matching the intervention to the needs of individuals. McMahon and colleagues (2013) offer an extensive list of other potential mediators or moderators, including symptom severity and group cohesiveness, that could be

examined to further specify: "What treatment, by whom, is most effective for this individual with that specific problem, and under which set of circumstances?" (Paul, 1976).

In addition to being theoretically derived and tailored to the population, ASSET is one of few studies in ASD social skills research to take a long view on impacts. Similarly, Herbrecht and colleagues (2009) measured quantitative changes in their participants across four time points. Yet, beginning with the pilot study, ASSET has been both quantitatively and qualitatively examined for appropriateness to the population, acceptability, and feasibility, not just through solicitation of participant feedback, but also through focus group and survey data collected from parents and group facilitators (Sung et al., 2017). Finally, the use of 2-month follow-up measures and interviews, and a 1-2-year participant follow-up focus group helped in identifying lasting, transferrable effects. As noted by McMahon and colleagues (2013), effects that do not last might not be interpretable as meaningful.

Finally, and most notably, ASSET and the intervention examined by Hillier et al., (2011) are the only two social skills programs, to date, to address both vocational and psychological functioning among adults with ASD. As noted by Hillier et al. (2011), the established relationships between anxiety, depression, and social functioning makes social skills interventions a logical choice for not only providing skills training, but also addressing psychological wellness. It is noteworthy, that the intervention designed by Hillier and colleagues (2011) specifically targeted anxiety and depression. In contrast, the ASSET intervention targets soft skill development exclusively. In light of the fact that ASSET is associated with significant improvements in anxiety and promising trends in depression, while primarily targeting social skills development, our results support previous findings that show an association between social functioning and psychological wellness.

Previous research has described an inverse relationship between cognition and selfassessed social competence. Furthermore, individuals with relatively high IQs, but potentially low self-perceived social competence may, subsequently, experience elevated levels of depression (Vickerstaff et al., 2007). This trend did not appear to play out in our data. While, on average, our participants made gains in social cognition, and potentially the self-awareness that comes with knowledge, they also concurrently made small and steady, while statistically nonsignificant, improvements in depression. While Vickerstaff and colleagues (2007) note a general association between low social appraisal/high IQ and depression among individuals with HFASD, it is speculated that ASSET may have offered some protection from negative selfappraisal as participants were able to examine their social strengths and needs within the safe and supportive milieu of the group.

Theoretical alignment. The results of this study largely support the tenets of SCCT (Lent & Brown, 1996) and mostly align with the theoretical framework laid out in chapter two. Our results indicate that autism-related characteristics (SCCT personal inputs), including impaired social cognition and social communication, in conjunction with contextual affordances (socioeconomic status), contributed to both the learning needs and responses to training among ASSET participants. Further, this learning experience was associated with large and positive changes in social and empathic self-efficacy which, in turn, were reflected in participants' statements regarding augmented career ambition, optimism, and realism (outcome expectations). In alignment with the framework, three constructs (the ASSET intervention, bolstered self-efficacy, and outcome expectations) can be described as primary drivers of the measurable improvements made in social functioning and psychological wellness among ASSET

participants. In fact, both social and empathic self-efficacy showed very large and positive¹ correlations with social functioning. Future study using mediation analysis to confirm this relationship in the HFASD population is warranted.

Limitations

While the results of this study contribute to our understanding about the vocational and psychosocial needs of young adults with HFASD, generalization to the larger population should be applied cautiously. This section details some of the limitations of this study.

Threats to external validity. Given the quasi-experimental nature of the study and limited sample size, several limitations should be considered before making any interpretations. First, the study design lacks random assignment and, therefore, the potential effects of treatment expectancy cannot be controlled. However, the community versus clinic-based delivery of the intervention may lessen treatment expectancy, as non-clinical settings are traditionally not associated with treatment. Second, change was assessed in one group over time and, therefore, causality cannot be determined between independent and dependent variables. Third, the generalizability of the findings is limited by the use of a non-random convenience sample. Finally, as noted earlier, the possibility of self-selection attrition cannot be overlooked when interpreting the qualitative data, as not only did these individuals complete the eight-week observation, but they were also motivated to return 1-2 years post. Thankfully, overall attrition was very low (1/18). However, the potential for self-selection bias is inherent to the voluntary nature of participation. Furthermore, our study was limited to three observations over time; additional observations would have allowed for growth curve analysis, giving a more robust description of any possible trends. Moreover, sample size, use of statistically conservative

¹ Table 4.3 lists negative numbers in the correlations between social cognition, social communication, and empathic and social self-efficacy. This is due to the scaling of the SRS, for which decreases in scoring reflect improved social function.

modeling, and instrument sensitivity may have limited our ability to detect a statistically significant improvement. Finally, the qualitative data collected through focus group methodology did not reach saturation, as recommended by Carlsen and Glenton (2011) but, rather, was practically limited by time and recruitment constraints to one group of two high-school-enrolled participants, and one group of three college-enrolled participants. Thus, the application of these results to populations other than young adults with HFASD or use of the intervention outside of group-based, community contexts should be considered cautiously.

Measurement biases. The use of self-report measures introduces a threat to internal validity, as the data is susceptible to self-report error and bias (Remler & Van Ryzin, 2011). All measures used in this study were based on perception; these perceptions may have been influenced by a variety of factors including but not limited to mood, fatigue, and motivation to report accurately. Furthermore, independent behavioral observations were not used to confirm or refute results of these measures, and evaluators were not blinded, i.e., they were part of the team conducting the intervention. Perhaps, most importantly, several authors have expressed concerns regarding the accuracy with which individuals with autism are able to introspect their mental states and emotions (Baron-Cohen, 1997; Kleinhans et al., 2011) in completing self-assessments. Much like Hillier and colleagues (2011), and as visually depicted in the chapter four boxplots, our sample showed tremendous variability in responses to the SRS, PESE, PSSE, GAD-7, and PHQ-9, which resulted in high standard deviations, and intraclass correlation coefficients. The use of LMM in our study was one way to help account for some of this individual level variance and, thereby, minimize Type II error. For example, the use of LMM enabled us to detect significant changes in *social communication* that were not detected using dependent samples t tests.

While using data from multiple raters could have offered corroboration of the reliability of participant report measures, this was not possible in the current study. Unfortunately, independent rater reliability could not be established as there were no significant correlations between teacher, parent, and self-report on the SRS. Due to this predicament, and the fact that for some observations, data was not collected by all three stakeholders, there was no effective way to determine which rater had the highest reliability. Thus, an average of all available ratings for each participant at each observation was used.

It was further noted that, despite having confirmed ASD diagnoses, at least 75% of the low SES group and 100% of the high SES group started ASSET with SRS *social communication* scores already within normal limits. This discrepancy may indicate an initial lack of insight into social communication abilities before the intervention. In addition, this trend may suggest that the SRS, while sensitive to change in young children with ASD, may not be as suited to capturing the more nuanced developmental changes that occur in adults. Moreover, the SRS may lack sensitivity in detecting change in the high functioning population, in which individuals, especially adults, may be more likely to test within normal limits.

In addition, this study was limited by lack of parsimonious measures of social functioning. While both the *social cognitive* and *social communication* subscales of the SRS showed utility in highlighting change over time, the SRS was designed for diagnostic confirmation rather than assessment of social skills growth. Moreover, the use of two subscales as opposed to one comprehensive assessment of social functioning, introduced the potential for increased Type I error in this study. Therefore, future studies would benefit from a dedicated measure not just of social function, but of *work-related* social skills in adult populations.

Threats to internal validity. In addition to the threats to external validity inherent to the

study design and sampling, the following concerns were noted regarding internal validity. First, the researcher and author of this thesis was also a group facilitator, curriculum developer, and funded program manager for the intervention and, consequently, may have inadvertently exhibited researcher bias. This threat was addressed through team collaboration, faculty supervision, and cross checking of the data collection, structuring, and analyses. In addition, consultation from the Michigan State University, Center for Statistical Training and Consulting was sought in order to ensure validity and appropriateness of all quantitative analyses. Furthermore, there have been a total of four facilitators involved in the intervention, thus creating a threat to internal validity and fidelity. However, the use of manualized lesson plans, in-session observation by faculty and research assistants, and weekly team debriefing meetings minimized these threats. Fidelity of treatment can be further enhanced and more systematically addressed in future studies through use of fidelity checklists completed by independent raters. Lastly, each cohort consisted of a college and high school group that each met the eligibility criteria but did have some difficult to measure, qualitative differences, such as level of career aspiration and family support for postsecondary education and employment. However, this threat appears to have been mitigated through examination of SES, which significantly correlated with the study's social constructs and showed commonalities across the college and high school groups.

Implications for Practice

Group-based interventions show promise in reducing service costs and caseload demands, while capitalizing on the power of peer interaction, group process, and the creation of safe therapeutic spaces in which skills generalization can begin (Gantman et al., 2011). Moreover, community-based interventions can lessen practical constraints, such as lack of transportation or lack of awareness of services, which can be barriers to seeking vocational

rehabilitation. Given the interdisciplinary, iterative, developmental design of the ASSET curriculum, in conjunction with the manual and associated training materials, ASSET is amenable to delivery by numerous professions, including counseling, occupational therapy, social work, and special education. Furthermore, ASSET requires minimal infrastructure (group seating, computer, projector, binders, printed materials, and video recording from mobile phones or stand-alone cameras), making it suited to any geographic location.

With training tailored to the HFASD population through use of visual supports, video modelling and feedback, and reduction of extraneous sensory stimuli (Wong et al., 2014), ASSET mitigates the lack of access to quality community-based rehabilitation by bringing vocational rehabilitation strategies to community settings. As ASSET addresses vocational readiness and is associated with gains in social functioning, self-efficacy, and psychological wellness, it can potentially help to fulfill federal mandates, such as WIOA (2014). Furthermore, the group interaction provides opportunities for vicarious learning (Bandura, 1986) through modeling (both live and video modeling) of positive social behaviors by peers and guest experts, and participation in group activities that reinforce learning and promote increased self-efficacy.

Moreover, the group experience offers individuals with HFASD not only the opportunity to practice social skills, but to experience the sense of belongingness that comes from being part of a group with shared experiences. Hiller and colleagues (2011) speculated that this opportunity to develop relationships with other young adults with HFASD partially contributed to their samples' significantly improved anxiety and depression. Our results further suggest that groupbased social skills training is associated with more than just skills acquisition. For instance, although ASSET was not designed to address psychological wellness, on average, ASSET participants experienced significant reduction in anxiety and an overall trend of lessening
depression. Therefore, practitioners working with this population should not overlook the secondary psychological wellness benefits associated with the ASSET social skills training program. Furthermore, as demonstrated by our sample, practitioners should be cautious not to screen out potential participants from skills training due to clinical levels of anxiety and/or depression. Thus, in addition to more targeted mental health approaches, social skills training should be considered an integral part of promoting, maintaining, and improving psychological wellness for young adults with HFASD.

Furthermore, the symptoms of both anxiety and depression may not present as they do in the general population, as they can be masked by ASD characteristics including flat affect and social withdrawal (Hillier et al., 2011). Not only might this partially explain our surprise in seeing how high our participants scored on measures of anxiety and depression, but it also implies that practitioners must be careful to not overlook clinical signs and symptoms by assuming them to be typical ASD behaviors or mannerisms. In conclusion, there is still much to learn about depression and psychological wellness among individuals with ASD (Hedley & Young, 2006). Our results underscore the prevalence and magnitude of these issues, as well as the potential to utilize group interventions to partially address psychological wellness through community-based, group interventions in addition to the more traditional, individual, clinical and/or pharmaceutical approaches.

In addition to being developed based on the unique needs of young adults with HFASD, ASSET is framed by theory. The development of the ASSET curriculum was guided by SCCT, thereby creating a common theoretical language through which practitioners can examine why, how, with whom, and when to implement the program. Furthermore, SCCT constructs have been previously validated as effective approaches to bolstering career-related self-efficacy

among other young adult populations, including college students with disabilities (Corrigan et al., 2001). In addition to the SCCT framework, the results of the current study, as well as the pilot efficacy and feasibility study (Sung et al., 2017), can be used to guide practitioners in assessing the suitability of ASSET in the service of their clients with HFASD. In sum, ASSET provides practitioners with a level-three (Chan et al., 2009) evidence-based, and manualized approach to fostering vocational social skills development and psychological wellness among young adult clients with HFASD. Recognizing that social dysfunction is a core feature of autism (APA, 2013), and the fact that, on average, one out of every two individuals with HFASD has comorbid anxiety and/or depression (White & Roberson-Nay., 2009), ethical practice demands that we use empirically validated interventions with this vulnerable population.

In addition to being HFASD specific and theoretically guided, ASSET is manualized. The ASSET curriculum was developed through a 3-year, iterative, developmental process that included an interdisciplinary team of researchers, educators, and research assistants. This process helped to ensure rigor and the development of an end product (including manual, handouts, and PowerPoints) that is practical and user friendly. Manualization is a step rarely achieved in the development of social skills interventions (White et al., 2007), understandably so given the tremendous time, staff commitment, and expertise needed to effectively build a useful manual. However, the provision of a validated manual provides reassurance to practitioners that the program can be delivered with ease and consistency. Furthermore, manualization not only aids the user in delivery of the intervention, but also aids researchers by providing additional assurance that the program is delivered with fidelity. These steps all contribute to ensuring that the program is safe and effective. Notably, our results show that, despite having multiple group facilitators, ASSET was still associated with significant improvements across two cohorts and

four groups of participants.

In summary, this study and the previous feasibility study (Sung et al., 2017) offer practitioners evidence that the ASSET intervention is: (1) suited to young adults with HFASD, (2) acceptable to this population, (3) designed for ease of delivery, and (4) associated with significant, consistent, and positive effects on social cognition, social and empathic self-efficacy, and anxiety.

Implications for Research

While many of our findings aligned with previous research, some results were unexpected. Although the literature has long described self-efficacy and anxiety as negatively correlated (Bandura, 1988), our results failed to show a statistically significant relationship between self-efficacy and psychological wellness (Table 4.3). The direction of the relationships was mostly negative (PESE and depression showed a very small positive, nonsignificant correlation), but the correlations failed to reach levels of significance. It is speculated that this may be due to lack of adequate power to detect change. However, future work will be required to confirm the influence of self-efficacy on psychological wellness among young adults with HFASD, and to explore whether anxiety and depression differ in their relationships to selfefficacy.

Another striking finding was the unexpectedly high social functioning scores indicated by the SRS. Based on clinical and qualitative observations, it seems unlikely that a majority of our sample, despite confirmed diagnosis of autistic disorder, had SRS *social cognitive* and *social communication* scores within normal limits. This conclusion aligns with those drawn by McMahon and colleagues (2013) in a systematic review of the group social skills literature. Specifically, these authors noted that this instrument's lack of design to evaluate efficacy of

intervention, along with the tendency of self and other reporters to inflate scores at baseline, can lead to spurious results. Moreover, they cautioned that achieving accurate baseline scores is difficult in general due to a lack of clinician/researcher familiarity of normal baseline behavior for each individual and the fact that participants may exhibit inhibited/atypical behavior patterns as they "acclimate to the intervention setting" (p. 33). Furthermore, we failed to find any significant correlation between self-reported social functioning and teacher and/or parent report. This finding aligns with other studies identified through systematic review of the literature (McMahon et al., 2013). Thus, both our experience and that of others in this field indicate that age-normed, population specific, social skills instruments designed to capture therapeutic change, as opposed to developmental patterns or diagnostic criteria, are needed.

Not only was it difficult to measure social functioning in the current study, but we also struggled to find an appropriate means of assessing *work-related* social self-efficacy. As a result, we combined *social* and *empathic* measures to approximate a measure of participant confidence in the ability to exercise theory of mind in understanding the feelings of coworkers and to be both sensitive and responsive to their emotional states (empathic), while also being able to express opinions, share personal experiences, work cooperatively, and manage interpersonal conflict in the workplace (social). However, neither measure is specifically work-related. Moreover, SCCT posits that self-efficacy is domain specific. Therefore, a more targeted measure of work-related social self-efficacy needed. This is not only an area for future research but also a limitation in our study.

Finally, the note of caution mentioned above regarding the atypical expression of mood and anxiety disorders in this population is relevant not just to practitioners, but to families, educators, and researchers. Based on the results of the current ASSET study, it is recommended

that future intervention studies outline procedures for addressing clinically significant assessment results even when behavioral observations do not seem aligned.

Future directions. While the group process effect cannot be controlled in this ex post facto analysis of the existing database, this study opens a future line of inquiry into the potential effects of augmenting traditional learning interventions with group methods derived from the counseling, psychology, and therapy literature. For example, closer comparisons of social skills *support groups*, such as those examined by Hillier and colleagues (2007; 2011) with structured learning interventions, such as ASSET and the PEERS program (Laugeson et al., 2012), could help tease out how much of the treatment effect is due to group process versus skills training.

In addition to better understand the clinical aspects of social skills interventions, continued research on manualized social skills curricula for schools is needed (White, Scahill et al., 2007), particularly for students with ASD who benefit from high frequency and intensity of intervention, along with opportunities for practice within natural contexts in order to generalize social skill performance (Lopata et al., 2013; Toomey, Lopata, Volker, & Thomeer, 2009). Such "dosage" effects and opportunities for generalization are not possible in clinical settings. Based on our results, particularly in the area of psychological wellness, the small but steady improvements observed in anxiety and depression over time are hypothesized to show larger effects if participants are exposed to greater frequency and duration of the group intervention, and they have increased opportunities to practice emerging social skills in a supported environment. Increasing the frequency and duration of the intervention is not sustainable in clinical environments, therefore future studies guided by implementation science (Locke et al., 2016) are needed to determine the most efficient and effective ways of inserting vocational social skills training and psychosocial supports into environments where young adults with HFASD spend much of their time. Clearly, this includes high schools, community colleges, and four-year institutions.

Research will also be necessary in order to develop measures of soft skills functioning and self-efficacy that stand alone and capture changes in work-related social function, as opposed to using multiple subscales of primarily diagnostic instruments. Development of such tools will not only make the assessment process less laborious for participants and researchers, but will reduce the additional Type I error introduced when testing multiple subscales. While it must be acknowledged that the use of blinded observers is superior to rating instruments both in terms of specificity and bias reduction, the costs, in terms of time, training, and supervision, are great. Therefore, our use of video data collection should be further explored as a potentially more efficient approach to observational rating.

In addition to more sensitive and targeted measures, future studies are needed to further validate SCCT as a theory with utility in guiding vocational social skills interventions and research. While our study adds to the SCCT literature on the impacts of learning (ASSET) on self-efficacy, career outcome expectations, and social functioning and psychological wellness, future work using larger sample sizes and mediation analysis can help to confirm if self-efficacy, as opposed to outcome expectations, accounts for most of the influence on psychological wellness and social functioning. Understanding the primary drivers of these outcomes can help to guide refinement of existing interventions and development of new ones.

Additionally, further examination of moderators and other potential mediators can shed more light on subgroups for which ASSET is most efficacious. Specifically, future research with stratified random assignment to treatment (Wang & Ware, 2013) is needed to ascertain if SES is a true moderator of social functioning among ASSET participants and within the HFASD

population. Moreover, Wang & Ware (2013) suggest that follow-up studies should include "stratified randomization of treatment assignments to ensure sufficient representation in the subgroups of interest so that the study has adequate power to detect the moderation effect" (p. 112). Also, larger samples would allow for the examination of self-efficacy as a potential mediator of the relationship between social skills training and psychological wellness.

Finally, some broad thoughts regarding the research horizon are offered. As the ASSET pilot phase and manual development is complete, next steps should include multi-site testing of the manualized intervention to ensure that it can be delivered with fidelity by a variety of professionals, such as occupational therapists, vocational rehabilitation counselors, psychologists, social workers, and school counselors in a variety of academic, community, and clinical settings. White and colleagues (2007) lament that this step is often overlooked in autism research, and they go on to stress that multi-site testing can greatly increase confidence in reporting efficacy as opposed to mere associations. Ideally, multi-site testing should be implemented using random assignment and control if causal inferences are to be made (White et al, 2009).

Finally, there is much known about barriers to employment for this population, yet there is little known about factors that facilitate not just job acquisition, but long-term and meaningful career fulfillment (Lee & Carter, 2012). Accordingly, expansion of the ASSET database, not necessarily by increasing sample size, but perhaps by increasing within-participant observations over time, could both increase statistical power to detect significant change and facilitate a longer view of what psychosocial challenges and successes occur over the long-term amongst these young adults.

Conclusion

The quantitative results of this mixed methods, quasi-experimental, single group, staggered enrollment, repeated measures study support an empirical association between the ASSET intervention and statistically significant, clinically relevant improvements in social cognition, social communication, empathic self-efficacy, social self-efficacy, and anxiety among young adults, ages 18-24 years, with autism and average to above-average intelligence. Moreover, although statistically significant changes in depression were not measured in this small sample (n = 17), ASSET was associated with steady and growing improvements in selfreported depression up to two months after the intervention was completed.

Furthermore, results of the qualitative analysis suggest varying degrees of social skills generalization in employment, social, and family contexts up to two years after completing the program. Specifically, greater transferability of social skills to successful employment experiences was reported from participants with higher socioeconomic backgrounds; however, all participants described optimistic, realistic, and positive career expectations and bolstered confidence in workplace interactions. In addition, few reports of work-related anxiety were described by participants, and those that were reported could be characterized as normal, situational reactions to stressful situations. Finally, while no depressive symptoms were shared in the 1-2-year follow-up focus group, this result should be interpreted with caution due to the high incidence of depression in the population, and the potential masking of symptoms by characteristics associated with autism.

In sum, this study provides empirical support that ASSET can: (1) partially meet the need for manualized, evidence-based strategies to address work-related social skill development among adults with HFASD, (2) help young adults with HFASD capitalize on the iterative power

of bolstered self-efficacy and optimistic career expectations when facing the social challenges inherent to HFASD, (3) mitigate barriers to delivering such services by making them community-based and interdisciplinary, and (4) provide an innovative and efficient mechanism for addressing psychological wellness while targeting transferable skills.

Knowing that comprehensive, theory-based interventions are needed in post-secondary transition service delivery (Murray & Doren, 2016), ASSET has been designed to help address the federal mandate for improved transition outcomes for youth with disabilities (WIOA, 2014) more seamlessly than traditional VR approaches by bringing the intervention to the community rather than bringing the clients to the office. ASSET achieves this by using an innovative, interdisciplinary, group-format service delivery model in traditional educational or community settings. Building on a three-year, iterative, developmental curriculum design, and the results of a pilot and feasibility study, this in-depth examination of the psychosocial implications of ASSET provides empirical evidence that carefully designed and administered, group-based vocational rehabilitation interventions go beyond teaching "skills to pay the bills," and offer participants opportunities to increase psychological wellness, refine career outcome expectations, and engage with their families and communities during the critical period surrounding post-secondary transition.

APPENDICES

APPENDIX A

Consent Form

Michigan State University

Participant Information and Consent Form

You are cordially invited to participate in a research-based skill training project. Researchers are required to provide a consent form to inform you about this project, to convey that your participation is voluntary, to explain risks and benefits of participation, and to empower you to make an informed decision. You should feel free to ask the researchers any questions you may have.

PROJECT TITLE: Job-related Social Skills Training Group for Improving Employment Outcome of Youth with Autism

RESEARCHER: Connie Sung, Ph.D., CRC, Assistant Professor of Rehabilitation Counseling

PROJECT FACILITATOR: June Chen, Ph.D., Research Associate Annemarie Connor, M.S., Research Assistant

DEPARTMENT AND INSTITUTION: Office of Rehabilitation and Disability Studies, MSU

<u>1. PURPOSE OF PROJECT</u>

The proposed project aims to adapt, further develop, and validate the effectiveness of an eight-week job-related social skills training group for transition-aged individuals with autism spectrum disorder (ASD), namely **ASSET** (**Assistive Social Skills and Employment Training**). In this project, researcher will examine the feasibility and applicability of the ASSET program among youth/young adults with ASD; evaluate the effectiveness of the ASSET program on individual's social and empathic skills, self-efficacy, as well as work-related social behaviors.

2. WHAT YOU WILL DO

If you decide to participate in this project, you will be invited to attend 11 individual and/or group sessions. Each session will be around 1.5 hours in length.

First (1st session), you will attend an initial screening interview session, during which, you will be asked to complete an assessment and individual interview about your job-related ability, experiences and career goals. You will then be asked to fill out a set of questionnaires at home prior to the beginning of the ASSET program.

Second (2nd – 9th session), if you are determined to be eligible for the ASSET program, you will be invited to attend eight weekly 1.5-hour intervention sessions, start from October 3rd, 2014 to November 21st, 2014. Each session will cover a topic of job-related social skills and corresponded activities.

Third (10th session), you will attend an exit interview session, during which, you will be interviewed about your intervention experience with the ASSET program and you will be asked

to fill out another set of questionnaires.

Finally (11th session), you will attend a follow-up interview session two months after completing the ASSET program and you will be asked to fill out the last set of questionnaires.

<u>3. POTENTIAL BENEFITS</u>

As a participant, you will receive the ASSET training program for free, which is a specifically designed intervention program for youth/young adults to improve their job-related social skills. Upon participation, we anticipate you will benefit in following areas: interpersonal social skills in workplace, job-related management skills, teamwork skills, employment-related communication skills, and problem solving skills.

Further, your participation may also contribute to the further development of the ASSET program. Results and products of this project can potentially be used for job-related social skills training for other youth/young adults with ASD to improve their employment outcomes.

4. POTENTIAL RISKS

There are no foreseeable risks associated with participation in this study except that you may experience anxious feelings about being in a new environment, meeting new people and doing activities with them. You are encouraged to speak with the researcher and discuss any issues related to study participation. Trained researchers will take multiple precautions to prevent unnecessary anxiety and/or work with you throughout the process to reduce your anxiety level.

5. PRIVACY AND CONFIDENTIALITY

All information gathered in this study will be used only for research purposes and be accessible only by the research personnel affiliated with this project. All data for this project will be kept strictly confidential. No names or identifiers will be revealed for non-research purposes. The results of this study may be published or presented at professional meetings, but the identities of all participants will remain confidential. All research materials will be treated confidentially and will be stored in a locked file cabinet and/or password protected computer.

The project involves group activities and discussion. The privacy of your personal information will be kept strictly confidential during these sessions. All the participants in the group will be asked to keep everything to be discussed in the group private, but this cannot be guaranteed. In any event, the researchers will take multiple precautions to protect the identity and confidentiality of all participants in the study. If the researchers find out during the process that there is any suspected life threatening or illegal abuse or neglect, either to yourself or others, the researchers will have to report the issues to state officials as required by the law. (Initials

The three individual interview sessions (1st, 10th, & 11th session) will be audiotaped and/or note-taken with your permission for research purposes. The audio recording will then be transcribed by the researcher and the tape will be erased once the transcriptions are checked for accuracy. Transcripts of your interview may be reproduced in whole or in part for use in presentations or written products that result from this project. Neither your name nor any other identifying information (e.g., your voice) will be used in presentation or in any written products resulting from the study. (Initials :_____)

6. YOUR RIGHTS TO PARTICIPATE, SAY NO, OR WITHDRAW

We very much hope that you will participate in this project and attend all scheduled

sessions. However, your participation is completely voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You have the right to say no. You may choose not to answer specific questions or to stop participating at any time. There is no consequence of withdrawal or incomplete participation.

7. COSTS AND COMPENSATION FOR BEING IN THE PROJECT

There is no cost participating in this project other than the value you place on your time. And, you will receive three gift cards for compensation at three different time points upon completion of the project: pre-intervention interview (\$15), post-intervention interview (\$15) and 2-month follow-up interview (\$15).

8. CONTACT INFORMATION

You may ask any questions about the research at any time. If you have concerns or questions about this study, such as scientific issues or how to do any part of it, please contact the researchers:

- Dr. Connie Sung at 517-353-1638, or email: <u>csung@msu.edu</u>, or regular mail at: Michigan State University, 460 Erickson Hall, East Lansing, MI 48824;
- Dr. June Chen at 517-353-8909, or email: junechen@msu.edu, or regular mail at: Michigan State University, 176 Erickson Hall, East Lansing, MI 48824;

If you have any questions 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 Programs at 517-355-2180, fax: 517-432-4503, or email: irb@msu.edu, or regular mail at: 207 Olds Hall, East Lansing, MI 48824.

9. AUDIOTAPE PERMISSION

You are voluntarily to give researcher the permission of audiotaping the three interview sessions (session 1, session 10 and session 11). The interviews will not be audiotaped if you do not want it to be. Also, you can ask the audiotaping to be turned off at any time. Please check the box to indicate your permission to the researcher:

I voluntarily agree to be audiotaped during the interviews, have the tape transcribed and have the transcript used in presentations and written products. (Initials :_____)
 I do not want my interview to be audiotaped. I voluntarily agree researcher take notes during the interview and used it in presentations and written products. (Initials :_____)

10. DOCUMENTATION OF INFORMED CONSENT

Again, your participation is completely voluntary and confidential. Your signature below means that you voluntarily agree to participate in this project. You will be given a copy of this signed consent form to keep.

Signature of Participants

Dute

Signature of Researcher

Date

APPENDIX B

Demographics

Assistive Social Skills & Employment Training (ASSET) Program

Please fill out the following form:

1.	Name	2. 0 0 0 0 0	What is your ethnic/racial background? Caucasian African American Hispanic/Latino Asian & Pacific Islanders Native/Indian American Other (Please specify)
3. □ □	What was your official diagnosis? Autistic disorder Asperger's syndrome Pervasive developmental disorder	4.	At what age were you first diagnosed?
5. 0 0 0	What type of social security benefits are you receiving (Please check all that apply) Not receiving any SSDI (Social Security Disability Insurance) SSI (Supplemental Social Income) Medicare Medicaid Other (Please specify)	6. 0 0	What is your current employment status? Employed (work as, work hours/week, weekly earnings: \$) Unemployed, and actively looking for a job Unemployed, and not looking for a job Volunteering Other (Please specify)

APPENDIX C

Questionnaire (Pre-Intervention)

Assistive Social Skills & Employment Training (ASSET) Program

Dear Participant,

Congratulations! You are being selected to participate in the 8-week ASSET Program. To help us to get to know you better and customized our training program, please complete and submit the following questionnaire prior to <u>September XXth, 2014</u>. Should you have any questions, please contact Dr. June Chen at <u>junechen@msu.edu</u>.

SECTION A (Demographic Information)

Instructions: Please check the options or fill in the blanks as best descriptions as your situations.

Name: _____

Date: _____

- 7. What is your ethnic/racial background?
 - a. Caucasian
 - b. African American
 - c. Hispanic/Latino
 - d. Asian & Pacific Islanders
 - e. Native/Indian American
 - f. Other (Please specify)

2. What type of social security benefits are you receiving (Please check all that apply)

- a. Not receiving any
- b. SSDI (Social Security Disability Insurance)
- c. SSI (Supplemental Social Income)
- d. Other (Please specify)

3. What is your current employment status?

- a. Employed (work _____ hours/week)
- b. Unemployed, and actively looking for a job
- c. Unemployed, and not looking for a job
- d. Volunteering
- e. Other (Please specify)_____

4. Since you are employed now,

- What is your current job? _____
- Approximately how much is your weekly earning?

5. Since you are unemployed now, have you ever been employed?

- a. Yes
- b. No

6. Since you have been employed before,

- What was your last job? _____
- Approximately how much was your weekly salary for the last job? _______
- Approximately how many hours did you work per week for the last job? ______

SECTION B (General Self-Efficacy)

Instructions: Please read each of the statements below and indicate how true you think it is for you. There is no right or wrong answer, please be open and honest in your response.

	Not at all	Hardly true	Moderatel v true	Exactly true
1. I can always manage to solve difficult problems if I try hard	1	2	3	4
enough.				
2. If someone opposes me, I can find the means and ways to	1	2	3	4
get what I want.				
3. It is easy for me to stick to my aims and accomplish my	1	2	3	4
goals.				
4. I am confident that I could deal efficiently with unexpected	1	2	3	4
events.				
5. Thanks to my resourcefulness, I know how to handle	1	2	3	4
unforeseen situations.				
6. I can solve most problems if I invest the necessary effort.	1	2	3	4
7. I can remain calm when facing difficulties because I can	1	2	3	4
rely on my coping abilities.				
8. When I am confronted with a problem, I can usually find	1	2	3	4
several solutions.				
9. If I am in trouble, I can usually think of a solution.	1	2	3	4
10. I can usually handle whatever comes my way.	1	2	3	4

SECTION C (Perceived Social Self-Efficacy)

Instructions: Below is a list of statements about yourself. Please rate how well you can do the following.

	How well can you	Not well at	Slightly	Moderately	Well	Very
		all	well	well		well
1.	express your opinion to people who are talking	1	2	3	4	5
	about something of interest to you?					
2.	work or study well with others?	1	2	3	4	5
3.	help someone new become part of a group to	1	2	3	4	5
	which you belong?					
4.	share an interesting experience you had with other	1	2	3	4	5
	people?					
5.	actively participate in group activities?	1	2	3	4	5

SECTION D (Perceived Empathy Self-Efficacy)

Instructions: Below is a list of statements about yourself. Please rate how well you can do the following.

	How well can you	Not well at	Slightly	Moderately	Well	Very
		all	well	well		well
1.	read your friends' needs?	1	2	3	4	5
2.	recognize when someone wants comfort and	1	2	3	4	5
	emotional support, even if (s)he does not overtly					
	exhibit it?					
3.	recognize whether a person is annoyed with you?	1	2	3	4	5
4.	recognize when a person is inhibited by fear?	1	2	3	4	5
5.	recognize when a companion needs your help?	1	2	3	4	5
6.	recognize when a person is experiencing	1	2	3	4	5
	depression?					

SECTION E (Social Functioning Scale) Instructions: Please read each of the statements below and choose the one that comes closest to how you have been in the past two to six weeks.

1	I complete my tasks at work and home satisfactorily.	Most of the time	Quite often	Sometimes	Not at all
2	I find my tasks at work and at home very stressful.	Most of the time	Quite often	Sometimes	Not at all
3	I have no money problems.	No problems at all	Slight worries only	Definite problems	Very severe problem s
4	I have difficulties in getting and keeping close relationships.	Severe difficulties	Some problems	Occasional problems	No problem s at all
5	I have problems in my romantic relationship.	Severe difficulties	Some problems	Occasional problems	No problem s at all
6	I get on well with my family and other relatives.	Yes, definitely	Yes, usually	No, some problems	No, severe problem s
7	I feel lonely and isolated from other people	Almost all the time	Much of the time	Not usually	Not at all
8	I enjoy my spare time.	Very much	Sometimes	Not often	Not at all

SECTION F (Autism Spectrum Quotient-10) Instructions: Read each of the following statements. Please rate to what extent you agree or disagree.

		Definitely disagree	Slightly disagree	Slightly agree	Definitely agree
1.	I often notice small sounds when others do not.	0	1	2	3
2.	I usually concentrate more on the whole picture, rather than the small details.	0	1	2	3
3.	I find it easy to do more than one thing at once.	0	1	2	3
4.	If there is an interruption, I can switch back to what I was doing very quickly.	0	1	2	3
5.	I find it easy to 'read between the lines' when someone is talking to me.	0	1	2	3
6.	I know how to tell if someone listening to me is getting bored.	0	1	2	3
7.	When I'm reading a story I find it difficult to work out the characters' intentions.	0	1	2	3
8.	I like to collect information about categories of things (e.g. types of car, bird, train, plant etc).	0	1	2	3
9.	I find it easy to work out what someone is thinking or feeling just by looking at their face.	0	1	2	3
10.	I find it difficult to work out people's intentions.	0	1	2	3

SECTION G (General Anxiety Disorder-7) Instructions: How often have you been bothered by any of the following problems over the **PAST TWO WEEKS**? Please select the answer that best describes you.

	Over the PAST TWO WEEKS ,	Not at all	Several days	More than half the days	Nearly every day
1.	Feeling nervous, anxious or on edge	0	1	2	3
2.	Not being able to stop or control worrying	0	1	2	3
3.	Worrying too much about different things	0	1	2	3
4.	Trouble relaxing	0	1	2	3
5.	Being so restless that it is hard to sit still	0	1	2	3
6.	Becoming easily annoyed or irritable	0	1	2	3
7.	Feeling afraid as if something awful might happen	0	1	2	3

SECTION H (Patient Health Questionnaire-9) Instructions: Over the **PAST TWO WEEKS**, how often have you been bothered by any of the following problems?

	Over the PAST TWO WEEKS ,	Not at all	Several days	More than half the days	Nearly every day
1.	Little interest or pleasure in doing things	0	1	2	3
2.	Feeling down, depressed, or hopeless	0	1	2	3
3.	Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4.	Feeling tired or having little energy	0	1	2	3
5.	Poor appetite or overeating	0	1	2	3
6.	Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7.	Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8.	Moving or speaking so slowly that other people could have noticed. Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9.	Thoughts that you would be better off dead, or of hurting yourself in some way	0	1	2	3
10.	If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?	Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult

APPENDIX D

Psychosocial Questionnaire (Post-Intervention)

Assistive Social Skills & Employment Training (ASSET) Program

Dear Participant,

Congratulations! You have finished our 8-week ASSET Program. To help us to better explore how our program works for you, <u>please complete the following survey and bring it back to your exit interview</u>. Should you have any questions, please contact us at <u>assetmsu@gmail.com</u> or 517-353-1638.

Name:

SECTION A (Usage Rating Profile-Intervention-Revised)

Instructions: Below is a list of statements about your experience in the ASSET program. Please rate to what extent you agree or disagree.

		Strongly disagree	Disagree	Not sure	Agree	Strongly disagree
1.	I am motivated to participate in this program.	1	2	3	4	5
2.	Each session of the program was implemented within the	1	2	3	4	5
2	The information and materials accurate in this measurem	1	2	2	4	5
э.	was appropriate and relevant to employment.	1	2	3	4	5
4.	The quality of instruction was good.	1	2	3	4	5
5.	The amount of time required to participate in this program was reasonable.	1	2	3	4	5
6.	The amount of weekly assignment was reasonable and helpful for my learning.					
7.	I would need consultative support to participate this program.	1	2	3	4	5
8.	The expectation of participating in this program was clear.	1	2	3	4	5
9.	The facilitators made the information in this program as interesting as possible.	1	2	3	4	5
10.	I have positive attitudes about participating in this program.	1	2	3	4	5
11.	I could easily understand the content covered in this program.	1	2	3	4	5
12.	I participated in this program with a good deal of enthusiasm.	1	2	3	4	5
13.	The strategies used for addressing the topics of this program were effective.					
14.	I have learned new skills through participation in this program.					
15.	I would be interested in participating in a program similar to this one in the future.	1	2	3	4	5
16.	Overall, the program is beneficial for me.	1	2	3	4	5
17.	I would recommend this program to others.	1	2	3	4	5
18.	I would be interested in participating in the EPASS program (extension of ASSET program) in spring semester.	1	2	3	4	5

SECTION B (Perceived Improvement)

	After participating in the ASSET	Not improved	Slightly	Moderately	Largely
	program, my ability in	at all	improved	improved	improved
1.	communicating with others has	1	2	3	4
2.	showing positive attitudes and enthusiasm	1	2	3	4
	has				
3.	working in a team has	1	2	3	4
4.	networking with others has	1	2	3	4
5.	critical thinking has	1	2	3	4
6.	problem solving has	1	2	3	4
7.	being professional has	1	2	3	4

Instructions: Below is a list of statements about your perceived improvement after participating in the ASSET program. Please rate to what extent you feel you have improved in following aspects.

SECTION C (Perceived Confidence)

Instructions: Below is a list of statements about your self-efficacy after participating in the ASSET program. Please rate to what extent you feel confident about yourself in following aspects.

	After participating in the ASSET program, my	Much less	Less	Equally	More	Much more
	self-efficacy in	confident	confident	confident	confident	confident
1.	soft skills (job-related social skills) is	1	2	3	4	5
2.	transition from school to work is	1	2	3	4	5
3.	finding and maintaining a job in the future is	1	2	3	4	5
4.	becoming a better employee is	1	2	3	4	5
5.	working with others in the workplace is	1	2	3	4	5
6.	succeeding in the workplace is	1	2	3	4	5

SECTION D (General Self-Efficacy)

Instructions: Please read each of the statements below and indicate how true you think it is for you. There is no right or wrong answer, please be open and honest in your response.

	Not at all	Hardly true	Moderately	Exactly
			true	true
1. I can always manage to solve difficult problems if I try	1	2	3	4
hard enough.				
2. If someone opposes me, I can find the means and ways to	1	2	3	4
get what I want.				
3. It is easy for me to stick to my aims and accomplish my	1	2	3	4
goals.				
4. I am confident that I could deal efficiently with	1	2	3	4
unexpected events.				
5. Thanks to my resourcefulness, I know how to handle	1	2	3	4
unforeseen situations.				
6. I can solve most problems if I invest the necessary effort.	1	2	3	4
7. I can remain calm when facing difficulties because I can	1	2	3	4
rely on my coping abilities.				
8. When I am confronted with a problem, I can usually find	1	2	3	4
several solutions.				
9. If I am in trouble, I can usually think of a solution.	1	2	3	4
10. I can usually handle whatever comes my way.	1	2	3	4

SECTION E (Perceived Social Self-Efficacy)

	How well can you	Not well	Slightly	Moderately	Well	Very well
		at all	well	well		
1.	express your opinion to people who are talking about something of interest to you?	1	2	3	4	5
2.	work or study well with others?	1	2	3	4	5
3.	help someone new become part of a group to which you belong?	1	2	3	4	5
4.	share an interesting experience you had with other people?	1	2	3	4	5
5.	actively participate in group activities?	1	2	3	4	5

Instructions: Below is a list of statements about yourself. Please rate how well you can do the following.

SECTION F (Perceived Empathy Self-Efficacy)

Instructions: Below is a list of statements about yourself. Please rate how well you can do the following.

	How well can you	Not well	Slightly	Moderately	Well	Very well
		at all	well	well		
1.	read your friends' needs?	1	2	3	4	5
2.	recognize when someone wants comfort and emotional support, even if (s)he does not overtly exhibit it?	1	2	3	4	5
3.	recognize whether a person is annoyed with you?	1	2	3	4	5
4.	recognize when a person is inhibited by fear?	1	2	3	4	5
5.	recognize when a companion needs your help?	1	2	3	4	5
6.	recognize when a person is experiencing depression?	1	2	3	4	5

SECTION G (Social Functioning Scale)

Instructions: Please read each of the statements below and choose the one that comes closest to how you have been in the past two to six weeks.

1	I complete my tasks at work and	Most of the	Quite often	Sometimes	Not at all
	home satisfactorily.	time			
2	I find my tasks at work and at home	Most of the	Quite often	Sometimes	Not at all
	very stressful.	time			
3	I have no money problems.	No problems	Slight worries	Definite	Very severe
		at all	only	problems	problems
4	I have difficulties in getting and	Severe	Some	Occasional	No problems at
	keeping close relationships.	difficulties	problems	problems	all
5	I have problems in my romantic	Severe	Some	Occasional	No problems at
	relationship.	difficulties	problems	problems	all
6	I get on well with my family and	Yes,	Yes, usually	No, some	No, severe
	other relatives.	definitely		problems	problems
7	I feel lonely and isolated from other	Almost all the	Much of the	Not usually	Not at all
	people	time	time		
8	I enjoy my spare time.	Very much	Sometimes	Not often	Not at all

	Szerier, i (nausin spectrum Quotient 10)							
Inst	Instructions: Read each of the following statements. Please rate to what extent you agree or disagree.							
	Definitely Slightly		Slightly	Definitely				
		disagree	disagree	agree	agree			
	I often notice small sounds when others do not.	0	1	2	3			
2.	I usually concentrate more on the whole	0	1	2	3			
	picture, rather than the small details.							
3.	I find it easy to do more than one thing at once.	0	1	2	3			
4.	If there is an interruption, I can switch back to	0	1	2	3			
	what I was doing very quickly.							
5.	I find it easy to 'read between the lines' when	0	1	2	3			
	someone is talking to me.							
6.	I know how to tell if someone listening to me	0	1	2	3			
	is getting bored.							
7.	When I'm reading a story I find it difficult to	0	1	2	3			
	work out the characters' intentions.							
8.	I like to collect information about categories of	0	1	2	3			
	things (e.g. types of car, bird, train, plant etc).							
9.	I find it easy to work out what someone is	0	1	2	3			
	thinking or feeling just by looking at their face.							
10.	I find it difficult to work out people's	0	1	2	3			
	intentions.							

SECTION F (Autism Spectrum Quotient-10)

SECTION G (General Anxiety Disorder-7) Instructions: How often have you been bothered by any of the following problems over the PAST TWO WEEKS? Please select the answer that best describes you.

	Over the PAST TWO WEEKS ,	Not at all	Several days	More than half the days	Nearly every day
	Feeling nervous, anxious or on edge	0	1	2	3
2.	Not being able to stop or control worrying	0	1	2	3
3.	Worrying too much about different things	0	1	2	3
4.	Trouble relaxing	0	1	2	3
5.	Being so restless that it is hard to sit still	0	1	2	3
6.	Becoming easily annoyed or irritable	0	1	2	3
7.	Feeling afraid as if something awful might happen	0	1	2	3

	Over the PAST TWO WEEKS ,	Not at all	Several days	More than half the days	Nearly every day
	Little interest or pleasure in doing things	0	1	2	3
2.	Feeling down, depressed, or hopeless	0	1	2	3
3.	Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4.	Feeling tired or having little energy	0	1	2	3
5.	Poor appetite or overeating	0	1	2	3
6.	Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7.	Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8.	Moving or speaking so slowly that other people could have noticed. Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9.	Thoughts that you would be better off dead, or of hurting yourself in some way	0	1	2	3
10.	If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?	Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult

SECTION H (Patient Health Questionnaire-9) Instructions: Over the PAST TWO WEEKS, how often have you been bothered by any of the following problems?_____

APPENDIX E

Focus Group Protocol (1-2 years Post-Intervention)

Interview Questions

This focus group is designed to explore how ASSET impacts participants' self-perceived *psychosocial functioning* (social functioning, self-efficacy, and psychological wellness) and *outcome expectations* over time.

- Discuss any changes you have noticed in yourself since participating in ASSET
 a. Probe for changes in:
 - i. Work-related self-efficacy
 - **ii.** Social functioning
 - iii. Anxiety
 - iv. Depression
- 2. Discuss any changes others have noticed in you since participating in ASSET
 - **a.** Probe for changes in:
 - i. Work-related self-efficacy
 - **ii.** Social functioning
 - iii. Anxiety
 - iv. Depression
- **3.** How have these changes impacted your ability to work with others in school, home, leisure, or work settings?
- 4. Discuss anything that has been easier for you to do since participating in ASSET.
- 5. Discuss anything that you feel you do better since participating in ASSET.
- 6. Discuss anything that you feel more confident doing since participating in ASSET.
- 7. What are your current work and independent living expectations/goals
 - a. Have they changed since participating in ASSET?
 - i. If yes, please explain.
- **8.** What else would you like to share with us about your experiences in ASSET and any changes since then?

APPENDIX F

Human Subjects Institutional Review Board Approval

MICHIGAN STATE UNIVERSITY

August 13, 2014

To: Ying Yuk Sung 620 Farm Lane, Room 460 Erickson Hall

IRB# X14-774e Category: Exempt 1 Re: Approval Date: August 13, 2014

Title: Job-related Social Skills Training Group for Improving Employment Outcome of Youth with Autism

Initial IRB

Application Determination

Exempt

The Institutional Review Board has completed their review of your project. I am pleased to advise you that your project has been deemed as exempt in accordance with federal regulations.

The IRB has found that your research project meets the criteria for exempt status and the criteria for the protection of human subjects in exempt research. Under our exempt policy the Principal Investigator assumes the responsibilities for the protection of human subjects in this project as outlined in the assurance letter and exempt educational material. The IRB office has received your signed assurance for exempt research. A copy of this signed agreement is appended for your information and records

Renewals: Exempt protocols doinot need to be renewed. If the project is completed, please submit an Application for Permanent Closure

Revisions: Exempt protocols do not require revisions. However, if changes are made to a protocol that may no longer meet the exempt criteria, a new initial application will be required.

Problems: If issues should arise during the conduct of the research, such as unanticipated problems, adverse events, or any problem that may increase the risk to the human subjects and change the category of review, notify the IRB office promptly. Any complaints from participants regarding the risk and benefits of the project must be reported to the IRB.



Follow-up: If your exempt project is not completed and closed after three years, the IRB office will contact you regarding the status of the project and to verify that no changes have occurred that may affect exempt status

Please use the IRB number listed above on any forms submitted which relate to this project, or on any correspondence with the IRB office.

Good luck in your research. If we can be of further assistance, please contact us at 517-355-2180 or via email at IRB@msu.edu. Thank you for your cooperation.

Biomedical & Health Institutional Review Board (BIRB)

Community Research Institutional Review Board (CRIRB)

Office of Regulatory Affairs Human Research Protection Programs

Social Science Behavioral/Education Institutional Review Board (SIRB)

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MSU is an affirmative-action, equal-opportunity employer.

Sincerely,

A. Mese

Harry McGee, MPH SIRB Chair

c: Lianjun Chen

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