Examining Variables Associated with Successful Treatment Outcomes of Autistic Youth Enrolled in PEERS ©

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Examining Variables Associated with Successful Treatment Outcomes of Autistic Youth Enrolled in PEERS ©

by

Justin William Harcourt McLeod

A THESIS
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Abstract

The present study sought to examine how certain variables of autistic youth who completed a formal social intervention program (PEERS) predicted social skill improvement post intervention. Specifically, this research aimed to determine if age, gender, emotional intelligence (EI), intellectual ability, and/or social cognition would predict social skill outcomes. Using extant data from parent and self-report batteries, change scores and multiple regressions were employed to examine which variables accounted for significant social skill improvement. Age, gender, EI, and social cognition did not predict change; however, higher intellectual ability paired with higher verbal ability and lower perceptual reasoning significantly predicted social skill outcomes for the self-report group. These findings suggest that autistic youth with specific cognitive profiles may be more successful in PEERS. This research also exemplifies the heterogeneous nature of autism symptomology and the continued need for research examining social skill interventions. Limitations and future directions are discussed.
Acknowledgements

It would be remiss to not first and foremost thank my supervisor Dr. Adam McCrimmon for his consistent dedication to my research and exploration of topics within psychology. Adam has guided me through the challenges that accompany graduate school while providing me with a multitude of opportunities to further my research and career. Adam continually challenged me to be a better researcher and clinician and I am forever grateful for his supervision and mentorship.

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<tbody>
<tr>
<td>ABA</td>
<td>Applied Behavioral Analysis</td>
</tr>
<tr>
<td>ADHD</td>
<td>Attention-Deficit/Hyperactivity Disorder</td>
</tr>
<tr>
<td>ADOS</td>
<td>Autism Diagnostic Observation Schedule</td>
</tr>
<tr>
<td>AEI</td>
<td>Ability Emotional Intelligence</td>
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<tr>
<td>ANCOVA</td>
<td>Analysis of Covariance</td>
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<tr>
<td>ANOVA</td>
<td>Analysis of Variance</td>
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<tr>
<td>APA</td>
<td>American Psychiatric Association</td>
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<tr>
<td>ASD</td>
<td>Autism Spectrum Disorder</td>
</tr>
<tr>
<td>BarOn EQ-I: YV(S)</td>
<td>Baron Emotional Quotient Inventory: Youth Version Short Form</td>
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<tr>
<td>CBT</td>
<td>Cognitive Behavioral Therapy</td>
</tr>
<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
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<tr>
<td>DSM</td>
<td>Diagnostic Statistical Manual of Mental Disorders</td>
</tr>
<tr>
<td>EI</td>
<td>Emotional Intelligence</td>
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<tr>
<td>EM</td>
<td>Expectation-Maximization</td>
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<tr>
<td>EQ-i</td>
<td>Emotional Quotient Inventory</td>
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<tr>
<td>EQ-YV</td>
<td>Emotional Quotient Inventory Youth Version</td>
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<tr>
<td>FSIQ</td>
<td>Full Scale Intelligence Quotient</td>
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<tr>
<td>g</td>
<td>General Intelligence</td>
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<tr>
<td>GSSIs</td>
<td>Group Social Skills Interventions</td>
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<tr>
<td>ID</td>
<td>Intellectual Disability</td>
</tr>
<tr>
<td>IQ</td>
<td>Intelligence Quotient</td>
</tr>
<tr>
<td>JA</td>
<td>Joint Attention</td>
</tr>
<tr>
<td>PDD</td>
<td>Pervasive Developmental Disorder</td>
</tr>
<tr>
<td>PDD-NOS</td>
<td>Pervasive Developmental Disorder – Not Otherwise Specified</td>
</tr>
<tr>
<td>PEERS</td>
<td>Program for the Education and Enrichment of Relational Skills</td>
</tr>
<tr>
<td>PIQ</td>
<td>Performance Intelligence Quotient</td>
</tr>
<tr>
<td>RCT</td>
<td>Randomized Control Trial</td>
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<tr>
<td>RRB</td>
<td>Repetitive Behaviors &amp; Interests</td>
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<tr>
<td>SA</td>
<td>Social Affect</td>
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<tr>
<td>SRS</td>
<td>Social Responsiveness Scale</td>
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<tr>
<td>SSIS</td>
<td>Social Skills Improvement System</td>
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<tr>
<td>SSI</td>
<td>Social Skill Intervention</td>
</tr>
<tr>
<td>TD</td>
<td>Typically Developing</td>
</tr>
<tr>
<td>TEI</td>
<td>Trait Emotional Intelligence</td>
</tr>
<tr>
<td>ToM</td>
<td>Theory of Mind</td>
</tr>
<tr>
<td>VCI</td>
<td>Verbal Comprehension Index</td>
</tr>
<tr>
<td>VIQ</td>
<td>Verbal Intelligence Quotient</td>
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<tr>
<td>WAIS</td>
<td>Wechsler Adult Intelligence Scale</td>
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<tr>
<td>WASI</td>
<td>Wechsler Abbreviated Intelligence Scale</td>
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<tr>
<td>WISC</td>
<td>Wechsler Intelligence Scale for Children</td>
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Chapter 1: INTRODUCTION

Social skills are essential for meaningful peer relations, prosocial behaviors, and developing positive connections with individuals in various settings (Gresham, 2016; Wentzel, 2009). Social skills are also associated with academic achievement, psychological adjustment, coping, and employment outcomes (Miles & Stipek, 2006). The development of social skills follows various milestones from early infancy to adolescence, finally maturing but ever evolving in adulthood, allowing individuals to interact with their immediate social environment and develop the necessary abilities to engage in conflict resolution, reflective conversations, development of meaningful friendships, social perspective taking, and collaboration with others (Dixon & Stein, 2006; Landy, 2009; Rubin et al., 2015; Soto-Icaza et al., 2015; Tomasello et al., 2005). However, underdeveloped social skills are a common occurrence and are associated with peer rejection and isolation, internalizing and externalizing disorders, peer victimization, academic and employment challenges, and a negative self-concept (Bukowski et al., 2018; Ladd et al., 2011; Rubin et al., 2015). It is apparent that effective and well-developed social skills are imperative for adequate academic, employment, and quality of life outcomes; however, social skills impairments and maladaptive social behaviors are an integral part of the diagnostic criteria and a main impairment observed in autism1.

Autism is an overarching construct describing a myriad of symptoms or impairments in the realms of social communication and repetitive and/or restricted patterns of behavior that are commonly observed in early childhood (American Psychiatric Association [APA], 2013). Autism is heterogeneous in nature, as diagnostic classifications of autism are viewed on a

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1 The terms “autistic”, “autism” or “on the autism spectrum” will be used throughout this document rather than “with autism”, “autism spectrum disorder”, or “ASD” to respect the recommendations and practices of self-advocates (Kapp et al., 2013; Nicolaidis et al., 2015).
spectrum encompassing a range of symptom severity (Lord et al., 2020). Many of the social and behavioral impairments seen in autism are hallmark features of the diagnosis, for which social skill interventions (SSIs) have become a common treatment modality.

As social skills may not develop naturally in autistic individuals, specialized interventions that focus on social skill development are considered essential (Hansen et al., 2018). Group social skills interventions (GSSIs) are often employed to improve autistic individuals’ social skills. There is an abundance of GSSIs with varying treatment modalities, yet their effectiveness is unclear. Randomized control trials (RCTs) and meta-analyses have assisted in synthesizing results of GSSIs, with only a select few demonstrating adequate outcomes. Of the GSSIs noted to be effective, The Program for the Enrichment and Education of Relational Skills (PEERS; Laugeson & Frankel, 2010) emerges as the gold standard for autistic youth. Through cognitive behavioral therapy (CBT) techniques and co-occurring parent education sessions, PEERS improves social skill outcomes in both short- and long-term observations (e.g., Mandleberg et al., 2014). Specifically, PEERS improves participants’ overall social skills knowledge, social responsiveness, and social cognition while simultaneously reducing autism symptomology (Laugeson et al., 2012; Schohl et al., 2014).

With PEERS demonstrating both efficacious and effective results for the improvement of social skills and reduction of autism symptomology, it becomes important to understand the potential predictors of success in this intervention. Notably, little is known regarding the specific cognitive profiles, personal characteristics, and/or abilities that autistic individuals possess that may predict success in PEERS. These predictors are important to consider as GSSIs could be tailored to individuals who will succeed, and novel intervention approaches could be created for those who do not experience success with current programs. The present study examined specific
predictors that autistic individuals possess that may lead to improved social skills from PEERS to redress this gap within the literature.

**Summary**

Currently, the predictors of success in PEERS are poorly understood; the present study explored several characteristics or variables that autistic adolescents possess that predict success in PEERS. The present study is presented in chapters. Chapter one briefly discussed relevant information, while providing a summary of the pertinent details of this study. Chapter two discusses essential literature to provide an understanding of current knowledge regarding the development and necessity of social skills, a history and current understanding of autism, and research on both GSSIs and PEERS. Moving forward, the methodology employed in the present study is presented in chapter three. The study’s results are then offered in chapter four. Finally, chapter five provides an in-depth discussion of the research findings, observed limitations, prospective directions, and conclusions.
Chapter 2: LITERATURE REVIEW

This chapter will examine previous and existing literature regarding social skills, autism, and social skill interventions. The chapter will begin by orientating the reader to the current operationalization of social skills as well as their development throughout the lifespan via the lens of appropriate development and underdeveloped skills. Readers are introduced to the theoretical framework adopted for social skill development and its relation to autism. Building upon this, autism is explored through a historical context while also introducing the reader to the present classification of the symptomology and associated challenges experienced by autistic individuals such as social skill impairments. Finally, GSSIs that have been implemented with autistic populations and their efficacy and effectiveness are explored.

Social Skills

Typically developing social skills, surrounding positive connections and acceptance, prosocial behaviors, and developing meaningful relations, are associated with beneficial psychosocial health and academic achievement (Goosby et al., 2013; Gresham, 2016; Wentzel, 2009). As described by Beauchamp and Anderson (2010), disturbances to social skills may create current or future concerns regarding psychological distress, social isolation, and reduced self-esteem, all of which may greatly reduce an individual’s quality of life. Social skills represent a dynamic interplay of genetics, ecological systems, and the individual themself, as these skills are mainly developed from childhood throughout adolescence and refined in adulthood, setting the stage for peer interactions and connection throughout an individual’s life (Beauchamp & Anderson, 2010). The importance of successful social interactions and their associated skills to the development and outcome of an individual’s overall quality of life is well established; however, there are varying definitions and operationalizations of what social skills truly
encompass within the literature (Gresham, 2016). Common themes observed in all operationalizations of social skills involve communication and interactions with others. Recent scholarly examinations of social skills involve an individual’s specific learned behaviors, initiation and reflective responses, and interactions with peers (Little et al., 2017). Importantly, as described by Gresham (2016), the distinction between social skills, social competence, and social tasks must be made when conceptualizing social behavior. A social task may be interacting in a game with peers, having a phone call with others, or joining into a conversation. Social skills are the necessary characteristics and actions an individual exhibits to complete a social task, whereas social competence is the judgements of others on how the social task was completed. Therefore, according to Gresham et al. (2010), social skills comprise specific behaviors exhibited to complete a social task that are then judged by external agents as either competent or incompetent. While it is important to examine social behavior as a whole, the present study and the measures employed specifically examine social skills and the improvements observed through social (skill) interventions.

**Typical Development of Social Skills**

The typical development of social skills from infancy to adulthood is a myriad of evolving systems that involves the refinement of social behaviors and cognitive processes (Soto-Icaza et al., 2015). There is a complex interplay of neural, behavioral, and environmental systems that must be navigated for an individual to develop appropriate social skills and create successful interactions with others (Soto-Icaza & Billeke, 2017). While there are various models that examine the typical development of social skills, there are both agreed upon milestones as well as global concepts that are required in the development of adequate social skills.
The present study adopts a developmental theoretical framework regarding social skills. The developmental framework encapsulates neural, cognitive, and behavioral aspects that are central to the development of many systems necessary for sufficient social success. Specifically, neural development is implicated with both social precursors (early onset abilities such as imitation and biological motion preference) and the social brain (structures necessary for social performance and processing; Soto-Icaza et al., 2015). Next, cognitive processes are implicated in social cognition and social skills, which are essential cognitive processes allowing individuals to interact with others and understand their intentions, feelings, emotions, and behaviors (Soto-Icaza et al., 2015). Finally, behavioral systems are implicated in social behavior, social functioning, and social precursors that embody the actions necessary to interact with others, integrate social skills over time and context, and engage in adequate performance or usage of learned social skills (Soto-Icaza et al., 2015). The developmental model is holistic, and pinpoints cognitive, neurological, and behavioral variables individuals possess that are either developed or lagging, resulting in adequate or impaired social success. Although there are various models of social skills that are too numerous to discuss here, crucial milestones and global developmental concepts of social skills are presented below.

The development of social skills begins in early infancy, with a focus on visual processing and visual behaviors (Emery, 2000; Happé & Frith, 2014). Specifically, typically developing two- to three-month-old infants are observed to recognize visual stimuli while also demonstrating social initiatives and preferences for focusing on eyes to receive crucial social information (Beauchamp & Anderson, 2010; Soto-Icaza & Billeke, 2017). Infants who demonstrate appropriate sensitivity to biological motion such as eye movement possess the capacity to learn from others, which is an essential undertaking of the developing social brain.
and skills such as joint attention (JA) and facial recognition (Happé & Frith, 2014). The next major milestone that is seen in the development of social skills and the social brain is at seven months, when the infant begins to integrate emotional information from both facial expressions and individuals’ voices (Grossman et al., 2006). While infants can engage in facial recognition, vocal integration, and focus on others’ eye movement, these milestones are only the building blocks for social communication. Importantly, at around nine months, infants begin to demonstrate JA, which is the ability to share the perception of a common object with another individual, creating a triadic interaction (Beauchamp & Anderson, 2010; Lachat et al., 2012). This ability is imperative for the development of social skills and prosocial interactions (Baars & Gage, 2010; Mundy et al., 2007). One of the main characterizations of JA surrounds the alternation of the infant’s attention between the shared object and the other individual (Soto-Icaza & Billeke, 2017). The ability to fluctuate attention between an object and another person revolves around an infant’s ability to use eye contact to derive information about another individual’s goal directed behavior while also comprehending that other people possess their own motivating factors (Morgan et al., 2003; Tomasello et al., 2005). With the developing ability to understand that others possess future cognitive orientation while also sharing intentionality, infants begin to demonstrate the beginnings of social skills such as coordinating plans and engaging in collaborative activities (Tomasello et al., 2005). As Baron-Cohen (2001) has described, the development of JA is a precursor of subsequent social cognition/skills, including theory of mind (ToM), as JA lays the foundation for understanding the intentions and being empathetic of others.

Once JA has been established in typically developing infants, the next milestone is achieved at around 12-18 months. Around this time, infants are observed to respond to others’
attention while also demonstrating more complex imitating behaviors (Rubin et al., 2015; Soto-Icaza et al., 2015). This milestone, in combination with achieving JA, is especially illustrative of attentional focus, which is paramount in the development of learning and social skills. Soon after complex imitating behaviors, the milestone of social perspective taking arises at 24 months (Moll & Kadipasaoglu, 2013; Soto-Icaza et al., 2015). Social perspective taking encompasses an infant’s ability to comprehend others’ determinations, preferences, and goals through the identification of others’ preferences and perspectives (Soto-Icaza et al., 2015). Importantly, Soto-Icaza et al. (2015) noted that the ability of social perspective taking is undertaken by an infant understanding past and present facial expressions, completing a comparison of them, and understanding one’s preference. By understanding the experiential background, a template is created in which an infant may engage in social reference and perspective taking (Soto-Icaza et al., 2015). Around three years, children begin to engage in cooperative play, with group experiences aiding in the development of social skills (Dosman et al., 2012). Specifically, children may engage in joint imaginary play, creating the opportunity for social-emotional and cognitive growth through the expression and reception of emotions and events (Dosman et al., 2012). Moreover, children begin to feel remorse for negative actions to others by attempting to ratify the situation by thinking of ways to make up for their behavior (Dosman et al., 2012).

Moving forward, at four years children typically develop a more autonomous self-identity with amplified curiosity about their environment (Dosman et al., 2012). They demonstrate an increased regulatory ability over stressful situations that may result in anger and aggression, developing more positive coping skills (Dixon & Stein, 2006; Landy, 2009). For example, children’s conflict resolution skills become more fine-tuned, illustrating a knowledge and respect for peers’ emotions and boundaries (Dixon & Stein, 2006; Landy, 2009). Next, at around five to
six years of age, children become progressively more skilled at conversational techniques (Dosman et al., 2012); they learn appropriate rules surrounding reflective conversations as demonstrated by listening to others’ opinions, conversational turn taking, and responding in an applicable manner (Landy, 2009).

Moving forward from six years of age to the period of adolescence, milestones developed in infancy and early childhood are further established and developed. Childhood encapsulates many of the building blocks for future social cognition and skills; basic abilities such as eye gaze and facial recognition, JA, cooperative play, and perspective taking build the foundation for more complex cognitive and social skills later in development. While childhood provides the building blocks for social skills, adolescence is instrumental to neurological and biological changes as well as environmental influences that develop social skills and influence social cognition (Beauchamp & Anderson, 2010). Regarding neurological changes, adolescence is a complex period of development with various transformations taking place in several areas of the brain. Particularly, both progressive and regressive changes in the adolescent brain occur that serve to increase the functionality of neurocircuitry (Spear, 2013). Regarding progressive fluctuations, the typical evolving adolescent brain demonstrates increased levels of dopaminergic activity, which may drastically increase reward seeking behavior (Arain et al., 2013). Moreover, it has been observed that there is greater activation in the ventral striatum, commonly referred to as the reward centre of the brain (Arain et al., 2013). With these progressive changes in the adolescent brain, reward driven behavior and increased neural reactivity to emotional properties of social stimuli are often observed (Arain et al., 2013). Conversely, regressive changes in the adolescent brain are widely observed through synaptic pruning and myelination, which although regressive, establish specialized connectivity and increased information flow (Spear, 2013).
Importantly, the decrease of gray matter and increase of white matter allows adolescents to process social interactions and complex social stimuli more rapidly and efficiently (Aboitiz et al., 1992; Bray et al., 2015). Finally, there may be a delayed maturation of the prefrontal cortex and other frontal brain regions that may lead to a lower response inhibition and more observable risky social behaviors (Spear, 2013).

The neurological changes are instrumental to adolescents’ development of social skills while navigating evolving social environments. There are also various environmental influences that shape the development of social skills. From a strictly environmental perspective, adolescents place significance on personal autonomy, increased importance of close friendships, and interacting in various group interactions (Beauchamp & Anderson, 2010). The development of close friendships throughout adolescence assists in social skill development by molding identities while also serving as a platform for adolescents to integrate cognitive skills and emotional intelligence (EI; Rubin et al., 2004). Incorporating EI, which is understood as the ability to perceive, use, understand, and manage emotions allows for adolescents to reason and solve social conflicts with emotional information, further enhancing close friendships (Salovey et al., 2002). Moreover, adolescent friendships build intimacy, security, and norm teaching of social skills (Rubin et al., 2004). The formation of close friendships and increased autonomy from parental figures, which creates an increased reliance on social skills with others, demonstrates how environmental factors are imperative in the development of adolescent social skills. However, if an individual’s social skills are not typically developed, with the capacity to develop qualitatively rich friendships, there may be various direct and indirect consequences.
Consequences of Underdeveloped Social Skills

Acquisition of social skills is one of the most challenging aspects of development, filled with navigating tumultuous social expectations, striving for autonomy, and balancing the demands of various agents. Nonetheless, through achieving appropriate protective factors such as social support and close friendships, the level of demand and associated stress on other areas of development can be easily mitigated. However, as described by Tantam (2000), individuals with impairments in social functioning may demonstrate challenges in terms of appropriate engagement in social interactions and possess lagging skills when attempting to construct lasting and meaningful friendships. As the challenges associated with social skills become more ingrained, individuals experience social rejection and isolation, which are precursors to anxiety and depression (Tantam, 2000). Unfortunately, there appears to be a “snowball effect” each year that social withdrawal and peer exclusion are experienced (Bukowski et al., 2010) that speaks to the higher levels of depression seen in youth each year that they continue to be excluded and withdrawn from close personal friendships due to poor social skills. Importantly, overarching social skill challenges lead to negative peer interactions that in turn become a vicious cycle of negative reinforcement, ultimately leading to the avoidance of further undesirable interactions or social anxiety and social withdrawal (Bellini, 2006). Adding to this negative feedback loop, research has shown the relation between social withdrawal and peer rejection, exclusion, and victimization (Bukowski et al., 2010; Ladd et al., 2011). This negative feedback loop leads to projections of weakness in individuals who are withdrawn and isolated, and results in bullying from others (Hodges et al., 1999). Peer interactions and typically developed social skills are the antecedent to a positive self-concept (Bukowski et al., 2018). The direct association between peer interactions and self-concept are observed through the benefits of friendship and
acceptance, which result in higher perceptions of well-being and adequacy (Rubin et al., 2015). It is apparent that social skills and close personal friendships are essential protective factors with respect to mental health issues, bullying, and a positive self-concept. However, various groups of individuals such as autistic children lack the basic skills to develop social skills appropriately and, in turn, protective factors.

**Autism Spectrum Disorder**

Autism spectrum disorder (autism) was first introduced in the early 20th century; however, the conceptualization of autism has evolved immensely as present research and understanding of it has exponentially developed. Currently, autism is a neurodevelopmental disorder in the *Diagnostic Statistical Manual of Mental Disorders* (5th ed.; *DSM*-5; American Psychiatric Association [APA], 2013) characterized by impairments in social and communicative abilities in conjunction with restricted and/or repetitive interests and behaviors (RRBs).

Explicitly, communication and social skills prove challenging for autistic individuals as autism can produce impairments in language development, poor non-verbal skills, and issues reading social cues, among others (Gilotty et al., 2002; Lord et al., 2020). The RRBs and social impairments typically present in early childhood yet are variable and may evolve throughout an individual’s lifespan (APA, 2013). While there have been changes in the way researchers operationalize autism, the core features have remained relatively unchanged (Lord et al., 2018). However, autism has recently subsumed other historical diagnoses, resulting in it being regarded as a spectrum with severity of symptoms ranging from mild to severe.

**Historical Context**

Autism originates from a complex series of events and findings and has been marked by an elusive definition of intertwined disorders. The clinical origin of autism was first observed in
1911 when Bleuler coined the term “autism” in description of individuals who demonstrated symptoms of schizophrenia (Bleuler, 1950[1911]). Specifically, Bleuler (1950[1911]) described autistic thinking as infantile wishes filled with hallucinations and fantasies used to avoid unsatisfying realities. While Bleuler’s (1950[1911]) early definition of autism was a far cry from the present operationalization of autism, it stimulated further research into the signs and symptoms of the developmental disorder. The next advancement was attributed to Kanner (1943) and Asperger (1944) who each described early developmental disorders that affected language, social relationships, and restricted interests. Specifically, Kanner (1943) studied eleven children described as having “early infantile autism”, positing that the children demonstrated restricted interests and severely impaired language and social communication. Asperger (1944) similarly described children with “autism psychopathology” who demonstrated abnormal language, gross motor issues, and socially isolating tendencies. The symptomology observed by Kanner (1943) and Asperger (1944) eventually became the underpinnings of the core features observed in autistic individuals at present; however, many reconceptualization’s and epidemiological research paved the way for how we view autism presently. The evolution of autism from once being accepted as a schizophrenic disorder to becoming understood as a neurodevelopmental disorder with varying impairments is most readily observed through the diagnostic criteria in the various Diagnostic and Statistical Manuals of Mental Disorders (DSM) and the accompanying research that influenced them.

Regarding early versions of the DSM, autism did not contain any of the unique developmental symptoms associated with the disorder today. Staying in tune with the research at the time, both the DSM (APA, 1952) and DSM-II (APA, 1968) regarded autism as a psychiatric condition in the form of childhood schizophrenia. However, as research began to transform from
observational studies to epidemiological and experimental designs with autistic children, researchers came to appreciate the language, speech, cognition, and global deficits integrating other sensory stimuli as essential descriptions in diagnosing and recognizing autism (e.g., Eisenberg & Kanner 1956; Frith, 1970; Hermelin & O’Connor, 1970; Rutter & Bartak, 1971; Rutter & Lockyer, 1967; Verhoeff, 2013). As well, reviewing the underpinnings of autism allowed for the reconceptualization from autism being associated with schizophrenia to primarily encapsulating language and cognitive challenges (Evans, 2013; Ricks & Wing, 1975; Rutter, 1968; Verhoeff, 2013). Significantly, these findings were mirrored in the DSM-III (APA, 1980). The three major criteria in the DSM-III (APA, 1980) were a pervasive lack of responsiveness to other people, gross impairments in language development (e.g., peculiar speech patterns including echolalia, metaphorical language, and pronominal reversal), and bizarre responses to various aspects of the environment (e.g., objections/resistance to change and preservatory behaviors/interest and attachment towards objects). However, the DSM-III (APA, 1980) required an onset of symptoms before 30 months and considered autism to be an infantile disorder. As can be observed in the drastic departure between the diagnostic and cardinal features of autism in the DSM-II (APA, 1968) to the DSM-III (APA, 1980), the dominant theory switched from psychogenic underpinnings towards language, cognitive, and sensory processing impairments. Nonetheless, as more research was conducted, the defining features and understanding of autism in the resulting DSMs continued to transform.

Soon after the publication of the DSM-III (APA, 1980), more influential epidemiological research was conducted that led to another shift in the understanding of autism. Researchers began to view autism and the associated behaviours as aspects of social impairment or as a neurocognitive/developmental disorder (Martin, 1971; Wing & Gould, 1979). This movement to
transform the substructure of autism from childhood schizophrenia and ego development into challenges with social behavior and management allowed for increased understanding of core behavioral and psychological features, while being able to understand the neurocognitive and developmental nature of autism (Evans, 2013). Maybe one of the most defining movements away from a schizophrenic substructure was Wing and Gould’s (1979) popularization of the triad of autistic impairments. Whereas Kanner (1943) broadly described symptoms such as “extreme autistic aloneness” (p. 242), “delayed echolalia” (p. 243), “monotonously repetitious” (p. 245), and “anxiously obsessive desires for sameness” (p. 245), Wing and Gould (1979) operationalized these behaviours into three categories: impaired communication, impaired social skills, and a restricted and repetitive way of being-in-the-world (Wing & Gould, 1979). Clearly defining the phenomena and placing observable behaviors into three domains allowed for increased understanding of autism for researchers and was also an influential transitional step in understanding autism (Cashin & Barker, 2009). Moreover, the triad of autistic impairments subscribes to a dimensional approach, making it more universal to understand the heterogeneity of behaviors described by the autism label (Berney, 2000).

Wing (1981) observed that abnormalities of social interaction, verbal and nonverbal communication, and imaginative activities occurred so frequently that they could be clustered together and contrast the sociable and socially impaired, further creating a concrete classification of autism. Wing (1981) was able to transform early ideas of social impairment being primarily understood as extreme autistic aloneness towards social challenges being understood as a subtle impairment in the use and understanding of the unwritten rules of social behavior. Wing’s (1981) epidemiological study rapidly influenced the operationalization of autism as the DSM-III-R (APA, 1987) was published with various novel understandings. Specifically, in contrast to the
DSM-III (APA, 1980), what was described as a pervasive lack of responsiveness to other people evolved in the DSM-III-R (APA, 1987) to be known as a qualitative impairment in reciprocal social interaction. This was further explained as an individual not at all or abnormally seeking comfort during times of distress or an inability to make friendships. Additionally, qualitative impairments in verbal and nonverbal communication replaced the domain of gross deficits in language development that was necessary for a diagnosis. The new domain focused on marked abnormal nonverbal communication and impairment in the ability to initiate or sustain a conversation with others, despite adequate speech (APA, 1987). Finally, one of the most pronounced changes to the DSM-III-R was the requirement of symptom onset before 30 months. Instead, the DSM-III-R ousted the infantile adjective and replaced it with autistic disorder, allowing for autism to be diagnosed after infancy (30 months) when possible latent social and communicatory issues may arise (APA, 1987). While autism research and diagnostic capabilities had been revolutionized through three editions of the DSM, many more modifications followed.

The foremost change that occurred in the DSM-IV stemmed from re-examination of early work in the field of autism. Kanner’s (1943) and Asperger’s (1944) similar observations surrounding challenges in social interaction, inappropriate communication skills, and interest restriction were split off into two separate disorders due to a rich variety of subtle clinical characteristics that distinguished the two symptomologies (Barahona-Corrêa & Filipe, 2016). Asperger’s (1944) description of patient symptoms appeared to contrast Kanner’s (1943) observations as there were differences in cognitive ability and language development seen through high intelligence, acquisition of speech, and differences in social tactics when comparing the two populations (Klin, 2003; Wing, 1994). This movement to demarcate autism and Asperger’s disorder was spurred by Wing’s (1981) description of the clinical features, course,
aetiology, epidemiology, differential diagnosis, and management of Asperger's disorder. Additionally, Rutter and Schopler (1992) called for a separation of the two disorders to increase research of Asperger’s disorder and determine if there was a true difference between them. This disparity and contention surrounding the two symptomologies eventually led to Asperger’s disorder being added to the DSM-IV (APA, 1994) and further delineation of the many symptoms observed under the autistic umbrella (Barahona-Corrêa & Filipe, 2016). While diagnostic criteria for autism remained the same, the DSM-IV (APA, 1994) became the first to recognize autism as a spectrum. Specifically, the DSM-IV (1994) placed autistic disorder, Asperger’s disorder, and pervasive developmental disorder not otherwise specified (PDD-NOS) under the broader category of pervasive developmental disorder (PDD). While this distinction between autism and Asperger’s disorder occurred as well as autism beginning to be categorized as a spectrum disorder, many of these changes were short lived.

Autism became representative of five disorders under the category of pervasive developmental disorders (PDDs) in the DSM-IV-TR (APA, 2000). The DSM-IV-TR designated the five disorders as: autistic disorder, Asperger’s disorder, PDD-NOS, Rett’s disorder, and childhood disintegrative disorder (APA, 2000). Autism becoming representative of five separate disorders demonstrated a move towards autism becoming a spectrum disorder. In fact, only 13 years later when the DSM-5 (APA, 2013) was published, a dimensional approach was embraced along with other changes that assisted in conceptualizing our current understanding of autism.

Present Classification

As with previous editions, reconceptualization of the classification and diagnostic criteria occurred in the DSM-5 (2013). First, Asperger’s disorder was subsumed, as many clinicians believed that the diagnosis was incongruously applied (Lord et al., 2012; Lord et al., 2020). As
well, it was concluded that there was little evidence for the inclusion of Asperger’s being a
distinct separate disorder (Miller & Ozonoff, 2000). This move was reinforced by the idea that
the *DSM-IV* (APA, 1994) possessed poorly defined categories, allowing for trivial diagnoses
such as under the PDD-NOS and Asperger’s disorder labels (Lord et al., 2020). Additionally, the
*DSM-5* amalgamated the social and communication criteria, and sensory issues were included
under the RRB domain to mirror the factor structure and pervasiveness of autism symptomology
(Green et al., 2016; Lord et al., 2020). The *DSM-5* (APA, 2013) also allowed symptom onset to
occur in the early developmental period with the understanding that symptoms may not fully
manifest until social demands exceed an individual’s capacities (Ozonoff et al., 2018).

In sum, the *DSM-5*’s (APA, 2013) description of autism amalgamated previous disorders,
and used a continuum concerned with severity and associated features instead of distinct
classifications between the disorders. Clinical descriptions of autism have transformed
substantially since originally being observed. What was once understood as a syndrome with
hallucinatory and schizophrenic substructures is now observed as a spectrum with
neurocognitive and developmental roots that vary in clinical presentations, resulting in different
understandings of aetiology, epidemiology, and treatment responses.

*Diagnosis*

A diagnosis of autism is based on behavioral presentation. Specifically, trained clinicians
examine social-communicative impairments as well as restricted and/or repetitive patterns of
behaviours or interests to determine if an autism diagnosis is appropriate (APA, 2013; Lord et
al., 2020). While there are substantial differences in behavioral and developmental trajectories
between autistic individuals, the specific core features are constant between and within
individuals, and present with enough severity to be recognized clinically regardless of the
heterogeneity between individuals (Lord et al., 2020). In examining the *DSM-5* (APA, 2013) criteria for an autism diagnosis, there are five symptom clusters that must be met and observed. The first is persistent challenges in social communication and interactions (APA, 2013). These impairments must be evidenced across multiple contexts/environments in three specific subdomains either presently or historically: (1) social reciprocity (e.g., difficulty with back-and-forth conversation), (2) non-verbal communication (e.g., abnormal eye contact), and (3) developing, maintaining, and understanding peer relationships (e.g., lack of interest in peers; APA, 2013). An individual must also demonstrate at least two of four RRBs either currently or by history; (1) stereotyped and repetitive behaviors (e.g., lining up objects, echolalia), (2) insistence on sameness (e.g., rigid behavioral/thinking patterns, difficulty with transitions), (3) highly restricted fixed interests (e.g., perseveration of specific topics, unusual depth of knowledge in an area), and (4) hyper or hyposensitivity or interest in sensory inputs (e.g., excessive smelling objects, seeming indifference to pain and/or temperature; APA, 2013). The final three symptom clusters surround the aforementioned behavioural symptoms causing clinically significant impairment in current functioning, symptoms not better realised as an intellectual disability or global developmental delay, and symptoms being present in the early developmental period (APA, 2013).

**Diagnostic specifiers**

As symptomology may vary by context and fluctuate over time in different individuals, the *DSM-5* (APA, 2013) includes three severity specifiers to delineate the levels of support that an individual may require. The severity levels are one (requiring support), two (requiring substantial support), and three (requiring very substantial support). These levels are based on ratings of an individual’s impairments with respect to adaptive functioning regarding social
communication and RRBs. The DSM-5 (APA, 2013) also requires specifiers such as with/without an intellectual impairment, a language impairment, an associated medical or genetic condition, an associated neurodevelopmental or behavioral disorder, and catatonia.

**Developmental Trajectories and Outcomes**

The variability of behavioural impairments presented by those on the autism spectrum produce challenges specifying a concrete developmental trajectory or outcome for every individual. Nonetheless, it is apparent that individuals who are increasingly able to develop their language ability, social skills, adaptive skills, cognitive functions, and engage in early intervention illustrate more positive outcomes when compared to individuals who have more severe impairments (Jones et al., 2017; Lord et al., 2018; Pickles et al., 2014). Particularly, children who begin to achieve milestones in language development and demonstrate adequate non-verbal skills before the age of five tend to achieve age-appropriate trajectories (Pickles et al., 2014). Conversely, those who struggle to catch up to age-appropriate levels in language development are more likely to be diagnosed with an intellectual disability (Lord et al., 2018).

While language development is instrumental to adult outcomes, engagement with peers and early intervention has also been demonstrated to improve outcomes later in life (Anderson et al., 2014; Jones et al., 2017). In fact, peer engagement has been observed to enhance independence and adaptive skills, which are critical for adult conceptual and practical life skills (Jones et al., 2017). As well, Bauminger and colleagues (2008) found that exposure to peers can enhance social development and the growth of appropriate social skills, which is important as Locke et al. (2017) found that positive peer interactions and friendships are predictive of milder or less overall autism symptoms. In addition to peer relations, early intervention predicts developmental trajectories. It has been observed that through early intervention, various autistic individuals over
time did not display the full behavioural criteria for the diagnosis, though the recognition of historical presentation of behaviour means that the diagnosis is still appropriate (Farley et al., 2009; Fein et al., 2013). Moreover, as described by Anderson and colleagues (2014), early intervention consistently predicts more positive adult outcomes in terms of significant outcome predictors like intelligence quotient (IQ), achievement, and adaptive skills.

While early intervention, language development, and peer involvement are essential for positive adult outcomes, there are patterns of behavioral onsets outlined by Ozonoff and Iosif (2019) that may create roadblocks for early intervention and screening for autism. The heterogeneity of onset patterns described below create challenges for clinicians to construct universal early interventions which are imperative for more beneficial outcomes later in life.

The first onset pattern is relatively common, being an early onset of behaviors in which children demonstrate challenges or deviations from social and communication milestones (Ozonoff & Iosif, 2019). Conversely, it is commonly observed that individuals may demonstrate a regressive onset pattern of autism behaviors. The regressive pattern of onset is typically seen in children who meet language and other developmental milestones and then undergo loss or decline of previously developed skills (Brignell et al., 2017; Ozonoff & Iosif, 2019). The third onset pattern surrounds the idea that individual’s plateau in their behavioral and social development; developmental skills may become stagnant and fail to reach advanced developmental milestones seen in neurotypical development (Shumway et al., 2011). Onset patterns as well as diagnosis of autism may occur as early as 12 months, yet the variability in onset pattern may pose challenges for pinpointing specific developmental trajectories and providing intervention for more positive outcomes (Clark et al., 2017; Steiner et al., 2012).
Nonetheless, it is apparent that language development, early intervention, and peer involvement are imperative for positive adult outcomes for autistic individuals.

**Epidemiology**

With the reconceptualization and evolution of research, the prevalence and incidence of autism has been reported differently and continues to change. Historical examinations of occurrence reported autism as relatively rare, occurring in 1 in 2,500 individuals (Lotter, 1966; Wing & Gould, 1979). However, recent examinations have observed a rapidly increasing prevalence. The Centers for Disease Control and Prevention [CDC] (2020) reported that approximately 1 in 54 children are diagnosed with autism (Maenner et al., 2020). The difference between current and previous reports represents a 208% increase in prevalence. This exponential increase has become a contentious issue, with questions surrounding why such a large increase has occurred. Researchers have pointed out that there is increased awareness and detection of the disorder as well as differing conceptualizations of autism throughout the years (Mash & Barkley, 2014). Regarding demographic factors, sex differences appear to be the most marked difference, with males being diagnosed at a 4.3:1 ratio to females (Maenner et al., 2020). Alternatively, factors such as socioeconomic status and ethnicity to do not appear to have any influence on the diagnosis, as any discrepancies have been attributed to lack of resources for individuals of minority ethnicities or lower SES brackets (Mandell et al., 2007).

**Risk Factors**

Various genetic and environmental risk factors have been proposed; however, no single risk factor has been found to cause autism. Regarding environmental risk, the present understandings encapsulate prenatal and perinatal factors while also attributing maternal lifestyle factors (Lord et al., 2018). With respect to environmental risk, both advanced maternal and
paternal age as well as detrimental pregnancy variables such as weight, hypertension, and bacterial or viral infections increase the risk of autism (Idring et al., 2014; Lyall et al., 2014). Additionally, obstetric complications such as preterm birth or extremely low or high birth weight are associated with risk (Lampi et al., 2012; Moore et al., 2012). Interestingly, periconceptual folic acid supplements reduced the risk of autism, especially in mothers with inefficient folate metabolism (Schmidt et al., 2012). There are also specific heritable heterogeneous genetic variants associated with autism risk (e.g., Niu et al., 2017; Tick et al., 2016). A meta-analysis twin study conducted by Tick and colleagues (2016) found that the heritability of risk factors is 74-93%. Genetic risk studies point to polygenetic variant inheritance while also observing both common and rare de-novo (i.e., genetic mutations occurring only in the child, not parents) mutations that further risk (Gaugler et al., 2014; Weiner et al., 2017). Overall, risk factors stem from both environmental and genetic influences yet more is still to be understood.

Co-Occurring Conditions

It is well established that autistic individuals are often diagnosed with one or more co-occurring clinical conditions (Simonoff et al., 2008). In fact, as reported in the DSM-5 (APA, 2013), up to 70% of autistic individuals may have one and up to 41% may have two or more co-occurring conditions. It has been found that a range from 41.9-62.8% of co-occurring disorders are commonly attributed to psychopathologies such as attention-deficit/hyperactivity disorder (ADHD), anxiety, depression, and oppositional defiant disorder (Lord et al., 2018; Simonoff et al., 2008; Snow & Lecavalier 2011). Of these conditions, ADHD is recognized as one of the most common co-occurring disorders observed in autistic individuals, with up to 28.2 % of individuals being diagnosed, which has also been found to create a higher risk of a second co-occurring disorder being diagnosed (Simonoff et al., 2008; Soke et al., 2018). With the high rate
at which co-occurring disorders are present in autistic populations, it is not surprising that depressive and anxiety symptoms have been noted at a significantly higher rate than typically developing populations (Hurtig et al., 2009). In addition, intellectual disability (ID), operationalized by both significant impairments in intellectual and adaptive functioning is frequently associated with autism, as present research indicates up to 35% of autistic individuals also meet criteria for ID (APA, 2013; Bertelli, 2019). Other conditions such as a developmental delay, language, and motor difficulties are also frequently observed (Lord et al., 2018; Snow & Lecavalier 2011). With autistic individuals experiencing a high rate of co-occurring disorders, the *DSM-5* allows for multiple diagnosis. However, it is important for continued monitoring of symptoms over an individual’s development given the complexity that multiple diagnoses pose.

**Treatment**

There are various treatment modalities for autistic individuals ranging in intensity and delivery. Like developmental outcomes, treatment modalities vary greatly due to the heterogenous presentation of autism. As research has demonstrated, improved treatment outcome is largely based on pre-treatment IQ levels (e.g., Eldevik et al., 2009; Smith & Iadarola, 2015). Nonetheless, presenting symptomology, observed impairments, and early intervention are the most imperative variables when considering treatment. With respect to early intervention, early parent-mediated interventions that educate parents on how to interact appropriately with their autistic child have been demonstrated to improve both social communication and behavior immediately (Weitlauf et al., 2014). Early parent-mediated interventions surround attempting to provide caregivers with psychoeducation regarding directed play and shared attention to establish appropriate initiative in social communication (Weitlauf et al., 2014). As Lord and colleagues (2018) describe, early parent-mediated interventions are non-intrusive for families,
relatively inexpensive, and can be helpful in improving outcomes for children who may not end up being diagnosed with autism. Early parent-mediated intervention is important; however, is not as well recognized as other treatment modalities.

One of the most prevalent treatment modalities for autism is early intensive behavioural intervention. The most used early intensive behavioural intervention is applied behavioral analysis (ABA), yet there are various forms that all encompass similar goals. In general, ABA and other behavioural interventions focus on communication, social interaction, and functional and adaptive skills (Dixon et al., 2019). Specifically, such intervention attempts to eliminate atypical behavior while concurrently establishing the use of novel and more applicable skills for learning (Roane et al., 2016). ABA has been found to impact language development, cognition, and adaptive skills in autistic individuals, as positive gains have been seen directly after intervention as well as long term (e.g., Dixon et al., 2019; Landa & Kalb, 2012).

Another abundant treatment modality is behavioral and social treatment groups that focus on various skills such as social skills, social cognition, or ToM development. With respect to social skills groups, the majority provide psychoeducation to parents while simultaneously teaching appropriate social skills to autistic individuals. Research on social skill intervention groups have established that such interventions vastly improve autistic individuals’ social behavior, with many large effect sizes reported (e.g., Gates et al., 2017). For the present research, social skills interventions will be discussed at length in later sections. Other behavioral interventions that focus on aspects such as higher-order cognitive abilities, ToM, and mental health have also been shown to improve overall functioning of autistic youth (e.g., Kenworthy et al., 2014). While the specific symptomology targeted by these groups is quite disparate, the main tenet of behavioral and social interventions is cognitive behavioral therapy (CBT) to reduce
symptomology while also providing a didactic approach to teaching, which engages autistic youth in perspective taking and cognitive restructuring to further develop lagging skills (McConachie et al., 2014; Moree & Davis III, 2010).

**Social Skills and Autism**

Autistic children demonstrate impairments in various social skill domains when compared to typically developing (TD) peers (Macintosh & Dissayanke, 2006). Domains such as self-control, cooperation, and assertion, all of which are pertinent for social success, have been found to be less developed in autistic children compared to TD controls (Macintosh & Dissayanke, 2006). Social skill impairments affect basic social interactions and the development of social relationships (McCoy et al., 2016). These impairments affect autistic children at all ages, as an individual moves through various stages from imaginative play as a child to establishing close personal friendships in adolescence. For example, many autistic children demonstrate restricted interests or the lack of skill necessary for imaginative play, which Strain and colleagues (2008) found resulted in these children being left to play alone as their underdeveloped skills did not afford ability to socialize appropriately with other children. Moreover, as described by Watkins et al. (2017), autistic youth demonstrate social skill difficulties with social-emotional reciprocity, non-verbal communicative behaviors used for social interaction, and developing, maintaining, and understanding relationships, all of which contribute to a lower frequency of appropriate social interactions when compared to TD peers.

As with TD children, underdeveloped social skills in autistic children lead to profound consequences. These repercussions concern issues with peer rejection, behavioral challenges, low quality relationships, and suicide. It has become evident that social skill impairments that encompass challenges with communication and lack of reciprocal friendships are directly
associated with peer rejection, poor peer relationships, and even inferior quality relationships with school staff (Blacher et al., 2009; Laws et al., 2012; Lyons et al., 2011). In addition to poorer relationships, autistic youth develop fewer close reciprocal friendships than their TD peers (Mazurek & Kanne, 2010). These challenges surrounding the development of reciprocal friendships and associated peer rejection lead to autistic youth becoming the targets of bullying, victimization, and isolation (Wainscot et al., 2008). Indeed, autistic children appear to be victimized at a much higher rate than TD peers as well as individuals with other disabilities due to their social and communicative difficulties (Cappadocia et al., 2012). This high rate of victimization further embeds social skill challenges as an environment of poor peer relations is established with autistic youth lacking the ability to be assertive and develop healthy communication styles. When added to an already challenging social environment, bullying and victimization contributes to higher rates of attempted suicide in autistic youth than their TD peers (Mayes et al., 2013); almost half of autistic youth have at one point had suicidal ideation or attempted suicide (Mayes et al., 2013). Regrettably, the lack of ability to develop close friendships or being the victim of peer rejection has monumental effects.

Similar to TD peers, an inability to engage in successful peer interactions and develop close reciprocal friendships creates risk for autistic children to develop internalizing disorders concerning isolation, anxiety, and depression (Zeedyk et al. 2016). Compounding the risk of internalizing disorders and peer rejection is the fact that autistic children are more likely to demonstrate clinically significant behavioral issues due to social skill impairments (Leyfer et al., 2006). Aforementioned co-occurring clinical conditions observed in autistic children amalgamate behavioral challenges such as immature or problemed behavior within the classroom and community settings, which are associated with a lack of successful social interactions and peer
rejection (Camargo et al., 2014; Zeedyk et al., 2016). Indeed, with both behavioral and social skill challenges impacting one’s ability to regulate emotional reactions and deciphering various social situations, the ability to build and maintain friendships is greatly impacted (Bauminger et al., 2008). Not only do social skill impairments lead to peer related issues, various cognitive, emotional, and developmental milestones are restricted due to a lack of appropriate social functioning (Carmago et al., 2014). With specific milestones being delayed or altogether missed, autistic children may struggle with academic and vocational success in their future endeavors. With social skill challenges becoming more ingrained and prevalent in adulthood, Rao and colleagues (2008) stated that autistic individuals are more likely to struggle with under or unemployment than the general population.

However, research has demonstrated that these consequences may be remitted through the facilitation of appropriate peer interactions and bolstering of lagging skills. Importantly, successful peer interactions build not only confidence in autistic youth, but also assist in the development of social competence and relationships (Camargo et al., 2016). Additionally, by facilitating and providing autistic youth with the opportunities to build personal friendships, the feelings of peer isolation and social anxiety can be greatly decreased (Bossaert et al., 2012). Over time, the ability for autistic youth to interact more with others and engage with friends has been illustrated to provide appropriate modelling for social skills, further increasing social competency (Odom et al., 2008).

Overall, it is apparent that autism greatly affects social skill development and general social competency, ultimately leading to various challenges throughout developmental periods. These consequences, if left un-intervened, may affect various areas including academic, career, and overall quality of life (Carmago et al., 2016; Watkins et al., 2017). With evidence that
autistic youth have the ability to develop protective factors in regard to social skills and relationships that may prevent permanent challenges in the future, it is important that social skills be measured, and effective social skill interventions be researched and implemented.

**Emotional Intelligence and Autism**

EI, which is necessary for processing emotional information and utilizing the same to solve problems and navigate social situations, is underdeveloped in many autistic individuals (Brady et al., 2014; Mayer & Salovey, 1997). In fact, many autistic individuals have difficulties understanding complex feelings and emotions, making socially related inferences, and managing their emotions appropriately (Bodner et al., 2015; Shamay-Tsoory, 2008). With a core feature of autism being impairment in social communication and social interaction (APA, 2013), it is no surprise that many autistic individuals have challenges with EI. Accordingly, social skills and EI have been found to be associated with one another (Schutte et al., 2001). Social interactions require individuals to recognize one’s own emotional state, and regulate one’s emotions to respond appropriately, which is epitomised by both social skills and EI (Hansen et al., 2009; Montgomery et al., 2018). Exemplifying the association between EI and social skills, Mavroveli and colleagues’ (2007) study established that higher EI is positively associated with peers’ ratings of classmates’ social competence. Moreover, skills such as cooperation and leadership that are essential for peer interactions were rated as better developed in individuals who demonstrated greater EI (Mavroveli et al., 2007). Perhaps the most indicative finding of the relation between EI and social skills is from Austin et al. (2005) who displayed the link between EI and social network size, quality, and support. In general, low levels of EI relate to challenges for individuals to adequately engage in social interactions, regulate their emotions, and process
external emotional information, creating poor reciprocal friendships and negative peer interactions (Gross, 2002; Lopes et al., 2003; Lopes et al., 2005).

Currently, EI has been split into two frameworks: trait emotional intelligence (TEI) and ability emotional intelligence (AEI). TEI is operationalized as a person’s perceived EI capabilities as well as characteristics such as self-esteem and flexibility (Salovey et al., 2003; Petrides & Furnham, 2001). Conversely, AEI is thought to encompass four branches, which are the ability to perceive, use, understand, and manage emotions effectively (Salovey et al., 2002).

Exemplifying EI impairments in some autistic individuals, a recent study by Boily and colleagues (2017) concluded that autistic individuals demonstrated significantly lower overall TEI when compared to typically developing adolescents, including challenges with stress management and interpersonal skills. Moreover, it was concluded that autistic youth displayed poorer AEI than controls, with impairments in both understanding and managing emotions. Not surprisingly, these lagging skills in EI further amalgamate social skill challenges and overall social outcomes of autistic youth. Unfortunately, social emotional difficulties related to underdeveloped EI in autistic individuals often lead to poor psychosocial outcomes such as mental health challenges, peer rejection, and social stress (Kanne et al., 2009; Montgomery et al., 2013). Moreover, EI challenges are highly predictive of poor resilience such as self-efficacy, peer support, and emotional reactivity in adolescents (Droppert et al., 2019; McCarthy et al., 2020). Not only is EI considerably related to resilience and psychosocial outcomes, but it is also predictive of social competence (Montgomery et al., 2010). Interestingly, studies have observed that autistic individuals may improve their AEI throughout adolescence and moving into adulthood; however, they still demonstrate challenges applying their emotional knowledge to real world situations, furthering poor social outcomes (Brady et al., 2014; Montgomery et al.,
In sum, EI impairments are present in many autistic individuals and further magnify their social skill and communicatory challenges, leading to reduced resilience, negative psychosocial outcomes, and social competence. Building upon the challenges reduced EI may create in autistic individuals, lagging social cognition skills may further catalyze social skill difficulties.

**Social Cognition and Autism**

Social cognition is an overarching construct that deals with how individuals predict, monitor, and interpret social behaviors and mental states of other individuals (Striano & Reid, 2009). Distinctive social cognition behaviors include eye contact, mutual experiences, and shared affect and expressions (Rochat & Striano, 1999). Important processes in the development of social cognition and how we attend to others include JA, agent identification, dyadic and triadic interactions, mental state attributions, and emotion processing (Happé & Frith, 2014; Striano & Reid, 2009). However, many of the integral developments leading to appropriate social cognition progress atypically in autistic individuals.

Baron-Cohen’s (2005) mind reading model details the development of social cognition and the neurocognitive areas in which dissociations from social cognition may take place. The model features six mechanisms required to develop adequate social cognition and the ability to understand others’ mental states (Baron-Cohen et al., 2008). The six mechanisms include the intentionality detector, eye direction detector, shared attention mechanism, ToM mechanism, emotion detector, and empathising system (Baron-Cohen et al., 2008). The intentionality, emotion, and eye direction detectors are central to building dyadic representations of mental states, understanding others’ goal directed behavior, and understanding affective states (Baron-Cohen et al., 2008). The shared attention mechanism is responsible for triadic relationships as it allows individuals to acknowledge that the self and other agents perceive the same event (Baron-
Cohen et al., 2008). The empathising system allows for individuals to understand others’ mental states (Baron-Cohen et al., 2008). Finally, ToM allows for an individual to understand others mental states and emotions by integrating both emotions and mental state concepts (Baron-Cohen et al., 2008). Unfortunately, many autistic individuals do not adequately develop these mechanisms and experience impaired social cognition.

Some autistic individuals demonstrate social cognitive impairments such as reduced imitation, lessened response to name, lower social interest and social smiling, and atypical eye contact, all of which are rooted in JA development and dyadic representations of mental states (Bruinsma et al., 2004; Happé & Frith, 2014; Striano & Reid, 2009; Zwaigenbaum et al., 2005). Another common social cognitive challenge observed in autistic individuals involves emotion recognition and empathy (Baron-Cohen et al., 2008). In fact, it has been revealed that many autistic individuals struggle to distinguish differing emotions with both static and dynamic stimuli depicting basic emotions (e.g., fear, anger, surprise; Deruelle et al., 2004; Yirmiya et al., 1992). The impairments become more profound when autistic individuals must distinguish more complex emotions (e.g., embarrassment, irritation, impatient; Baron-Cohen et al., 2001). In addition to emotional and empathetic impairments, complex mental state recognition also appears to be a challenge for many autistic individuals (Baron-Cohen et al., 2008). The impaired ability to attend to others’ mental states appears to be due to a failure to attend to the right social or emotional cues as well as poor central coherence (seeing the big picture) that is observed in many autistic individuals (Golan et al., 2006; Heavey et al., 2000; Klin et al., 2002).

It is apparent that many autistic individuals struggle with processes necessary for adequate social cognition. Dissociations from emotion recognition, empathetic ability, dyadic and triadic interactions, and mental state representations lead to challenges appropriately
predicting, monitoring, and interpreting others’ social behaviors. These challenges with social cognition relate to improper development of specific cognitive, neurological, and behavioral processes outlined by the developmental model of social skills.

**Developmental Model of Social Skills and Autism**

The developmental model of social skills embodies the theoretical framework that there is a complex interplay of cognitive, neurological, and behavioral processes that develop adequate social skills necessary for social success. Specializations of neural, cognitive, and behavioral mechanisms including facets such as sensory, motor, language, and working memory ability, allows individuals to manage their social environments appropriately (Soto-Icaza et al., 2015). More specifically, individuals who have typically developing social skills create an internal model to navigate their social environment. Individuals with adequately developed skills can recognize, identify, anticipate, and adapt to other social agents’ social behavior (Soto-Icaza et al., 2015). With social skills impairments being a hallmark feature of autism, research has attempted to pinpoint the exact mechanisms of the developmental model that are not properly established.

In many autistic individuals, impaired cognitive, neural, and behavioral mechanisms create an inability to formulate an appropriate internal model of social agents which may be the foundation of many social challenges (Courchesne & Pierce, 2005; Soto-Icaza et al., 2015). The social impairments observed in many autistic individuals have been detected in neurological imaging, which has demonstrated reduced long range functional brain connectivity, alterations in early event related potentials indicating impairments in local circuit specialization, poor autonomic neuronal prediction, and a lagging ability to adjust to environmental uncertainty (Dunn et al., 2008; Favre et al., 2015; Happé & Frith, 2006; Hileman et al., 2011). Many of these neurological challenges lead to poor specializations of necessary cognitive and behavioral
mechanisms essential to adequate social skills, social cognition, and social functioning. In line with the developmental model of social skill acquisition, operationalizing social skills impairments in autism may best be understood by the neural alterations and the associated cognitive and behavioral challenges arising in early stages of development (Soto-Icaza et al., 2015). These early developmental alterations serve as a general framework for why autistic individuals face challenges when adapting their behavior to various social environments and making predictions of other individuals’ social behaviors (Soto-Icaza et al., 2015).

**Social Skills Interventions**

One of the primary features of autism is challenges with social cognition, communication, and interaction, creating an overall impairment in the realm of social skills (APA, 2013). As previously outlined, these challenges have numerous consequences. Autistic individuals are more likely to experience peer victimization, co-occurring mental health issues, and isolation (Laws et al., 2012; Mazurek & Kanne, 2010; Zeedyk et al. 2016). Social impairments in autism are stable, resulting in poor overall outcomes as individuals pass through significant developmental milestones such as the social demands of adolescence (Picci & Scherf, 2015). Given the consequences of these social impairments, numerous social skills interventions (SSIs) have been created, the most common form of which is GSSIs, in which various modalities are employed to educate and foster social skill development (McMahon et al., 2013).

While GSSIs are the most ubiquitous SSI, there are contentious results within the literature as to their effectiveness. Perhaps more abundant than the GSSIs themselves, researchers have commonly raised concerns over the lack of synthesis and effectiveness of research results (e.g., Brady et al., 2020; Ledford et al., 2018; McMahon et al., 2013; Moody & Laugeson, 2020; Reichow et al., 2012; Wolstencroft et al., 2018). Moreover, red flags have been
raised in terms of the types of research conducted in observing the effectiveness of GSSIs (Gates et al., 2017; Waugh & Peskin, 2015). Nonetheless, research has emerged that has used both randomized control trials (RCTs) and meta-analyses to synthesize existing literature and determine the effectiveness of GSSIs. Specifically, a meta-analysis conducted by Gates et al. (2017) aimed at not only examining the overall effectiveness of GSSIs but also examining how reporting sources impact outcomes (e.g., self-report, parent-report, teacher-report). From critiquing 19 RCTs and synthesizing existing literature, it was observed that autistic individuals who received GSSI treatment made significantly greater improvements in social competence when compared to controls (Gates et al., 2017). Additionally, it was observed that self-report measures demonstrated the greatest improvement, as participants felt as though they had adequately engaged and evinced social skill development (Gates et al., 2017). Similar evidence of effective GSSIs was brought forth by Wolstencroft and colleagues (2018) who reported improved autistic symptomology with large effect sizes of improvement in social communication and fewer RRBs (Wolstencroft, et al., 2018). Of note, however, was the identification of specific GSSIs that have larger effect sizes and are understood as the true golden standard of SSIs. Wolstencroft and colleagues’ (2018) meta-analysis indicated that two GSSIs had significant and large effect sizes. The first was the comprehensive summer social development program (summerMAX; Lopata et al., 2010) and the second was The Program for the Enrichment and Education of Relational Skills (PEERS; Laugeson & Frankel, 2010). Of these two, only PEERS is designed for adolescent use. In general, while there are various GSSIs to improve social skill deficiencies for autistic individuals, PEERS is the gold standard in effective and significant reduction of social communication impairments for autistic adolescents.
**PEERS**

PEERS is an evidenced based social intervention aimed at teaching necessary skills for making and keeping friends, managing peer conflict, and addressing peer rejection to autistic teens (Laugeson & Frankel, 2010; Moody & Laugeson, 2020). PEERS is designed for teens (13-18 years of age) experiencing challenges with a broad range of social skills (Laugeson & Frankel, 2010). PEERS is a 14-week manualized intervention that was built on the foundations of Frankel and Myatt’s (2003) SSI known as Children’s Friendship Training. A main tenet of PEERS is that the intervention is parent-assisted, allowing parents to learn the skills that are being taught and to act as social coaches to practice learned skills with the teens. PEERS sessions are 90 minutes and cover various social skills such as electronic communication, having get-togethers, and handling teasing and/or bullying (Laugeson & Frankel, 2010). Unique to PEERS is the focus on homework assignments, parent handouts, role-plays, behavioral rehearsals, and an emphasis on teens engaging in get-togethers with peers (Laugeson & Frankel, 2010). The techniques specific to PEERS surround the use of CBT in the form of didactic instruction, Socratic questioning, perspective taking, behavior rehearsal, homework assignments, and social problem solving that allow teens to be engaged within the groups and increases the durability of treatment gains over time (Laugeson & Park, 2014; Mandelberg et al., 2014).

Within PEERS, the didactic instructional approach aims to provide psychoeducation by acknowledging the facilitator as an active member and educator (Laugeson & Park, 2014). The didactic approach follows specific and concrete rules to engage in social behavior adequately. Complex social behaviors that autistic individuals may struggle with are broken down into achievable and distinct actions so a teen can learn the skill and incorporate it into their social awareness. For example, particular steps for hosting a get-together include greeting your guest,
providing a tour of your house, offering refreshments, and allowing the guest to pick the activity (Laugeson & Frankel, 2010). While other GSSIs or advice from individuals may rely on personal social experiences, the concrete rules for social skills in PEERS are ecologically valid (Laugeson & Park, 2014) in that PEERS is based on social skills research in real world and generalizable environments, therefore not relying on trivial techniques but actual ecologically observed and valid skills (Laugeson & Park, 2014). With ecologically valid skills being taught through the didactic approach, PEERS enhances teens’ awareness of their social skills while providing them with concrete skills to apply to make and keep friends.

A cornerstone of PEERS is the use of Socratic questioning as an overarching technique important for facilitating reflection and guiding discovery using open-ended questions (Neenan, 2009). Socratic questioning centres around guiding discovery for the reasons of the specific rules and steps outlined for skills. For example, following the steps for beginning a get together, the facilitator may ask why it is important to greet your guest or why you should let the guest pick the activity, allowing participants to determine the importance of the concrete steps themselves. While Socratic questioning assists in guiding discovery of social skills, the role plays and perspective taking questions in PEERS allow for a comprehensive approach to GSSIs. Through this approach, teens can be an active participant in their learning, therefore increasing attention and engagement of participants, boosting self-efficacy, and ensuring adequate retention of learned material (Laugeson & Park, 2014).

The role plays in PEERS allow participants to have simplified examples of the supplied steps and skills while simultaneously being provided with perspective taking questions and encouraging social problem solving. The role plays are contrasting in that both socially appropriate and inappropriate behaviours are demonstrated. While it is important for participants
to learn appropriate social skills, it is also imperative that they also learn to identify and discern what not to do in social situations. Although the Socratic method is integral in allowing participants to guide their social skill development, role plays allow teens to view abstract social skill concepts and form them into observable concrete actions. Role plays are used often throughout the program and are usually introduced for the participants to watch what the facilitators are doing right or wrong during the role play. During “inappropriate” role plays, facilitators will often break or not follow the specific outlined rules for a social skill, whereas they will follow all the concrete steps for “appropriate” role plays. According to Laugeson and Park (2014), the role plays in each lesson encourage social observational learning while also creating repetitiveness of instruction, allowing for further impressing of specific social skills to participants.

After each role play, perspective taking questions are posed to the participants. For example, after an “inappropriate” role play in which a facilitator may have barged into a conversation, the perspective taking questions encourage participants to brainstorm what the experience may have been like for the people having a conversation and what they may have thought about the facilitator who made the errors. Similarly, after an “appropriate” role play, the same perspective taking questions are asked. Examples of the perspective taking questions are “What do you think that was like for the other people?” “What do you think they thought of me?” and “Are they going to want to talk to me again?” (Laugeson & Frankel, 2010, p. 59). The perspective taking questions are vital for encouraging the development of ToM, social cognition, and social problem solving (Laugeson and Park, 2014). By asking how others feel in social situations, participants can observe how their actions may influence peer acceptance or rejection. As well, the questions assist in developing a routine for the participants to develop increased
introspection in future situations and how they should assess social interactions outside of the treatment setting (Laugeson and Park, 2014). Moreover, perspective taking questions encourage participants to establish if certain behaviors would be considered socially appropriate for the situation and how to change those behaviors moving forward (Laugeson and Park, 2014). For example, when a facilitator demonstrates an inappropriate role play by not using outlined social skills, participants are asked why the social interaction was poor and ways in which it could be improved (Laugeson & Frankel, 2010). By using perspective taking questions, participants are encouraged to engage their social problem-solving skills and social cognition to develop the skills necessary to avoid problematic social scenarios outside of treatment settings.

Teens also engage in behavioral rehearsals so they can practice the skills learned during each session. Behavioral rehearsals are a cornerstone of CBT as they challenge individuals to correct behavioral errors or cognitively restructure their thought patterns (Spence, 2003). Furthermore, behavioral rehearsals have been found to be a valuable teaching tool as they increase the independent use and effectiveness of skills trained (Toelken & Miltenberger, 2012). Within PEERS, behavioral rehearsals allow participants to practice newly acquired skills in a safe space while also being able to receive feedback (Laugeson and Park, 2014). A behavioral rehearsal begins by a facilitator coaching an individual about a specific skill and going over the concrete steps they need to follow. Once the participant is comfortable with the skill, they engage in a practice scenario with other participants and facilitators. After the behavioral rehearsal, they then receive performance feedback about ways to improve the social skill. As White and colleagues (2010) outlined, immediate feedback is imperative as autistic youth have challenges with sustained attention and difficulties distinguishing essential from irrelevant details, making immediate feedback the most effective method of correcting errors with a
demonstrated social skill. After a participant has received feedback, they are able to practice the skill again. Repeated behavioral rehearsals with corrective feedback allows for participants’ behavior to be molded and appropriate social skills to become easily recalled and utilized in real world environments (Laugeson and Park, 2014).

A final shared aspect between CBT and PEERS is the use of homework assignments. It is well established that homework compliance boosts treatment outcomes by improving the maintenance of learned skills and encouraging practice of skills in natural settings (LeBeau et al., 2013). In PEERS, homework assignments are designed to target the skills learned each week. For example, participants are encouraged to host a get together as a homework assignment and follow the rules outlined for being a good host to practice the newly learned skills outside of a treatment setting. Accordingly, each PEERS session begins with a homework review in which the facilitator asks questions about the previous week’s assignment. The homework review is integral to success of the participants as it ensures that the intervention is individually tailored for each participant, with changes occurring if they are struggling with a skill or require certain accommodations to achieve success (Laugeson and Park, 2014). By using CBT techniques such as homework assignments, behavioral rehearsals, and a didactic approach, PEERS sets itself apart of other evidence based GSSIs and is considered the gold standard in improving social skills of adolescents (Gates et al., 2017; Hall et al. 2018).

**PEERS Research.** Numerous RCTs have evaluated the efficacy of PEERS at reducing symptomology of autism and improving social skills in adolescents (Hill et al., 2017; Karst et al., 2015; Laugeson et al., 2009; Laugeson et al., 2012; Laugeson et al., 2015; Mandleberg et al., 2014; Mcvey et al., 2017; Schohl et al., 2014; Yamada et al., 2020; Yoo et al., 2014). Both short term and long-term gains have been found by researchers examining the outcomes of PEERS.
Laugeson et al. (2009) examined social skills by comparing treatment and control groups. It was concluded that the intervention group who participated in PEERS improved their knowledge of social skills, increased frequency of hosted get-togethers, and enriched overall social skills as reported by the participants’ parents (Laugeson et al., 2009). Similar results were found by Laugeson et al. (2012) in which autistic adolescents who participated in PEERS significantly improved their overall social skills knowledge, social responsiveness, and specific social skills such as, social cognition, social awareness, social motivation, social communication, assertion, cooperation, and responsibility (Laugeson et al., 2012). Additionally, it was found that autism symptomology was reduced while the amount of peer interactions increased significantly (Laugeson et al., 2012). Continuing with the trend of efficacious results from RCTs examining PEERS, Schohl and colleagues (2014) attempted to replicate the studies of earlier research. Schohl et al. (2014) concluded from the first independent replication of PEERS research that when compared to a waitlist, individuals who participated in PEERS demonstrated significantly improved knowledge of friendship skills and engaged in a higher number of get togethers, while also having observed decreased levels of social anxiety, core autistic symptoms, and problem behaviors (Schohl et al., 2014). Regarding long-term outcomes for PEERS, Mandleberg et al., (2014) examined the durability of post-intervention success one to five years after program completion; adolescents maintained treatment gains on standardized measures of social skill outcomes (Mandleberg et al., 2014). Importantly, there was improved social skills gains post intervention that was attributed to social skill coaches (i.e., parents) continuing to implement PEERS skills after the intervention. It appears that PEERS is well established to produce gains in social skills while also reducing participants’ autism symptoms.
With PEERS demonstrating efficaciousness in improving social skills and reducing autism symptomology, research has examined if similar results hold true cross-culturally. As PEERS requires linguistic and cultural modifications when being used in various cultures, countries, or languages, it is important to understand if similar results seen in previous studies hold true. Of note, Yamada and colleagues (2020) examined the efficacy of the Japanese version of PEERS. They concluded that there were improvements observed in socialization, communication, knowledge of social skills, autistic mannerisms, and behavioral and emotional problems. Moreover, Yoo and colleagues (2014) examined the efficacy of PEERS in Korea. When compared to controls, a culturally modified version of PEERS was found to significantly improve social skills such as interpersonal skills and play/leisure skills, while simultaneously reducing depression and autism symptoms (Yoo et al., 2014). While there have been relatively few studies examining the cross-cultural effectiveness of PEERS, early research demonstrates that social skills improvements hold true through various cultures and languages.

In addition to the social skills benefits observed in the previous RCTs, Karst and colleagues (2015) examined the benefits PEERS has on family systems. They assessed the impact of PEERS on family chaos, parenting stress, and parenting self-efficacy post intervention. It was concluded that when compared to waitlist controls, PEERS significantly reduced the amount of family disruption and distress, grouped into the domain of family chaos (Karst et al., 2015). Currently, more research is needed in various associated system outcomes, as social skill challenges and autism symptomatology possess a wide-ranging impact on school and family systems. Nonetheless, it is apparent that RCTs examining PEERS efficacy demonstrate consistent results of improved social skill functioning and reduced autism symptomology.
While the aforementioned studies demonstrate efficaciousness in RCTs, Hill et al. (2017) examined the effectiveness in community settings. The researchers concluded that autistic individuals in a community sample demonstrated significant improvement in their social engagement, social cognition, social communication, and social motivation, while simultaneously evincing a reduction of internalizing autism symptoms (Hill et al., 2017). PEERS has been largely found to be efficacious in RCTs and has also been shown to be effective in community settings; however, the predictors for this success as well as the reasons for a lack of treatment gains is largely understudied.

To date, only two such research studies have been conducted (Chang et al., 2014; Mcvey et al., 2017). Chang and colleagues (2014) determined that adolescents with higher parent-reported baseline social skills demonstrated greater improvement in social skills following PEERS. Regarding gender, Mcvey et al., (2017) concluded that there were no gender differences in the outcome of PEERS as both male and female participants responded similarly to the intervention. However, Chang et al. solely relied on parent reported social skill improvements, used a small number of predictor variables, and did not report reliable change scores. Additionally, Mcvey and colleagues (2017) studied only the effects of gender on post-PEERS success. Nonetheless, this research is important as predictors of success in GSSIs are largely misunderstood. Due to the lack of literature investigating factors that may lead to social skills improvements in PEERS, it is imperative that increased knowledge is generated.

**Current Study**

While GSSIs, and specifically PEERS, have been extensively studied, not every participant demonstrates the social skills gains from the intervention largely reported in the literature (e.g., Gates et al., 2017; Moody & Laugeson, 2020; Wolstencroft et al., 2018). In fact,
many teens do not improve in the targeted skills and some even regress. We do not yet understand which individuals and what characteristics they possess that may lead to success within PEERS. This gap within the literature is imperative to examine as understanding the variables to success may allow researchers and program facilitators to tailor PEERS towards individuals with those characteristics most related to improvement (and potentially direct those who do not have such characteristics to other programs that may yield more positive benefit). Moreover, improvements to future social skill interventions may be created for those who may not find PEERS to create enhancement regarding their social skills. This study aims to examine which specific variables may lead to increased performance within PEERS to fill this gap within the literature. Extant data will be used to examine several research questions. The objective of this study is to further understand social skills interventions for autistic individuals and which characteristics individuals possess that lead to varying performances.

**Research Questions and Hypotheses**

This study addressed the following research questions (hypotheses in italics):

1. Is participant age related to outcome from completion of PEERS? *Participant age will not play a significant role in the outcome of social skills from PEERS.*

2. Is participant gender related to outcome from completion of PEERS? *Participant gender will not play a significant role in the outcome of social skills from PEERS.*

3. Is participant cognitive intelligence and/or EI related to outcome from completion of PEERS? *Individuals with higher levels of cognitive intelligence will illustrate a significant amount of success from the completion of PEERS.* *Individuals with higher levels of EI will demonstrate greater levels of social skill improvement resulting from PEERS.*
4. Is participant social cognition related to outcome from completion of PEERS? *Increased social cognition in participants will lead to significantly better outcome of social skills from PEERS.*
Chapter 3: METHODOLOGY

Participants

Extant data from 65 participants were analyzed to examine specific variables’ relation to improvement of social skills from completion of PEERS. The sample included 58 males (89%) and 7 females (11%), with an average age of 15.66 years (SD = 1.48; range = 13.30-18.80). The data was collected and adhered to all informed consent and ethical/regulatory guidelines. All participants were required to undergo a screening process, including a parent and child interview as well as an online questionnaire, to assess eligibility for PEERS and to acquire relevant background information. Inclusionary criteria for the present study required the extant data to include completed pre and post SSIS forms, and data on cognitive intelligence, EI, and social cognition. Demographic information is shown in Table 1.

Table 1

Demographic Information

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD)</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>15.66 (1.48)</td>
<td>13.30</td>
<td>18.80</td>
</tr>
<tr>
<td>Gender (% male)</td>
<td>89.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FSIQ-4</td>
<td>104.91 (15.34)</td>
<td>70.00</td>
<td>130.00</td>
</tr>
<tr>
<td>PRI</td>
<td>106.26 (17.78)</td>
<td>71.00</td>
<td>147.00</td>
</tr>
<tr>
<td>VCI</td>
<td>102.34 (14.81)</td>
<td>73.00</td>
<td>137.00</td>
</tr>
<tr>
<td>Change Score Parent</td>
<td>5.33 (9.40)</td>
<td>-14.00</td>
<td>34.00</td>
</tr>
<tr>
<td>Change Score Teen</td>
<td>4.83 (8.91)</td>
<td>-14.00</td>
<td>22.00</td>
</tr>
</tbody>
</table>

Note: age is presented in decimal form (i.e., 15 years, 6 months = 15.5). FSIQ is presented in standard score format (M = 100, SD = 15).

Measures

Autism Diagnostic Observation Schedule, Second Edition (ADOS-2)

The ADOS-2 (Lord et al., 2012) is a standardized assessment measure aimed at evaluating autistic symptomology. The ADOS-2 has five separate modules, one of which is selected for completion based on an examinee’s language ability and chronological age. The ADOS-2 is a Level C assessment (i.e., can be administered by trained individuals with masters or
doctoral training in psychology or related occupation) and is highly encouraged to only be used by examiners who have both clinical training with the measure and with experience in the realm of autism (Lord et al., 2012; McCrimmon & Rostad, 2014). With the hallmark symptoms of autism surrounding social/communicative impairments and restricted and/or RRBs, the ADOS-2 attempts to measure both domains. Specifically, the ADOS-2 examines symptoms of social affect (SA) and RRBs, including module four, which was recently reconceptualized from the original Autism Diagnostic Observation Schedule (ADOS; Lord et al., 1999) by Hus and Lord (2014).

In the present study, all participants completed either module three (under 16 years of age) or four (16 years or older). Module three is comprised of 14 activities and 29 coded items to be delivered to verbally fluent individuals under the age of 16. Separately, module four is made up of 15 activities and 32 coded activities used for verbally fluent participants over the age of 16.

Scoring of the ADOS-2 is completed by coding items specific to each module under the domains of language and communication, reciprocal social interaction, play and imagination, stereotyped behaviors and restricted interests, and other behaviors (McCrimmon & Rostad, 2014). Codes are based on behavioral and language observations made throughout the measure. Codes 0 to 3 deal specifically with the absence or presence of atypical behaviors, language ability, or other atypical behaviors. Codes are then put into an algorithm and summed to provide insight into autistic symptomology and assist in the possible diagnosis of autism.

Standardization of the ADOS-2 was completed on a sample of 1,574 children who were majority male (57%-86%) and white/European (71%-91%). Within the sample, the participants received diagnoses of autism, other developmental disorders, or were typically developing. The ADOS-2 illustrates strong internal consistency for the SA domain (.87-.92) and adequate alpha
values for the RRB domain (.51-.66) in modules one to three. With the recent re-standardization of module four by Hus and Lord (2014), new reliability and validity calculations were conducted. Results demonstrated similar internal consistencies compared to the first three modules for both the SA domain (.84) and for the RRB domain (.61), respectively. Inter-rater reliability for all module four items exceeded 80 percent. Hus and Lord’s (2014) work on module four also demonstrated significant contributions to diagnostic classification in both the SA and RRB domains. With respect to the test-retest reliability of the ADOS-2, a sample of 75 participants were used with participants having the same module readministered within a ten-month separation period. Results indicated that for both the SA and RRB domain, correlations ranged from .68 to .92. Regarding inter-rater reliability, item coding across all modules was 71% or higher. Moreover, correlations in the SA and RRB domains ranged from .79 to .98 across the five modules. Most importantly, diagnostic classification demonstrated strong inter-rater reliability ranging from 92% to 98%. Content and construct validity was completed through selecting codes for inclusion based on their unique contribution to the original ADOS algorithm, creating two domains based on clinically meaningful behaviors. Factor analysis examined the goodness of fit and correlation of items in the new two domain model (SA and RRB). Logistic regression demonstrated that both domains significantly contribute to an autism diagnosis; however, the two domains combined produced the highest predictive value of an autism diagnosis. Predictive validity of the ADOS-2 demonstrated similar or improved sensitivity (60%-95%) and specificity (75%-100%) compared to the original ADOS.

All administrations for the present research were administered by trained clinicians and were recorded and reviewed by a certified ADOS-2 trainer to ensure valid and reliable administration and results.
**Social Skills Improvement System (SSIS)**

The SSIS (Gresham & Elliot, 2008) measures social skills of 8- to 18-year-olds. It is a revised version of the Social Skills Rating System (SSRS; Gresham & Elliott, 1990), with improvements in areas such as updated norms, four additional subscales, greater overlap across forms, validity scales, and improved psychometric properties (Crosby, 2011). The SSIS is a Level B measure (i.e., can be administered by individuals with at least a bachelor’s degree in psychology or related occupation).

The SSIS consists of three different age groupings: preschool (ages 3 to 5), younger students (ages 8 to 12), and older students (ages 13 to 18). Within these age groupings, the SSIS relies on multi-raters, as there are specific forms for teachers, parents, and students to measure observed social skills. The SSIS is concerned with the frequency and perceived importance of positive behaviors demonstrated by the student as well as problem behaviors that impact a student’s ability to engage in appropriate social skills (Crosby, 2011). Parents or teachers provide responses to question stems in a four-point Likert fashion ranging from “never” to “almost always”, whereas students’ four-point responses range from “not true” to “very true”. Exclusive to the older students (ages 13 to 18) age range, all raters are asked to rate the importance of each specific problem behavior or social skill.

Only the social skill domain was used in the current study, consisting of areas such as communication, cooperation, assertion, responsibility, empathy, engagement, and self-control. To understand each domain further, subscale descriptions are provided. For example, in the domain of social skills, the subdomain of cooperation may be labelled with a behavior level of “below average”, “average”, or “above average”. Additional psychometric properties such as
validity index scores, confidence intervals, the standard error of measurement, adjusted scores, and validity indexes are also provided (Gresham et al., 2010).

Development of the measure included a sample of 4,700 children with ages ranging from 3-18 (Gresham & Elliot, 2008). The U.S. Census Bureau’s (2006) population survey was employed to ensure adequate sampling distribution, such as participant socioeconomic status, ethnicity, and geographic region. There was an equal number of male and female participants in each age group (Crosby, 2011; Gresham et al., 2010). Authors also controlled for individuals with special education program placement or varying externalizing and internalizing disorders. Regarding the reliability of the three domains, median alpha levels are .90 or higher with median alpha values of the subscales ranging from .70 to .80 on parent/teacher forms and self-report forms, respectively (Crosby, 2011; Gresham et al., 2010). Test-retest reliability is .71 (student form) to .81 (parent form). Inter-rater reliability of the parent and teacher forms ranges from .50-.60 (Crosby, 2011; Gresham et al., 2010). Gresham and Elliot (2008) also ensured content validity by including items that were highly correlated to each domain by running factor analyses, differential item functioning, and item-total correlations. Additionally, items were selected by utilizing content guidelines for social skills and employing the DSM-IV-TR (APA, 2000) to validate problem behavior items (Crosby, 2011). Concurrent validity was also demonstrated to be adequate, with correlations to the SSRS (Gresham & Elliott, 1990), Behavior Assessment System for Children, 2nd ed. (BASC-2; Reynolds & Kamphaus, 2004), and Vineland Adaptive Behavior Scales 2nd ed. (Sparrow et al., 2005). Furthermore, special population studies demonstrated significant differences in subscales of academic performance, social skills, and problem behaviors, when compared to typically developing individuals (Gresham et al., 2010).
Wechsler Abbreviated Scale of Intelligence, Second Edition (WASI-II)

The WASI-II (Weschler, 2011) is an abbreviated measure of cognitive ability designed for individuals between 6-90 years of age. The WASI-II has two separate forms, a four-subtest form that takes around 30 minutes to complete and a two-subtest form that takes 15 minutes to complete. Administration of the WASI-II is limited to Level C practitioners (i.e., individuals with a masters or doctoral training in psychology or related profession, or by individuals with a bachelor’s degree under supervision of the aforementioned trained individuals).

The WASI-II’s development was aimed at bridging the gap between current intelligence assessments for adults (Weschler Adult Intelligence Scale-4th Edition [WAIS-IV]; Weschler, 2008) and children (Weschler Intelligence Scale for Children-4th Edition [WISC-IV]; Weschler, 2003) while simultaneously improving the overall functionality and psychometric properties from the previous version WASI (Weschler, 1999). With respect to the WASI-II’s subtests, those with the highest factor loadings on general intelligence (g) were selected (McCrimmon & Smith, 2013). Specifically, the four-subtest form is comprised of a Verbal Comprehension Index (VCI; Vocabulary and Similarities) and a Perceptual Reasoning Index (PRI; Block Design and Matrix Reasoning) which in turn form the Full-Scale IQ-4 Subtests (FSIQ-4). Conversely, the Full-Scale IQ-2 Subtests (FSIQ-2) consists of Vocabulary and Matrix Reasoning. For this study, the four-subtest form was employed to garner VCI, PRI, and FSIQ scores to be used in the analysis. For participants to be eligible for the present study, VCI, PRI, and FSIQ scores were all required to be above 70. While the four-subtest form was used to glean verbal and perceptual reasoning abilities, only PRI and FSIQ were included in the analysis for two reasons. First, performance intelligence (PIQ) which can be generalized as non-verbal skills, has been found to be directly related to social skill acquisition in autistic individuals (Saulnier & Klin, 2007). Conversely,
verbal intelligence (VIQ) has been found to be more related to receptive and expressive language abilities and not real-world social skill ability (Saulnier & Klin, 2007). Second, including VCI within the analysis may have created issues with statistical power and therefore increased the risk of type two errors. Moreover, including VCI in the analysis may have created multicollinearity issues or led to the model being overfit, producing poor predictions on social skill improvement. Therefore, VCI was important for screening participant intellectual ability but was left out of the multiple regression model.

The WASI-II’s technical adequacy is strong, with satisfactory test standardization, reliability, and validity (McCrimmon & Smith, 2013). The WASI-II was standardized on a sample of 2,300 examinees with varying ages, ethnicities, sex, education level, and geographical location consistent with the U.S. Bureau of the Census (2008). Normative participants were representative of special education students, varying levels of cognitive functioning, and mental health concerns (McCrimmon & Smith, 2013). Additionally, the standardization sample was split into a child (6-16) and adult sample (17-70). In terms of the WASI-II’s reliability, internal consistency scores of the child sample ranged from good (.87) to excellent (.91), with the adult sample demonstrating excellent consistency scores (.90 to .92). Inter-rater reliability was very high for PRI (.98-.99) and VCI (.94-.95) subtests. Test-retest stability ranged from acceptable to excellent for both the child and adult sample. The WASI-II’s validity in measuring cognitive ability similar to the WISC-IV and WAIS-IV was also examined. The internal structure of the WASI-II was found to be adequate, as results from both a confirmatory and exploratory factor analysis were found to support the unique factors and overall test structure. The WASI-II’s concurrent validity was proven to be acceptable (0.71) to excellent (0.92) when compared to the WASI, WISC-IV, and WAIS-IV. Special group studies including participants with mental health
disorders and varying cognitive abilities demonstrated that measurements of their cognitive ability are accurate in accordance with their diagnosis (McCrimon & Smith, 2013).

**BarOn Emotional Quotient Inventory: Youth Version Short Form (BarOn EQ-I: YV[S])**

The BarOn EQ-I: YV(S) (Bar-On & Parker, 2000) is a measure of EI such as one’s ability to understand feelings, empathize with others, and adapt to novel social situations. The age range for the BarOn EQ-I: YV(S) is seven to 18 years of age. The measure is available in long (60 item) and short (30 items) versions; the short form was utilized in the present study. The administration time of the short form is approximately 10 minutes and can be administered by those with level B classification. The measure uses a four-point Likert scale ranging from “not true of me: never, seldom” to “very much true of me: very often”. Responses on the four-point Likert scale are tallied to create four subscales examining various constructs of EI and a total measure of EI. The first subscale is the interpersonal scale, concerned with an individual’s ability to engage in empathy and fulfill social responsibility. Next, an intrapersonal scale measures an individual’s self-awareness in social situations. Third, a stress management subscale examines the stress tolerance and ability to control impulses in varying social situations. Finally, the adaptability subscale measures a participant’s ability to problem solve socially and adapt to new situations. In addition to the subscales and total EI score, the BarOn EQ-I: YV(S) also provides a Positive Impression Index that is useful in examining if a participant is responding in a certain way to improve their self-impression.

For this study, only the total EI and intrapersonal scale scores were analyzed. The decision to only observe these scores was deemed appropriate due to the fact the total EI score provides a holistic examination of an individual’s EI, whereas the intrapersonal subscale examines constructs explicitly related to social skills and areas targeted by PEERS. The
The intrapersonal subscale is the most comprehensive, exploring five domains necessary for social competence (e.g., self-regard, emotional self-awareness, assertiveness, independence, and self-actualization). As outlined by Wood and colleagues (2009), the intrapersonal subscale embodies the ability to identify, label, and understand emotions, which are necessary for developing appropriate social behaviors through understanding other social agents’ perspectives and emotional responses. Additionally, PEERS specifically targets participants’ ability to take the perspective of others, which is necessary for informing social behaviors, such as if someone is interested in a conversation you may be engaging in with them. Overall, total EI and the intrapersonal subscale appear to be the most related to social skill acquisition and ability and were therefore the only two BarOn EQ-I: YV(S) subscales analyzed.

The BarOn EQ-i:YV (S) demonstrates adequate technical quality in regard to the normative sample, reliability, and validity. The normative sample included 9,172 youth ranging in age from seven to 18 years. Bar-On and Parker (2000) reported a diverse sample regarding ethnicity, geographical region, and socioeconomic status, with participants being recruited from elementary, junior high, and high schools in various regions of Canada and the United States. Internal consistency reliability estimates ranged from .65 to .87. Test-retest coefficients demonstrated strong reliability, with estimates ranging from .77 to .87. A factor analysis demonstrated moderate loading on the factor (Intrapersonal, Interpersonal, Stress Management, and Adaptability) that each item in the measure was designed to measure, and low loadings on other factors (Bar-On & Parker, 2000). There were high intercorrelations reported between the long and short versions of the measure with scale scores for the same scale on long and short forms demonstrating correlations ranging from 0.92 to 1.0. The construct validity was adequate with moderate to high (0.56 to 0.88) correlations with scale scores on the adult version of the
EQ-i. Additionally, significant correlations were found between the Intrapersonal and Interpersonal scales when compared to Costa and McCrae’s (1992) NEO-Five Factor Inventory and its Extraversion and Agreeableness scales. There was also significant correlation between the Adaptability and total EI scores when compared with FSIQ scores on the Wechsler Intelligence Scale for Children-III (Weschler, 1991). The BarOn EQ-i:YV (S) also possesses the ability to predict externalizing and internalizing behaviors measured by measured by the BASC-2 (Reynolds & Kamphaus, 2004; Shuler, 2004).

**Social Responsiveness Scale–Second Edition (SRS-2)**

The SRS-2 (Constantino & Gruber, 2012) is a rating scale concerned with social behavior and communication impairments commonly related to autistic symptomology. The SRS-2 is helpful in providing a more comprehensive autism diagnosis as well as pinpointing specific social domains that individuals may find challenging (Bruni, 2014). The SRS-2 has forms across three age bands: preschool (2.5 years to 4.5 years), school age (4 years to 18 years), and adults (19 years to 89 years). The preschool and school age forms are completed by parents or teachers, whereas the adult age form includes a self-report or other rater forms. Only the school age form completed by parents was examined in this study. Items on the school age form are scored on a four-point Likert scale, ranging from “not true”, “sometimes true”, “often true”, to “almost always true”. Of the 65 items, results are reported in subscales (Social Awareness, Social Cognition, Social Communication, Social Motivation, and Restricted Interests and Repetitive Behavior) that cover social skills and common autistic symptomology as well as a total overall score. The Social Awareness subscale contains eight items and details an individual’s ability to process the social behavior of others. The Social Cognition subscale has 12 items and is concerned with how individuals understand social behavior.
includes 22 items and encapsulates how a person engages in mutual communication with others. The Social Motivation subscale contains 11 items that examine the participants motivation to engage in social interactions with others. Finally, the Restricted Interests and Repetitive Behavior subscale is 12 items that assesses an individual’s engagement in repetitive behavior or possess constrained interests. Scores on each of the subscales are calculated as T-scores that describe clinically significant (T > 76), moderate (T between 66 and 75), mild (T between 60 to 65), and no indication (T < 59) of social difficulties associated with an autism diagnosis.

For this study, only total overall score of the five subscales was used in the analysis. This decision reflects the desire to observe how overall social behavior and communication impairments related to social cognition challenges in autistic youth may predict social skill improvement post PEERS. Since all five subscales are associated with social cognition impairments and common autistic symptomology, it proved superfluous to examine any subscales individually.

The school age form was normed using 2,025 ratings of 1,014 children across 16 age levels. According to Constantino and Gruber (2012), the normative sample closely matched the U.S. Census Bureau’s (2009) population survey, with similar socioeconomic status, education level, ethnicity, and geographic placement. The internal consistency of the SRS-2 is strong with reliability coefficients ranging from .94 to .96 across all age bands in both a clinical and normative sample. Test-retest reliability was not examined in the SRS-2; however, the original SRS (Constantino, 2005) demonstrated test-retest reliability ranging from .88 to .95. With respect to inter-rater reliability of the SRS-2, correlations for the school age form, preschool form, and adult forms were .77 and .61, respectively and the adult form ranged from .61 and .92.
The disparity in inter-rater reliability stems from the different environments each rater observes the individual in, ranging from, schools, homes, and workplaces (Bruni, 2014).

The SRS-2’s content validity was only slightly altered, as the SRS became the school age form on the SRS-2 and adjustments were made on the school form for the adult and preschool forms to accommodate the new age bands (Bruni, 2014). Content on the SRS-2 was based on diagnostic specifiers of autism based on the *DSM-IV-TR* (APA, 2004) as well as input from special education and parents of children on the autism spectrum. Construct validity indicated that a two-factor model (social communication and restricted interests and repetitive behavior domain) demonstrated adequate goodness of fit (Bruni, 2014). A mean difference analysis found a large effect size (Cohen’s $d = 2.7$) when comparing autistic and neurotypical participants, as autistic individuals scored significantly higher raw scores. Moreover, the predictive validity of the SRS-2 was found to have a sensitivity value of .92, demonstrating that the SRS-2 accurately identifies individuals with social skill deficits meeting criteria for autism. Concurrent validity was also strong as the SRS-2 was concluded to possess moderate to high correlations with other rating scales of social skills (e.g., Social Communication Questionnaire [Rutter, et al., 2001] and Social and Communication Disorders Checklist [Skuse et al., 2005]).

**Procedure**

**Data Collection**

Extant data from a six-year period, ranging from 2013 to 2019, was utilized for this study. Only data pertaining to social skill, cognitive, social cognition, and EI were included. Social skill data was examined through change score analysis; data gathered at two time points were used for this purpose: one week before (T1) and one week after (T2) the intervention.
During the period in which data was collected, PEERS research and the PEERS intervention were distinct entities. Families who were accepted into PEERS were provided with the choice to participate in research or solely engage in the intervention. Teens who accepted research participation invites completed various inclusionary measures (e.g., ADOS-2, WASI-II) to ensure that they met criteria for an autism diagnosis and to ensure they had the cognitive ability to properly engage with the PEERS curriculum. Individuals who fell below criteria requirements (i.e., failed to exceed threshold for a diagnosis on the ADOS-2 and/or scored below 70 on either VCI or PRI components of the WASI-II) were able to complete the intervention but were not included in the research. Both families and teens participating in the research aspect were provided monetary compensation for their time in completing the research measures.

**Intervention**

Eligible teens and their parent(s) participated in PEERS facilitated by registered psychologists and graduate student clinicians who were certified in the program’s delivery. The intervention team consisted of two PEERS facilitators (one for the teen group and another for the parent group) and two behavioral coaches (both in the teen group) who supported the teen facilitator via demonstrative role-plays, assisting in behavioral rehearsals, and promoting appropriate behavior of participants. Each intervention cohort ran for 14 weeks with each session lasting approximately 90 minutes. Participants from 13 cohorts were included in the present study.

The intervention was separated into two groups, a teen group and an accompanying parent group. Teen participants were led through didactic lessons encompassing topics such as conversational skills, entering group conversations, exiting conversations, electronic communication, appropriate use of humor and get togethers. Throughout each session, role plays
were acted out by the behavioral coaches, while participants engaged in social perspective taking, pinpointing specific skills used that made the simulated social situation either effective or unsuccessful. In addition to role plays, teens were also placed into smaller groups to practice the learned skills through behavioral rehearsals with behavioral coaches and facilitators. At the end of each session, participants were given homework to practice for the following week. Each homework assignment dealt with the specific skills learned that week and encouraged the participants to engage in practice social situations while utilizing novel learned skills with their family members or peers. With each new week, the facilitator reviewed the homework ensuring completion while also allowing participants to voice areas in which they struggled, to tailor recommendations to each teen’s specific needs.

Concurrently, a parent group was run by another PEERS facilitator to enable parents to become social coaches to practice learned skills throughout the week and ensure treatment gains of the teens long term. The main goal of the parent sessions is to provide psychoeducation regarding specific skills teens are learning and afford parents the ability to provide social coaching to their teens. Parents are informed of the homework assignments, behavioral rehearsals, and expectations for the teens to be active participants in their teen’s social skill development. Additionally, each parent session allows for parents to voice concerns or questions they may have regarding certain lagging skills, while the facilitator offers troubleshooting opportunities.
Chapter 4: ANALYSIS AND RESULTS

The use of change scores and multiple regressions were employed to explore which characteristics and abilities autistic individuals retain that lead to social skill improvement following PEERS social skills interventions. This chapter elucidates the procedure of measuring change in social skills post-intervention regarding variables such as social cognition, EI, gender, age, and intellectual ability. Further, factors such as the requirements and assumptions used while preparing the data for analysis and during the multiple regression analyses are described. This chapter spotlights the specific analytic procedures used to measure social skill change post PEERS intervention and the results of the statistical analyses used.

Change Scores/Difference Scores

Change scores provide a metric of the raw gain observed by individuals as an index of change over time or the difference between two measures using the same sampling unit (Cronbach & Furby, 1970; Furr, 2018). Considerations surrounding difference scores are often associated with classical test theory, in which a participant’s observed score is a function of their true score plus error. One of the most common applications of the difference score is to compare the amount of change from pre-test to post-test across groups (Cronbach & Furby, 1970; Furr, 2018). By comparing pre-post change between groups, the statistic examines the null hypothesis of no difference across groups in the amount of raw change between the time points (Jennings & Cribbie, 2016). Quite simply, a positive value signifies an observable amount of positive change or a successful intervention. Conversely, a negative value indicates an observable amount of declining skill over the two time periods. Finally, no difference (a change score of zero) indicates no change of skill or behavior. While change scores appear to be a straightforward statistical analysis method, there are specific flaws and interpretation biases that must be accounted for.
**Change Score Biases**

While the methodology of measuring growth and change through two time points has been used in psychological research for years, many studies use the analytical method incorrectly. One of the most prolific issues observed in employing change scores when measuring growth is Lord’s paradox (1967). To understand Lord’s paradox (1967), it becomes imperative to also understand separate measures of growth and change, specifically analysis of covariance (ANCOVA). ANCOVA treats pre-test scores as a covariate that can be a source of variation that can affect post-test scores, and accordingly the post-test score is regressed on both the pre-test score and the grouping variable. ANCOVA adjusts the pre-test scores, increasing the power to determine whether there has been a treatment effect. This approach tests the null hypothesis of no difference between the control and treatment post-test scores, conditional on the pre-test scores. Researchers often rely on ANCOVA instead of change scores when investigating group differences. The use of change scores and ANCOVA both came into question when Lord (1967) examined the effects on students’ weight from cafeteria food provided in different university dining halls and if there were any observable sex differences in these effects. Specifically, the weight of each student was measured at the time of their arrival in September and then their weight the following June was recorded. The concern that was observed was that change scores and ANCOVA both seem viable when measuring growth and change, but Lord (1967) observed that each approach led to different statistical outcomes. Specifically, when running one analyses, there was no significant difference between dining halls yet there was a significant difference between dining halls and their effect on student weight when running the other (Lord, 1967). Statistically, this discrepancy occurs because T-tests within change scores ask if the average gain is different for the two groups and the ANCOVA asks if the average gain,
while partiaalling out pre-test scores, is different between the two groups. Lord’s paradox (1967) points out that the choice of analysis is a main issue with measuring change because many researchers don’t understand what they are truly asking with their research questions or what they are measuring and therefore may end up with fallacious results. Lord (1967) concluded that neither approach can properly account for uncontrollable pre-existing group differences. Lord’s paradox demonstrates that varying statistical analyses may produce fallacious results due to incorrect research methodology; though, there are other issues that impact change scores as well.

One of these issues is the law of initial values, first described by Wilder (1958). While this law was proposed in a biological sense, it is applicable and must be acknowledged when measuring any psychological phenomenon. The law states that the direction of response of a body function to any agent depends to a large degree on the initial level of that function (Wilder, 1958). Therefore, measuring any form of change will be greatly influenced by a participant’s initial value and can lead researchers to make trivial conclusions from the participant data. For example, a researcher may want to examine if participants’ heart rate will be lower after a two-week fitness class. As different participants may vary in their fitness levels as well as their average heart rate, it would be fallacious to conclude that a change score has given a true generalization of the phenomenon at hand. Specifically, there will be an extreme bias for unfit people to illustrate change. The observed effect is simply an artifact of the statistical method and the law of initial values, not a real finding. Further examinations of the flaws of change scores are discussed by Bryk and Raudenbush (1987). Specifically, they describe how low reliability of change scores may indicate that the measures are incapable of supporting precise statements about individual change. Although there are various flaws with change scores, some are natural biases that are seen in many statistical techniques. Moreover, change score biases may be
accounted for by measuring the reliability before running analysis and ensuring the study is both asking and measuring the correct constructs.

Given the issues with change score analysis, the present research is mindful of the results needing to be exploratory in nature while simultaneously avoiding overgeneralization of findings, which may be influenced by unavoidable natural statistic biases. As well, the law of initial values is accounted for in the analysis as varying levels of social skill change are acknowledged to be participant dependent. Simply put, the present study is not interested in which individuals make the most gains and drawing fallacious conclusions, but rather which variables relate to improved social skills after completion of PEERS. Therefore, the present study is not measuring an artifact of the statistical method. The present study also ensured reliable change score measurements to reduce inaccurate measuring of change observed in participants and appropriate measuring of correct constructs.

**Change Score Reliability**

A common inaccuracy that has occurred is that researchers rely solely on change scores as a predictor of growth and change without estimating the reliability of the change score measure itself (Furr, 2018). If the change score measure itself is not reliable, both the methodology and data analysis of a study are flawed and ungeneralizable. As with any measure, it is important that change scores are a reliable examination of a phenomenon. If specific change scores can be concluded as reliable, issues such as psychometric biases can be mitigated to draw meaningful conclusions from the hypotheses generated (Furr, 2018). In fact, a reliable change score allows a researcher to understand the degree to which an observed difference reflects a true psychological phenomenon (Furr, 2018).
It was imperative that the change score measure be reliable to determine if change, such as social skill improvement in the present study, is measured accurately. Three sets of information were utilized to estimate the reliability of a change score in this study. Specifically, two change score reliabilities must be estimated, the parent SSIS change score and student SSIS change score. The first value used in the reliability calculation is the estimated reliability of each of the two tests used to compute the difference score. Second, the variability of the tests observed scores must be examined. Finally, the correlation between observed test scores. Once those values are obtained, they are placed in the following equation: variance of observed test scores ($S^2_{x0}, S^2_{y0}$) multiplied by the reliability ($R_x, R_y$) of the test scores minus two times the correlation of the observed test scores multiplied by the square root of the variances ($S_{x0}, S_{y0}$). Those values are then divided by the pre- and post-variances added together minus two times the correlation ($r_{x0y0}$) of the observed test scores multiplied by the square root of the variances.

$$R_d = \frac{s^2 x0 R_{xx} + s^2 y0 R_{yy} - 2r_{x0y0} s_{x0} s_{y0}}{s^2 x0 + s^2 y0 - 2r_{x0y0} s_{x0} s_{y0}}$$

The change scores in the present study were deemed reliable through the above reliability calculation, with reliability coefficients of .80 and .79 for parent and student change scores, respectively. Parent change score reliability alpha (.80) represents a good range, whereas student change score reliability alpha (.79) represents an acceptable range according to Chronbach (1951). While there are varying reports on reliability ranges, it is largely agreed that reliability coefficients must be above .70 to be regarded as acceptable, and usually range from .70-.95 (Devellis, 2016; Tavakol & Dennick, 2011). However, even with reliable change scores, measurements of change within the study must be interpreted appropriately. More specifically, it is apparent that change scores may possess statistical biases; however, this study strives to not
overinterpret the results of the statistical analysis or overgeneralize the findings. While increased time point analysis would ease specific biases, this study relies on extant data. Therefore, the overall goal of this study is to inform future research and spur future novel findings regarding group social skills interventions for autistic individuals. Through exploring what specific variables individuals possess that lead to success in PEERS, the present study may be able to provide the underpinnings for the creation of other successful group social skill interventions and choose specific individuals for PEERS to maximize outcomes.

Data Cleaning

Data cleaning methods and tests were employed to examine key features of the data collected from previous PEERS cohorts (e.g., outliers, missing data, distributional forms, homoscedasticity, multicollinearity). After running descriptive statistics to observe the accuracy of the input data, it appeared that all participant scores were in the acceptable ranges for each measure, and skewness and kurtosis values were not out of range for any variable. Next, histograms were created to examine outliers, skewness and kurtosis, and normal distribution in a visual manner. When observing the histograms, skewness and kurtosis levels aligned with a normal distribution. After normal distribution was observed, boxplot analysis was completed to observe any outliers. Four outliers were discovered in the FSIQ and PRI measures of the WASI-II with all four participants having scores below 70 on either the FSIQ or PRI measures. Since participant PRI and FSIQ levels were required to be over 70, these four participants were deleted before analysis, as they were not statistically valid for this study. The next step was to examine missing value patterns and expectation-maximization (EM) means. It was found through the Little’s MCAR test that the data were missing completely at random as there were no significant EM means. Given this result, multiple imputation was a viable choice to fill in missing data.
points on measures that may not have been completed by participants. However, with the variability of autistic samples such as inconsistent levels of intelligence, social cognition, and EI, it was decided to delete participants with over 20% of missing data to maintain a more natural sample. Due to this choice, an additional 18 participants were deleted from the sample. There were 10 participants with a single missing variable (which was below the threshold of 20%), such as those who may have been missing a parent change score but had a valid self-report change score that added value to the analysis, and therefore remained in the sample. After 22 participants were deleted due to missing data and outliers who did not meet inclusion criteria of having FSIQ, VCI, and PRI over 70, all descriptive and visual statistics were run a second time to observe any outliers; none were identified, creating a final sample size of 65 participants.

Analysis

SSIS ratings for both pre- and post-intervention were completed separately by teens and parents to derive a change score. As two change scores were used, the research questions examining intellectual ability, EI, social cognition, age, and gender on the outcome of social skill improvement through PEERS is examined through two lenses: parent and self-report. This is important because teens and parents may rate social skill improvement differently both before and after they have completed PEERS. Two multiple regressions were used for parent and teen change scores to observe which variables affect variation in social skills post intervention. Multiple regression allows this study to determine the overall model fit (variance explained) and the relative contribution of each predictor (age, gender, social cognition [total SRS-2 score], EI [BarOn EQ-I: YV(S) intrapersonal subscale and total EI score], and intellectual ability [WASI-II FSIQ and WASI-II PRI]) to the total variance explained in social skills change scores.
Results

**Teen Change Score**

A multiple regression was run to predict social skill improvement from age, gender, social cognition [total SRS-2 score], EI [BarOn EQ-I: YV(S) intrapersonal subscale and total EI score], and intellectual ability [WASI-II FSIQ and WASI-II PRI]). After the data was cleaned, there was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was independence of residuals, as assessed by a Durbin-Watson statistic of 2.075. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. There were no studentized deleted residuals greater than ±3 standard deviations, no leverage values greater than 0.2, and values for Cook's distance above 1. The assumption of normality was met, as assessed by a Q-Q plot and histogram. The results of the regression indicated that the model explained 34.3% of the variance. The multiple regression model was statistically significant in predicting teen social skill change scores, \( F(7, 52) = 3.833, p < .05, \) adj. \( R^2 = .26. \) However, only the WASI-II FSIQ-4 (\( B = .49, p < .001 \)) and WASI-II PRI (\( B = -.49, p < .001 \)) variables added statistical significance to the prediction. The size and direction of the relations suggest that higher overall FSIQ with lower PRI predicts improved social skills and, in turn, better outcomes from the PEERS intervention.

<table>
<thead>
<tr>
<th>Change Score</th>
<th>( B )</th>
<th>95% CI for ( B )</th>
<th>95% CI for ( B )</th>
<th>( SE )</th>
<th>( \beta )</th>
<th>( R^2 )</th>
<th>( \Delta R^2 )</th>
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<tbody>
<tr>
<td>Model</td>
<td>.59*</td>
<td>.34*</td>
<td>.59*</td>
<td>.34*</td>
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<td>Age</td>
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<td>2.305</td>
<td>.758</td>
<td>.785</td>
<td>-.736</td>
<td>2.305</td>
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<tr>
<td>WASI-II FSIQ-4</td>
<td>.488</td>
<td>.248</td>
<td>.729</td>
<td>.120</td>
<td>.488</td>
<td>.248</td>
<td>.729</td>
</tr>
</tbody>
</table>

Table 2

Multiple regression results for teen change scores
WASI-II PRI - .494 -.691 -.296 .098 -.975***
Baron Intra -.081 -.113 .275 .097 .142
SRS-2 -.057 -.301 .187 .122 -.055
Baron TEQ .006 -.186 .198 .096 .009

Note. Mode = “Enter” method in SPSS Statistics; $B$ = unstandardized regression coefficient; CI = confidence intervals; $LL$ = lower limit; $UL$ = upper limit; $SE B$ = standard error of the coefficient; $\beta$ = standardized coefficient; $R^2$ = coefficient of determination; $\Delta R^2$ = adjusted $R^2$. *$p < .05$ **$p < .01$ ***$p < .001$.

**Parent Change Score**

A multiple regression was run to predict social skill improvement from age, gender, social cognition [total SRS-2 score], EI [BarOn EQ-I: YV(S) intrapersonal subscale and total EI score], and intellectual ability [WASI-II FSIQ and WASI-II PRI]). After the data was cleaned, there was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was independence of residuals, as assessed by a Durbin-Watson statistic of 2.044. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. There was one case of studentized deleted residuals greater than ±3 standard deviations; however, it was not deemed to be an influential data point. There were no leverage values greater than 0.2, or values for Cook's distance above 1. The assumption of normality was met, as assessed by a Q-Q plot and histogram. The results of the regression indicated that the model explained 6.1% of the variance. The multiple regression model was not statistically significant in predicting parent social skill change scores, $F(7, 49) = 0.457, p = .86$, adj. $R^2 = -.07$. Moreover, none of the variables significantly added to the prediction.

**Table 3**

*Multiple regression results for parent change scores*
<table>
<thead>
<tr>
<th>Change Score</th>
<th>( B )</th>
<th>95% CI for  ( B )</th>
<th>95% CI for  ( B )</th>
<th>( SE B )</th>
<th>( \beta )</th>
<th>( R^2 )</th>
<th>( \Delta R^2 )</th>
</tr>
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<tbody>
<tr>
<td>Model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-10.078</td>
<td>-57.327</td>
<td>37.172</td>
<td>23.512</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>.781</td>
<td>-1.036</td>
<td>2.597</td>
<td>.904</td>
<td>.127</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WASI-II FSIQ-4</td>
<td>-.149</td>
<td>-.446</td>
<td>.148</td>
<td>.148</td>
<td>-.247</td>
<td></td>
<td></td>
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<tr>
<td>WASI-II PRI</td>
<td>.139</td>
<td>-.114</td>
<td>.392</td>
<td>.126</td>
<td>.267</td>
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<td>Baron Intra</td>
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<td>-.270</td>
<td>.218</td>
<td>.121</td>
<td>-.044</td>
<td></td>
<td></td>
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<tr>
<td>SRS-2</td>
<td>.150</td>
<td>-.167</td>
<td>.466</td>
<td>.157</td>
<td>.140</td>
<td></td>
<td></td>
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<tr>
<td>Baron TEQ</td>
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<td>-.255</td>
<td>.240</td>
<td>.123</td>
<td>-.012</td>
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</tbody>
</table>

Note. Mode = “Enter” method in SPSS Statistics;  \( B \) = unstandardized regression coefficient; CI = confidence intervals; \( LL \) = lower limit; \( UL \) = upper limit; \( SE B \) = standard error of the coefficient; \( \beta \) = standardized coefficient; \( R^2 \) = coefficient of determination; \( \Delta R^2 \) = adjusted \( R^2 \). *\( p < .05 \) **\( p < .01 \) ***\( p < .001 \).
CHAPTER 5: DISCUSSION

The current study explored the variables present in autistic teens that predict social skill improvement after completing PEERS. There is currently an abundance of literature supporting the effectiveness of PEERS in improving social skill abilities in autistic teens; however, a lack of knowledge regarding what characteristics may make those individuals successful and demonstrate improved social skills. The present study explored these issues in the context of four research questions to redress this gap within the literature and inform future research.

Research Question 1

The first research question asked if participant age would relate to varying outcomes from completion of PEERS. Although it has been demonstrated that PEERS participants show social skill improvement (e.g., Hill et al., 2017), this current study examined the specific effects of the age of participants on their social skill improvement. Previous research that has examined the effects of baseline age in predicting positive social skills in PEERS indicated no effect (Chang et al., 2014). Due to this previous finding, the present study hypothesized that age would similarly not predict social skill improvement. Analysis of parent and teen change scores through respective multiple regressions revealed that neither participant group reported a significant effect of age (p > .05). The lack of significance of age in the current study could be due to the fact that other variables that are not affected by age may play a larger role in social skill improvement. For example, participants may have varying levels of intelligence, social awareness, or participation levels, all of which may have more greatly affected social skill improvement regardless of age. Moreover, PEERS is designed to be administered to individuals aged 13-18, with no known age differences in terms of the digestibility of content. Therefore, the result observed in this present study with age not being a significant predictor of social skill
success further proves that the age ranges for the PEERS program are appropriate, with all participants having equal opportunity to succeed. However, the restriction of age range being 13-18 has the potential to influence the significance of which the variable may have on social skill change. For example, with ages less than 13 or more than 18, the variable may play a more significant role in influencing outcome post PEERS intervention.

**Research Question 2**

The second research question was directed at examining if participant gender would predict the outcome from the completion of PEERS. Past examinations of participant gender’s possible influence on social skill improvement through PEERS was examined by Mcvey and colleagues (2017). It was concluded that gender did not significantly impact the outcome of PEERS, as both males and females were observed to be equally successful in demonstrating social skill acquisition. Examinations of Mcvey and colleagues (2017) research helped inform the present study’s hypothesis of there being no significant prediction of success in PEERS based on gender, which was supported (p > .05). Like the variable of age, gender simply may not create advantages or disadvantages for autistic individuals in terms of opportunity to improve their social skills. Instead, other characteristics that autistic individuals possess may be of more consequence to learning and maintaining new social skills. Interestingly, there has been research illustrating that autistic females may have social advantages due to the ability to mask autism symptoms (Allely, 2019), mimic others social behavior better than males (Hiller et al., 2016), and score significantly higher on friendship quality measures (Head et al., 2014). Conversely, it has been found that autistic females may actually be equally or more socially disadvantaged than males (Bargiela et al., 2016; Mandy et al., 2012). The divergent findings of certain social advantages or disadvantages that autistic females may have, combined with the findings of the
present study, demonstrating no significant effect of gender on social skill improvement, embodies the heterogeneous nature of autism symptomology. Overall, through conflicting previous research findings and the current study, it appears as though gender is not a main predictor of the ability to learn and progress social skills in PEERS.

**Research Question 3**

The third research question asked if participant cognitive and/or EI would forecast social skill outcomes post completion of PEERS. To date, there is no known research examining the relation between emotional and cognitive intelligence with social skill improvement through PEERS. Nonetheless, research has demonstrated the importance of EI in overall social functioning and social relationships (e.g., Frederickson et al., 2012; Trigueros et al., 2020). It is also well-established that lower cognitive ability in some autistic individuals is associated with increased social skill challenges (Sigafoos et al., 2017; Smith & Matson, 2010). Additionally, literature has demonstrated a negative association between self-perceived social competence and intellectual ability in autistic individuals (Vickerstaff et al., 2007). With this knowledge, the present study posited that higher levels of cognitive intelligence would lead to increased success in PEERS. As well, it was also believed that higher EI would lead to better social skill outcomes post PEERS. In contrast to the hypothesis regarding EI, both the parent and teen multiple regression models did not illustrate EI to be a significant predictor of social skill improvement (p > .05). While EI is important for positive social relationships and developing adequate social skills, the present study did not find that EI predicted better social skill outcomes.

Nonetheless, unlike EI, cognitive ability did play a role in predicting social skill gains through PEERS. Specifically, in the self-report change score multiple regression, it was observed that teens with a higher overall FSIQ demonstrated a significant predicted social skill
improvement (p < .001). Interestingly, a lower PRI score also predicted social skill success (p < .001), meaning that individuals had to have a high VCI to offset the poorer PRI and yield an overall strong FSIQ to have a significant social skill improvement. Research into cognitive profiles embodying individuals with high VCIs and lower PRIs demonstrates that these individuals often have social skill difficulties (e.g., Kimpton, 2011; Petti et al., 2003). As described by Kimpton (2011), individuals with high VCI and low PRI may often be identified as gifted due to their superior decoding proficiency, expansive vocabulary, and remarkable rote memory skills. However, individuals with this cognitive profile are often diagnosed with a non-verbal learning disability and experience higher rates of social skill difficulties (Kimpton, 2011).

Specific to autism, it has been recently observed that autistic individuals with higher VIQ demonstrate lower levels of autistic symptoms (Johnson et al., 2021). Conversely, autistic individuals with lower VIQ and higher PIQ levels demonstrate increased autism symptoms (Ankenman et al., 2014). Consequently, reduced autism symptoms observed in cognitive profiles with higher VIQ’s may demonstrate the possible explanation of the present study’s findings.

Previous research along with the present findings may lend weight to the idea that individuals with a higher FSIQ and VCI but lower PRI may simply better understand the material presented to them and be able to apply the learned social skills due to higher verbal ability and better rote memory of certain social scenarios and applicable rules. Conversely, individuals with high VCI and low PRI may have more room to grow with social skills due to their lack of non-verbal knowledge. An example of PRI skills in PEERS is the ability to assess for interest of others during a conversation. Specifically, participants learn to examine the body language of another individual such as if they are making eye contact with them or facing them to understand if the person is interested in the conversation. Therefore, an individual who may
struggle with utilizing their visual-spatial and novel problem-solving skills may have a higher trajectory of learning non-verbal cues, further influencing their overall social skill success in PEERS. While PEERS focuses on numerous social skills, the program may pinpoint PRI/non-verbal social skill development such as non-verbal cues that may be lacking in some individuals that in turn are useful in social cognition and the enhancement of social skills. An additional explanation may have to do with VIQ’s association with reduced autism symptoms. Particularly, individuals with a higher VIQ, and therefore lower autism symptomology, may be better able to overcome EI and/or social cognitive impairments that forecast social skill challenges. Conversely, autistic individuals with lower verbal abilities, and therefore increased autism symptomology may have challenges reasoning with PEERS information due to more impacted EI, and social cognitive abilities. Whether it is an ability to understand, memorize, and utilize learned social skills or having increased room to grow with non-verbal social skills, the present finding illustrates that a higher overall FSIQ and VCI while having a lower PRI score leads to predicting social skill success in PEERS.

Although cognitive ability appears to play a role in self-report predictors of social skill change, the same was not upheld in the parent report measure. In fact, cognitive ability variables (FSIQ and PRI) did not significantly predict social skill outcome post intervention (p > .05). This disparity between parent and self-report may demonstrate how parents view their adolescents’ social skills differently and how different variables may affect perceived social skill improvement. Nonetheless, it proves important to understand that only cognitive ability may predict social skill change in self reports in PEERS, whereas EI does not play a significant role.
Research Question 4

The final research question inquired about how social cognition may relate to the participant social skill outcome post completion of PEERS. Current understandings of social cognition illustrate that comprehending and predicting others’ social behaviors and mental states may be a challenge for many autistic individuals (e.g., Baron-Cohen et al., 2008). Specifically, emotion recognition, empathetic ability, and dyadic/triadic interactions appear to be lagging skills for many autistic individuals, leading to challenges with social interactions. Due to this knowledge, the present study hypothesized that increased social cognition in participants would lead to a significantly better outcome of social skills from PEERS. Interestingly, results from the multiple regression with both parent and teen change scores revealed that social cognition did not significantly predict a better social skill outcome from PEERS (p > .05). With social cognition playing an imperative role in social interactions, it is puzzling that higher levels of social cognition would not lead to improved social skills post PEERS. However, this finding may be explained by the intervention’s focus on social skill development that does not necessarily employ social cognition mechanisms. Whereas social cognition has pillars based in empathy and ToM, there are many social skills in PEERS that do not require mastery of empathy or ToM. For teens to develop social skills such as engaging in electronic communication, handling teasing, or planning a get together, they may not be required to engage social cognitive processes. While social cognition is important for predicting and reacting to others’ emotional or mental states, PEERS solely attends to developing the social skills to make and keep friends and function appropriately in varying social situations. While autistic teens may thrive during role play examples in PEERS by being able to empathize or read others’ mental states more appropriately than others, they may not possess any advantage when learning novel social skills. Additionally,
with many autistic individuals having challenges with social cognition, there may have not been enough variance between participants’ social cognition scores to observe a significant difference. For example, an autistic teen with a higher level of social cognition when compared to other individuals in the group still may not have social cognitive systems that are adequately developed enough to demonstrate any statistically significant prediction of social skill improvement through PEERS. As a whole, social cognition is crucial for understanding others’ emotional states and predicting their social behavior; however, the present findings suggest that well developed social cognition is not a significant predictor of social skill outcomes in PEERS.

**Variance Between Parent and Teen Change Score Models**

When comparing the parent and teen change score regression models it is apparent that variables in the self-reported model accounted for a much greater amount of variance (34.3%) than the parent model (6.1%). This disparity is likely due to the singular environment in which parents observe their teens engaging in social skills versus the multitude of environments and social situations that teens engage in. In other words, teens have a much larger sample of social situations with various agents in which to report change, whereas parents can only rate their observations of social interactions in environments in which they are there to observe. It is well established that teens tend to strive for autonomy during the adolescent period of development (e.g., McElhaney et al., 2009) by branching out from interactions with their parents and attending to social interactions with their peers more frequently. The dissimilarity between variance accounted for in the two models could be explained by teens simply not employing the social skills learned from PEERS with their parents or parents having a skewed view of social skill improvement due to only observing teens in the home environment.
Implications

The findings of the present study, while exploratory in nature, carry important implications for both the research and field of practice regarding social skills, autism symptomology, and predicting successful outcomes of PEERS. Most notably, recruiting participants who have a cognitive profile of higher FSIQ and VCI levels, with lower PRI abilities, may lead to significantly improved social skill outcomes in PEERS. While PEERS is the gold standard for GSSIs and leads to social skill improvement for many autistic individuals (e.g., Gates et al., 2017; Moody & Laugeson, 2020; Wolstencroft et al., 2018), it may prove beneficial for individuals demonstrating social skill challenges with the aforementioned cognitive profile to undergo the PEERS intervention to improve self-reported social skills. These individuals may find the most growth from PEERS due to the ability to better reason with the information provided or conversely make larger gains in areas of lagging skills such as non-verbal problem-solving ability. No matter the root of the predicted social skill success due to specific cognitive profiles, the ability to significantly improve self-reported social skills should be fostered and therefore pre-screening may be effective in finding individuals who may have the most success.

A second implication of this research, which examined specific predictors of social skill outcomes post PEERS intervention, is to add to a body of literature that is currently lacking in depth. Specifically, this research may spur advances in observing important factors autistic individuals retain that may make them more successful in GSSI’s. With the importance social skills play in psychosocial, scholastic, and employment outcomes (Bukowski et al., 2010; Goosby et al., 2013; Gresham, 2016; Ladd et al., 2011), the present exploratory findings of this study aim to catalyze research that may pinpoint specific individuals who may be more
successful in PEERS and inform novel GSSIs that will enhance social skill development for others. With social challenges being highly prolific in many autistic teens, the research into the development of new GSSIs is imperative to provide willing participants the opportunity to develop their social skills to improve specific life outcomes. However, without novel research continuing to explore the many aspects of predicting social skill success in PEERS and other GSSIs, advancements may stay stagnant. Therefore, while exploratory in nature, this present study may consequently provide further insight into an understudied area of autism symptomology and GSSIs.

Another outcome of the findings of the present study highlights how the included variables (except cognitive ability in self-report) did not significantly predict social skill outcomes and only accounted for moderate to small amounts of variance in the multiple regression change score models. While this finding may not necessarily lend itself to immediate understanding of factors responsible for social skill improvement post PEERS, it does greatly inform future research to explore new, possibly more pertinent variables. Specifically, there may be other variables associated with autism symptomology that are better predictors of social skill success that have not been explored. As well, the lack of significant predictors in the present study may be the consequence of autistic symptomology and populations being largely heterogeneous (Georgiades et al., 2013). In fact, the evolution and demarcation of autism has greatly added to the challenges of autism research. As Mottron (2021) alluded to, the wide range of autism symptomology has created statistical noise in much of the autism research community and has posed challenges for researchers to observe group differences.

Not only is heterogeneity a challenge for generalizing and replicating findings but the large number of co-occurring disorders associated with autism may have also greatly impacted
participants’ overall social skill growth post intervention. Once again, the results of the present study raise important questions about possible avenues of exploration in future studies as well as the prospective conceptualization of autism in the future. This finding therefore may further exemplify the challenge of studying autism symptomology due to the heterogeneity and unique samples faced by researchers.

The results of this study are not meant to be over generalized and are aimed at beginning to redress gaps within the literature. Nonetheless, implications from these findings highlight that cognitive ability may play an important role in social skill improvement specific to self-report measures. Moreover, the present study could encourage further explorations into GSSIs and autism symptomology with specific examinations into predictors of social skill success not explored in this study. With social skills playing a major role in life outcomes and social challenges being a hallmark of autism, future in-depth examinations of predictive social skill variables are necessary.

**Limitations**

While the findings of this study do carry important implications, there are many limitations that are notwithstanding. Interpretation of the results should be done with the following limitations in mind. A major limitation of the study surrounds various issues regarding the sample of extant data and participants included in the analysis. First, the sample size was relatively small (N=65), which reduces the overall generalizability of the findings. Moreover, although this study was aimed at examining social skill outcomes of autistic teens post PEERS intervention, it may not be representative of a randomly selected sample of autistic teens. In general, the sample of extant data represents autistic teens who were willing to engage in a GSSI and its associated programming. Additionally, the sample of participants were selected with strict
inclusionary measures such as intellectual abilities on the WASI-II needing to be above a certain level. Unfortunately, not all autistic teens have intact intellectual functioning and therefore this sample does not represent the true heterogeneity of autistic individuals. The sample was also restricted by the age range of participants allowed to engage in PEERS. More significant change may have been accounted for if the age range of participants in the intervention was expanded and may be possibly explored in future research. Finally, the sample used in this study lacked equal group sizes specific to female participants. Although it is well established that there is a high male to female ratio in autism diagnoses (Milner et al., 2019), it would prove beneficial to have a larger proportion of female participants to understand gender differences better.

Another limitation of the present study is the inherent biases that are associated with measuring change and growth. Specific to this study, using change scores to measure growth between two time points increases the opportunity for fallacious results. While the present study took every possible step to mitigate potential statistical biases such as the use of reliable change score measurements, reducing the law of initial values, and avoiding measuring the artifact of the statistical method, natural statistical biases may still be at play. Therefore, a limitation of the study is the lack of generalizability that these findings may possess. Future statistical analysis methods to avoid biases are discussed in future directions.

The aforementioned disparity between variance of the self-report and parent report change score models is also a limitation of the present research. Likely due to parents only observing their child in a restricted environment or their children attempting to strive for autonomy and distancing themselves from social interactions with parents, this disparity may have been satisfied with a third agent report. Specifically, this study lacked the insight from teachers, which could have furthered the insight into social skill improvement post PEERS in an
environment where teens most often engage their social skills with peers and individuals in authority. Teacher reports were administered as part of the initial data collection; however, most respondents failed to return the reports or did not fill them out correctly. As such, this study lacks the insight of specific third parties, and reduces the insight into predictors of social skill change post PEERS.

Building upon the limitations regarding the rating methods of social skill improvement, there is the issue of self-report biases. Specific to autistic teens rating their social-emotional functioning, many researchers have found significant discrepancies between self-report and parent measures (e.g., Jepsen et al., 2012; Lerner et al., 2012; Shalom et al., 2006). It is possible that the self-reports utilized in the present study fell victim to selective memory biases, such as teens only recalling positive or negative social interactions, instead of viewing their pre and post ratings in a holistic sense. Additionally, many participants may have initially rated their social skills highly and then when observing other participants and learning novel social skills through PEERS, realized that they may have overrated themselves and in turn rated themselves lower on post report measures. The opposite may have also been true, with participants viewing their self-efficacy and social skills lower than they may have been and then reporting larger gains than what were really occurring. Due to the possible discrepancies and concrete observations of possible self-report biases in autistic populations, self-report measures must be interpreted with caution.

Indeed, while GSSI’s are aimed at improving social skills for autistic youth, there is discussion surrounding whether the interventions improve social skills or teach participants ways to compensate or camouflage social skill deficits and autism symptoms. Supporting this notion, research has demonstrated that in many autistic individuals, overt behavior or perceived ability
of social skills is substantially better than their measured ability on social cognition, EI, or intelligence measures (Livingston et al., 2019). Challenges with EI and social cognition spur difficulties with emotion regulation, reading others mental states, and reasoning with emotional stimuli and are well documented associated variables for social skill deficits (e.g., Montgomery et al., 2018; Striano & Reid, 2009). If participants demonstrate continued challenges with social cognitive or EI abilities, it may indicate that participants have only learned skills to compensate or camouflage their social skill challenges. Unfortunately, Livingston (2019) reports that many of these compensatory strategies are fragile and can be easily overwhelmed in challenging or evolving social situations. Since there is disparate evidence that GSSI’s may only provide fragile skills to compensate for social skill difficulties, there is limitations to this studies ability to make generalizable conclusions to social skill improvement.

Although this study attempted to measure variables predictive of social skill outcomes such as EI, social cognition, and intellectual ability (Happé & Frith, 2014; Montgomery et al., 2013), there is the possibility that other variables could better predict social skill outcomes. While it is challenging to measure every variable or characteristic that may influence a participant’s functioning, this study was limited to a selection of variables that have been informed by past literature and the extant data collected. Consequently, future research may consider the addition of other characteristics and variables associated with social skills and social outcomes.

Finally, the present study is limited by its quantitative research methodology. Specifically, for the present study to measure social skill change and associated characteristics, measures with close-ended questions and Likert rating scales were employed. Quantitative measures employed in this study do not include extraneous events that may impact participants
level of commitment to PEERS or the ability to gauge their full insight into self-report measures. While these measures have been found to be both valid and reliable techniques, qualitative reports may further assist in gaining insight particular to an individual’s thoughts and feelings surrounding their social skill development. The use of a mixed methods approach to viewing social skill improvement may drastically promote insight into the understanding of how specific characteristics impact social skill development.

**Future Directions**

Specific future directions should be considered for prospective examinations into predicting social skill improvement in PEERS to remediate possible limitations demonstrated in this study. Specifically, it is important to combat change score biases by adding increased time point analyses such as baseline and follow up measurements. By adding increased time point analyses, less biased statistical methodologies may be employed such as structural equation modelling or repeated measures analysis of variance (ANOVA). Not only would there be fewer statistical biases, but it would also prove interesting to examine if change scores held constant, improved, or diminished post intervention. With increased time point analysis, researchers could also consider what characteristics certain autistic individuals have that allow them to maintain or diminish intervention gains.

Future research may also consider examining different variables in their analysis. Specifically, researchers may include considerations that go beyond the heteronormative binary categorization of biological sex and gender and include more categorizations such as non-binary when examining the role that sex and gender may play in autism symptomology and social skill success in PEERS. Moreover, alternative variables that may be responsible for social skill challenges and predicting social skill outcomes from PEERS should be examined. For example,
other cognitive abilities such as planning, working memory, mental flexibility, response initiation, response inhibition, and impulse control have been found to be lacking in some autistic individuals (Demetriou et al., 2018; Robinson et al., 2008). Examples of social skills challenges due to these impairments surround isolated play, peer rejection, poor perspective taking, and issues with adaptive conversational skills. Frequently, challenges in these types of cognitive abilities and social skills are marked indicators and common challenges demonstrated by autistic individuals (Galambos et al., 2005; Holmes et al., 2016). Further examinations into these variables may provide further insight into predictors of success in PEERS.

Finally, future research concerning predicting social skill improvement in PEERS may choose to examine other GSSIs to determine if similar results hold true when applied to different therapeutic modalities. While PEERS is considered the gold standard, other GSSIs are still commonly used and should be studied to improve programming and tailor certain interventions to individuals who will demonstrate social skill growth. As well, future research may attempt to replicate the findings of this study to increase the ability of generalizing the findings to real world populations. Overall, there is a large gap within the literature that proves important to further redress to improve social skill outcomes and in turn overall life outcomes for autistic individuals.

Conclusions

Social skills are essential for positive psychosocial, academic, and employment outcomes (Gresham, 2016; Miles & Stipek, 2006; Wentzel, 2009). However, as is observed in the developmental model of social skills, there are possible cognitive, neurological, and behavioral dissociations that may occur that may impede the adequate development of social skills and in turn, positive life outcomes (Soto-Icaza et al., 2015). In fact, autistic symptomology embodies
communicatory and social challenges. More specifically, impaired cognitive, neural, and behavioral mechanisms in many autistic individuals create a wide array of challenges reasoning, interpreting, and responding to social situations. Autistic individuals often struggle to adapt their behavior to various social environments and predict other individuals’ social behaviors (Dunn et al., 2008; Favre et al., 2015; Happé & Frith, 2006; Hileman et al., 2011).

Fortunately, there are various GSSIs aimed at improving autistic individual’s social skill functioning. Of the omnipresent GSSIs, PEERS remains the gold standard of improving autistic teens social skills post intervention. Nonetheless, little is understood about the variables/characteristics that autistic teens possess and how those attributes may lead to success in PEERS. The present study sought to examine how age, gender, EI, intellectual ability, and social cognition predicted social skills outcomes of participants in PEERS to redress this relatively unknown construct. It was concluded that only FSIQ and PRI had a significant effect in predicting social skills outcomes in self-report measures. All other variables in both parent and self-report measures were found to be non-significant predictors of social skill outcomes. While there was a lack of significant predictors, the implications of the study are essential. Particularly, the findings elucidate how certain autistic individuals may be more successful in PEERS than others. As well, the exploratory nature of the study lends itself to spur further research into specific variables that may be responsible for predicting social skill outcomes of autistic youth in GSSIs. Nevertheless, the study was not without limitations. Importantly, the study must be interpreted as exploratory as there are possible statistical concerns with change score analysis. As well, lack of generalizability concerns was present due to possible biased self-report measures, lack of third-party reporting, and sample issues. These limitations could readily be mitigated with increased time point analysis, novel variable analysis, and replicability studies.
It would be neglectful to observe the social skill challenges faced by many autistic individuals and not seek further explorations into the specific associated mechanisms that contribute to these impairments. Although there are GSSIs specifically aimed at improving social skills, such as PEERS, it is apparent that not all participants are successful. Given the encumbrance that social skills play in an individual’s psychosocial, academic, and employment outcomes, it proves important to further understand what makes autistic youth successful in improving their social competence. Consequently, continued research exploring the predictors of social skill change will allow for novel GSSI’s to be tailored for maximal social skill improvement in various participants with heterogenous autistic symptomologies. Moving forward, it is imperative that opportunities such as positive social skill development for neurodivergent individuals is supported and better understood.
References


https://doi.org/10.1007/978-3-030-26276-1_8


https://doi.org/10.1016/j.rasd.2014.05.009


https://doi.org/10.1007/s10803-007-0359-3


https://doi.org/10.1016/j.ajhg.2015.11.017


https://doi.org/10.1111/j.1939-0025.1956.tb06202.x


https://doi.org/10.1177/0952695113484320


https://doi.org/10.1002/aur.69


Georgiades, S., Szatmari, P., Boyle, M., Hanna, S., Duku, E., Zwaigenbaum, L., Bryson, S.,
Fombonne, E., Volden, J., Mirenda, P., Smith, I., Roberts, W., Vaillancourt, T., Waddell,
C., Bennett, T., & Thompson, A. (2013). Investigating phenotypic heterogeneity in
children with autism spectrum disorder: a factor mixture modeling approach. Journal of

https://doi.org/10.1076/chin.8.4.241.13504

complex emotion recognition in adults with and without autism spectrum

https://doi.org/10.1111/soin.12018

sensory behaviours in children with and without an autism spectrum disorder. Journal of

Gresham, F. M. (2016). Social skills assessment and intervention for children and
https://doi.org/10.1080/0305764X.2016.1195788


and anxiety in adolescents with autism spectrum disorder. *Journal of developmental and physical disabilities, 29*(5), 797-808. https://doi.org/10.1007/s10882-017-9557-x


https://doi.org/10.15585/mmwr.ss6904a1


https://doi.org/10.1080/19315864.2012.730600


https://doi.org/10.1007/s10803-011-1356-0


https://doi.org/10.1348/026151006X118577


Nicolaidis, C., Raymaker, D. M., Ashkenazy, E., McDonald, K. E., Dern, S., Baggs, A. E., ... & Boisclair, W. C. (2015). “Respect the way I need to communicate with you”: Healthcare

https://doi.org/10.1177/1362361315576221


https://doi.org/10.1177/0883073817712875


https://doi.org/10.1023/A:1021400203453


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