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LOYOLA UNIVERSITY CHICAGO

A DEVELOPMENTAL MODEL PREDICTING ADJUSTMENT IN YOUTH WITH AUTISM SPECTRUM DISORDERS: THE ROLE OF EXECUTIVE FUNCTIONS, SOCIAL IMPAIRMENT, AND FRIENDSHIP QUALITY

A DISSERTATION SUBMITTED TO

THE FACULTY OF THE GRADUATE SCHOOL

IN CANDIDACY FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

PROGRAM IN CLINICAL PSYCHOLOGY

BY

REBECCA WASSERMAN LIEB

CHICAGO, ILLINOIS

AUGUST 2011

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ABSTRACT

Autism Spectrum Disorders (ASD) are pervasive developmental disorders characterized by several core deficits including social skills impairments and difficulty processing social information. Little is known about the role of contributing factors adjustment in this population. The first aim of this study was to evaluate two meditational models of youth with ASD in which social impairment and friendship quality mediated the relation between various domains of executive functions (EF) and adjustment, as well as a full developmental model in which EF contributed to compromised social skills which influenced friendship quality leading to increased adjustment difficulties in this population. The second aim of the study was to investigate organized activity involvement as a potential buffer against poorer adjustment. Participants included 127 high functioning ASD adolescents and a parent. Results indicated that all social impairment models significantly mediated the relations between EF and adjustment, while friendship quality only partially mediated the relation between emotional control and loneliness. Four developmental models were a good fit for the data, indicating that EF, social impairment, and friendship quality impacted adjustment. Furthermore, increased organized activity involvement was associated with better adjustment. These results will help inform treatments for adjustment in ASD youth. As research continues to identify factors influencing adjustment, more comprehensive treatments can be adopted that target the development of skills that will lead to better adjustment.

CHAPTER ONE

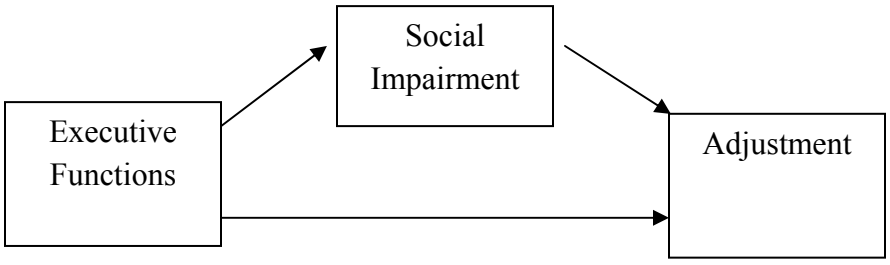
INTRODUCTION

Autism Spectrum Disorders (ASD) are pervasive developmental disorders that are characterized by several core deficits including social skills impairments and difficulty processing social information. Youth with ASD have difficulty with higher order mental organization and planning as well as processing multiple levels of information (i.e., executive function or EF difficulties), which likely affects their ability to successfully interact socially with others (e.g., Joseph, 1999; Solomon, Goodlin-Jones, & Anders, 2004). These EF and social impairments may be manifest as poor quality friendships (e.g., Bauminger et al., 2008) which may result in feelings of loneliness and depression (e.g., Ghaziuddin, Ghaziuddin, & Greden, 2002; Volkmar & Klin, 2005). While adjustment difficulties have been well documented in youth with ASD, little is known about the role of contributing factors, including social skills, friendship quality, and executive functions, both on each other and their contributions to increased depressive symptoms and loneliness in this population. This study tested two meditational models of ASD youth in which social impairment and friendship quality mediated the relation between various domains of executive functions and depressive symptoms and loneliness, as well as a full developmental model in which executive functions contributed to compromised social skills which influenced friendship quality leading to increased adjustment difficulties in this population (see Figure 1).

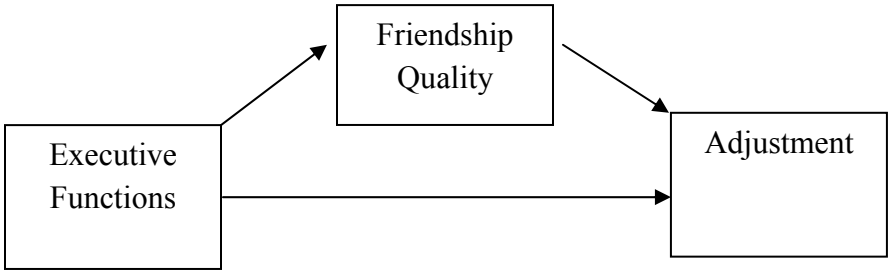
Youth with developmental disabilities are also less likely to participate in school-based or after-school activities in comparison to typically developing peers (Kleinert, Miracle, & Sheppard-Jones, 2007), offering fewer opportunities to develop and practice social skills. And while the benefits of organized activity involvement in typically developing youth has been well established (e.g., Barber, Eccles, & Stone, 2001; Eccles, Barber, Stone, & Hunt, 2003; Feldman & Matjasko, 2005; Fredricks & Eccles, 2006a; Gore, Farrell, & Gorden, 2001; Mahoney, 2000; Posner & Vandell, 1999), it is not known whether these benefits are also seen in youth with ASD. Thus, the current study also investigated organized activity involvement as a potential buffer against depressive symptoms and loneliness.

Figure 1: Proposed Mediational Models

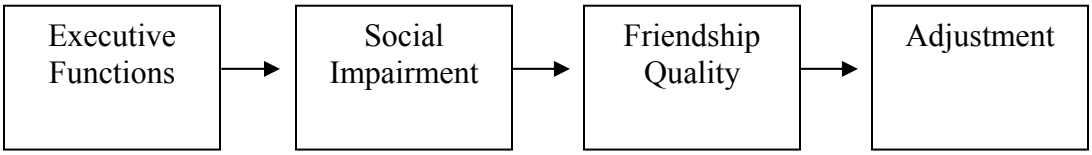
Social Impairment as a Mediator



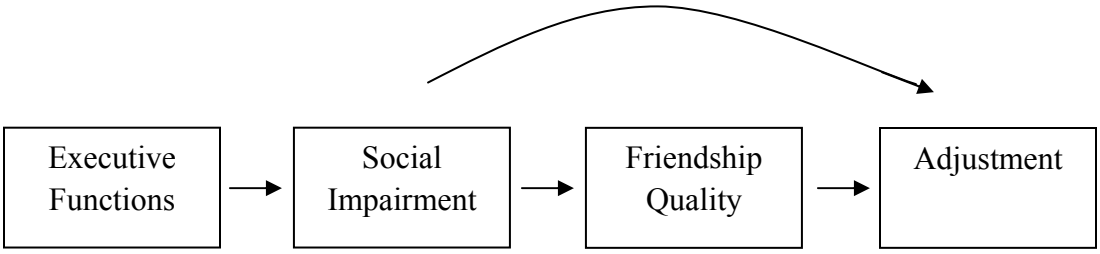
Friendship Quality as a Mediator



Three-Path Developmental Mediational Model



Four-Path Alternate Developmental Mediational Model



Autism Spectrum Disorders

Autism Spectrum Disorders (ASD) are pervasive developmental disorders that are consistently identified in youth across different ethnicities, regional groups, and income levels (Boris et al., 2007; Klinger, Dawson, & Renner, 2003; Kolb & Whitshaw, 2003) but are four times more commonly seen in males than in females (Folstein & Rosen-Sheidley, 2001; Kolb & Whitshaw, 2003). Typically identified as the most severe, autism is characterized by deficits in social functioning, communication (including language), restricted interests or repetitive behavior, and a lack of symbolic or imaginary play that are displayed before the youth is two years old (American Psychiatric Association, 2000). Prevalence rates for autism have ranged from approximately one in every 500 births to 66 in every 10,000 births (Folstein & Rose-Sheidley, 2001; Kolb & Whitshaw, 2003; Klinger et al, 2003), with a recent review of 43 studies on ASD suggesting prevalence rates ranging from 0.7 per 10,000 to 72.6 per 10,000 (Fombonne, 2005).

Asperger's disorder is characterized by relatively intact intellectual and verbal abilities but includes deficits in socialization (including social reciprocity) non-verbal communication, and restricted patterns of intense interests in specific (though often appropriate) topics (Klinger et al., 2003) However, unlike autism, youth with Asperger's disorder do not display delays in the development of language skills for the first three years of life (American Psychiatric Association, 2000). In fact, youth with Asperger's disorder often have well developed language and are frequently described as being very bright (Klin, McPartland, & Volkmar, 2005). Prevalence rates for Asperger's disorder are less well defined, as it is a diagnosis more recently added to the DSM-IV. Studies comparing autism and Asperger's disorder generally report lower rates of the latter, with a ratio of approximately five to one (Fombonne, 2005).

Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS) is the final diagnosis on the autism spectrum and often identified as the least severe. Youth diagnosed with PDD-NOS display deficits consistent with one to two areas of functioning (i.e., social interaction, communication skills, and stereotyped behaviors/interests domains), or display difficulties in all three areas, but do not meet diagnostic criteria for autism until after age three (American Psychiatric Association, 2000). PDD-NOS is usually diagnosed when it is unclear at what age the symptoms began to appear and persist, when the symptoms are not pervasive enough to warrant a diagnosis of autism but are significant enough to cause clinical impairment, or when the onset of the symptoms are later in development, but are not consistent with a child disintegrative disorder (Towbin, 1997). The prevalence rates of PDD-NOS are difficult to identify due to the vast heterogeneity within the diagnosis. Fombonne's (2005) review of the existing

literature found an average ratio of one to six for PDD-NOS compared to autism, and estimates an average prevalence rate of 20.8 per 10,000.

Brain Physiology and Autism Spectrum Disorders. Although there is a consistent agreement throughout the literature that there are genetic and neuroanatomic components to the etiology of ASD, a specific pattern of brain abnormalities or pathways have not been uniformly identified. Korvatska, Van de Water, Anders, and Gershwin (2002) suggest that discrepancies in the literature may be due to the broad phenotype of ASD and the heterogeneity both between and within diagnoses. A meta-analysis of youth with autism revealed reduced volume of the corpus callosum compared to normally developing controls, with increased age moderating the relation (Frazier & Hardan, 2009). Increased total volume of the amygdala (Groen, Teluij, Buitelaar, & Tendolkar, 2010) and the hippocampus (Groen et al., 2010; Schumann, Barnes, Lord, & Courchesne, 2009) have also been found in youth with ASD. Furthermore, much of the research has focused on brain structures related to social information processing.

The amygdala is an area of the brain that is involved in social cognition and the ability to find and retrieve information related to emotions which is part of what is known as the "social brain" (Corbett et al., 2009). Corbett et al.'s 2009 review of the literature confirms that the amygdala is engaged when a person is involved in a social action. Their fMRI and MRI study investigating amygdala activation in ASD youth compared to controls found that, while youth with ASD were able to complete social tasks, their amygdala engagement was limited compared to the controls. This is consistent with other research demonstrating less activation in the amygdala for this population (see

Hughes, 2009 for a review) as well as a link between amygdala activation and clinical impairments in children with ASD (Schumann et al., 2009).

Recent studies have also suggested that deficits in the mirror neuron system may be associated with communication and social deficits seen in ASD (e.g., Oberman & Ramachandran, 2007). Mirror neurons are cells in the premotor cortex in the brain that are activated both when a person is doing an action but also when a person is observing someone else doing a similar action (Hughes, 2009; Rizzolatti, 2005). It has been suggested that mirror neurons may play a part in the experience of empathy, as these neurons fire in the same way when doing an action (e.g., crying) and when watching someone else do that same action (e.g., Cheng et al., 2008; Oberman & Ramachandran, 2007). For example, Martineau, Andersson, Barthèlèmy, Cottier, and Destrieux (2010) found that, while high functioning adolescents with ASD had brain activation similar to normally developing controls on a task (opening and closing hands), when watching another complete the same task, the ASD group had atypical brain activation in areas of the brain including the mirror neuron systems. While more research on the mirror neuron system is needed, studies such as this suggest that atypical activation of this area of the brain may contribute to the social difficulties that are a hallmark of ASD.

Heterogeneity Within Autism Spectrum Disorders. While there are clear diagnostic criteria to delineate between diagnoses on the spectrum, one of the challenges in the research on ASD is the marked heterogeneity *within* diagnoses. For example, a diagnosis of autism is often considered to be the most serious and pervasive of the ASD, yet there are many youth with autism who, although they did meet developmental milestones within the appropriate timeframe, have made significant improvements and

are currently higher functioning than when they were two or three years old (e.g., have developed language, intact cognitive skills, etc.). As a result, their actual level of functioning is higher than what one might think when they hear the term "autism." In fact, a diagnosis or reference of "high functioning autism" is often used in the research and clinical literature (e.g., Kasari & Rotheram-Fuller, 2005; Solomon et al., 2004; South, Ozonoff, & McMahon, 2007) even though is it not an official diagnosis in the DSM-IV. Furthermore, as these children develop and possibly receive therapeutic services, some may acquire skills to improve the core deficits associated with ASD. Therefore, the traditional categorical classifications of autism, Asperger's, and PDD-NOS may be less relevant as these youth develop into adolescents. For example, while the DSM-IV diagnostic criteria are specific for Asperger's, the diagnosis is commonly used as a way to describe youth who fall under other ASD but do not have the severity of symptoms (e.g., "higher functioning") or who are not as limited cognitively (Klin et al., 2005). Consistent with this, previous research has demonstrated that there are other ways to classify samples of ASD youth which may offer more real world clinical utility. For example, Sevin et al. (1995) used cluster analysis to reclassify 34 youth diagnosed with autism and PDD-NOS. They found that their sample fit well into four clusters: atypical, mild, moderate, and severe, which were characterized based on social deficits, communication, and presence of ritualistic behaviors. These between-group behavioral differences mark a departure from the typical classification system employed by the DSM-IV-TR and provide another way to conceptualize deficits in ASD which may impact the efficacy of different treatments. In order to understand the impact of an ASD

on youth, the current study did not focus on traditional diagnostic criteria as a way to differentiate within the sample, but focused on a high functioning ASD sample.

In the current study, attempts were made to recruit a sample of high functioning adolescents with an ASD (i.e., youth aged 12-17 years old with well developed communication skills and at least a sixth grade reading level) rather than selecting youth who only meet a certain diagnosis for several reasons. First, it may be that there are other, more meaningful ways to distinguish between naturally occurring groups within the spectrum as the population reaches adolescence, including EF abilities (e.g., Verte, Geurts, Roeyers, Oosterlaan, & Sergeant, 2006). Next, high functioning adolescents are better able to complete self-report measures of adjustment. In addition, as will be discussed shortly, as higher functioning youth with ASD develop into adolescents, they become more aware of their differences and social difficulties in comparison to their same-aged peers.

Developmental Considerations. It is important to recognize the importance of adolescence in terms of its relevance for EF, social impairment, friendship quality, and adjustment. At its most basic level, adolescence marks a period of transition from childhood, where youth experiences both physical and emotional changes. Lerner and Steinberg (2004) note that major depressive disorders are the most common disorder to occur during adolescence, and that the prevalence rates of depressive disorders often increase from childhood to adolescence, with a greater increase for females in comparison to males. Loneliness is also a problem during this time, as adolescents transition from being focused on their families to reaching out more to peers for acceptance and social adjustment (Lerner & Steinberg, 2004). Many high functioning

youth with ASD exhibit more depressive symptoms and loneliness in adolescence as they become aware that they are different and have less successful social interactions. Therefore, this is a critical transition time for youth and it is important to see how this developmental period affects all aspects of a person's life.

While it is important to acknowledge that adolescence is a significant time period, it is equally important to recognize that the development of EF is a process that continues throughout adolescence. Children are not born with the ability to incorporate higher-level thinking, organizing, and planning into their lives and activities. These abilities develop over time and can be refined and improved as youth experience new things and are confronted by new challenges. The acquisition of these skills begins to develop in early childhood and is refined throughout adolescence (e.g., Anderson, 2002). For example, while attentional control develops in early childhood, domains including cognitive flexibility, information processing and goal setting develop in preadolescence and are considered to be well developed by adolescence (Anderson, 2002). Furthermore, the ability to do perspective taking and understand the thoughts and feelings of others, which is important in the development of successful social interactions, is also thought to be developed and refined during this period (Lerner & Steinberg, 2004). Therefore, this developmental time period is appropriate for the study of EF, as this population has the capacity for more mature EF abilities.

Adjustment in Autism Spectrum Disorders

Although there is considerable heterogeneity among youth diagnosed with ASD, one of the challenge that many face is poor adjustment. Research has shown that youth with ASD often exhibit depressive symptoms (e.g., Ghaziuddin et al., 2002; Volkmar &

Klin, 2005; Klin et. al, 2005; Lopata et al., 2010), although this report is not always consistent between parent and child report; with only parents reporting significantly elevated depressive symptoms (Lopata et al., 2010). In fact, comorbidity rates between autism and depressive symptoms have been shown to range from 4-58% (Lainhart, 1999). Furthermore, it has been suggested that in higher functioning youth with ASD, levels of depressive symptoms can be high enough to quality for a diagnosis of depression. As the youth become aware of their differences in relation to same-aged peers (Volkmar & Klin, 2005), they become increasingly frustrated in their unsuccessful attempts to initiate and maintain social interactions with others (Klin et al., 2005). In a six-year longitudinal study comparing a normally developing population to higher functioning youth with autism and Asperger's disorder, researchers found that those on the autism spectrum had higher rates of anxiety and depressive symptoms (Kim, Szatmari, Bryson, Streiner, & Wilson, 2000).

Research has also demonstrated that youth with ASD also exhibit greater levels of loneliness in comparison to typically developing peers (e.g., Bauminger & Kasari, 2000; Ghaziuddin et al., 2002; Lasgaard, Nielsen, Eriksen, & Goossens, 2009). Bauminger, Shulman, & Agam (2003) suggest that, in typically developing youth, reporting loneliness may be an indicator that a person wants increased socialization and greater levels of peer interaction. Their study comparing 18 youth with autism to 17 typically-developing youth aged 8-17 years found that both groups understood the concept of loneliness, including the idea that someone could be lonely even in a group of friends. However, the autism group reported significantly more feelings of social loneliness in comparison to the control group. This suggests that youth with ASD are not only aware

of the concept of loneliness, but can recognize it in themselves. Furthermore, as discussed previously, higher functioning youth with ASD may become increasingly frustrated in their unsuccessful attempts to initiate and maintain social interactions with others (Klin et al., 2005). This may lead to increased levels of loneliness, as they become more aware that they are different and do not have social supports. Furthermore, Jobe and White's (2007) study of autistic-like behaviors in typically developing college students found that a greater presence of behaviors consistent with the autism spectrum was a significant predictor of greater levels of loneliness.

While researchers have demonstrated that youth with ASD experience poor adjustment, including increased levels of depressive symptoms and loneliness, what is less well understood is the role of contributing factors that lead to adjustment difficulties. The current study investigated several mediated models in order to better understand factors that contribute to adjustment difficulties in youth with ASD (see Figure 1).

Executive Functions

Because there is so much heterogeneity within ASD, many researchers have been attempting to identify other ways of studying youth with ASD in order to find more meaningful and useful ways to differentiate within the spectrum. A more recent focus of the ASD literature has been looking across the spectrum at this population's executive function abilities. Executive functions (EF), are a set of cognitive behaviors that allow for higher level planning and organization including "planning, set-shifting or cognitive flexibility, inhibition, working memory, generativity, strategy formation, and self-monitoring" (Wong, Mayberry, Bishop, Maley, & Hallmayer, 2006 p. 562). EF abilities have been linked with the frontal lobes of the brain, as research has demonstrated that the

development of EF skills corresponds with the maturation of the frontal lobes (Brocki & Bohlin, 2004; Casey, Giedd, & Thomas, 2000; Welsh, Pennington & Grossier, 1991), although demographic characteristics have also been noted to influence EF development (e.g., Ardila, Rosselli, Matute, & Guarjardo, 2005; Mezzacappa, 2004; Lipina, Martelli, Vuelta, & Colombo, 2005).

This set of functions, when present and functioning normally, allows a person to use their abilities and problem solving skills to plan for and achieve goals (Solomon, Goodlin-Jones, & Anders, 2004). These skills, which develop over childhood and through adolescence, are seen as vital to a person's ability to succeed in an increasingly more complicated world. In fact, EF skills have been described as being "at the heart of all socially useful, personally enhancing, constructive, and creative thoughts. Impairment or loss of these functions compromises a person's capacity to maintain an independent, constructively self-serving, and socially productive life." (Lezak, 1982, p. 281).

Deficits in EF often lead to a person being fixated on irrelevant or unnecessary details of a situation, which makes them unable to shift away from these details or be distracted by these input pieces. This, in turn, makes it difficult to attend to the important components of a situation and complete a task or solve a situation (Ozonoff, 1998). One of the diagnostic components of an ASD is a cognitive rigidity and resistance to change. One way to conceptualize this is to define this rigidity and resistance to change in terms of a difficulty shifting from one set of information to another. For example, a child with an ASD who must always see the aquarium while riding in the car on the way to school may be unable to cope with not seeing it on a day where there is a construction detour. This can be thought of as a difficulty shifting sets from the daily routine of the aquarium

to a new, perhaps unknown set of information (i.e., the buildings and business along the detour route). Therefore, it may be that less developed EF plays a role in many aspects of ASD, including social impairments, friendship quality, and adjustment.

The higher-order processing abilities of EF are thought to play a role in several childhood disorders, including ADHD (Verte, et al., 2006; Sigman, Spence, & Wang, 2006), obsessive compulsive disorder (Verte et al., 2006), learning disabilities (see review of literature in Taylor, 1996), and ASD (e.g., Ozonoff & Jensen, 1999; Sigman et al., 2006). More importantly, research has consistently shown that youth with ASD demonstrate impairment in EF in comparison to normally developing peers (e.g., Russo et al., 2007; Verte et al., 2006; Akshoomoff, 2005) and this has been identified as an important area of study in relation to ASD. Specific impairments in ASD youth have been demonstrated in set shifting (i.e., moving between multiple pieces of information) and cognitive flexibility (the ability to use different problem solving techniques and recognize more than one solution to a problem; Ozonoff & Jensen, 1999: Joseph, 1999; Russo et al., 2007; Verte et al., 2006).

In addition, there is evidence for impairments in the domain of working memory (i.e., holding information in active memory in order for further processing or integration; e.g., Russo et al, 2007; Rogers & Bennetto, 2000; Verte et al, 2006) and emotional control (including affect regulation, Konstantareas & Stewart, 2006). There is less evidence supporting other specific deficits in other EF domains, including inhibition (Rogers & Bennetto, 2000; Verte et al., 2006). Rogers and Bennetto (2000) suggest that, while youth with ASD do not exhibit specific deficits in inhibition, difficulties may increase as a task becomes more complex and multiple domains of EF must be enacted

simultaneously (e.g., also involves having to shift sets or hold and process information). For example, Verte et al. (2006) compared EF skills of autism, high functioning autism, and PDD-NOS children to a typically developing control group. They found that, while there was not necessarily significant differences in EF between the groups on the spectrum, there were differences in comparison to the control group. The autism and high functioning autism groups had poorer cognitive flexibility, inhibition, visual working memory, planning, and verbal fluency and the PDD-NOS group had poor cognitive flexibility, inhibition, and verbal fluency compared to the control group. Furthermore, Konstantareas and Stewart (2006) compared affect regulation in children with ASD and found that they scored lower on attention focusing and inhibitory control compared to a control sample. However, because laboratory measures of EF involve complex instructions and a high level of demand is placed on the participant, many of these study samples have only included those people on the autism spectrum who are higher functioning (Rogers & Bennetto, 2000).

A recent review of the neuropsychological literature demonstrates a consistent link between EF abilities and depressive symptoms (Rogers et al., 2004). The review found support for impaired working memory and poor planning abilities in depressed participants compared to non-depressed control groups, but found mixed support for set-shifting and inhibition (although some studies found depressed participants to be slower to inhibit responses). Therefore, differences in specific EF domains appear to be related to higher levels of depressive symptoms. A review of the mood disorder literature in typically developing participants has also found evidence of reduced attention and cognitive flexibility among those with elevated depressive symptoms; however, less

support was found for deficits in EF tasks involving inhibition (Rogers et al., 2004). Another study comparing depressed and non-depressed controls found that those in the depressed group had more difficulty with tasks involving set-shifting, but did not differ from the control group on tasks that had no set-shifting component (Austin et al., 1999). However, while there is evidence to suggest a relation between EF ability and presence of depressive symptoms in typically developing populations, this link has not been specifically tested in youth with ASD.

Social Impairment as a Mediator

The current models proposed that the relation between EF and adjustment difficulties is mediated by social impairments and friendship quality (see Figure 1). As discussed, one of the challenges consistently seen across youth with ASD is social impairments that are manifested as cognition, awareness, and communication deficits. The proposed model suggests that social impairments may partially explain how EF deficits lead to adjustment problems among ASD youth. Research has demonstrated that youth with ASD do in fact have fewer social interactions in comparison to their same-aged peers. One study comparing higher functioning youth with autism to a group with behavioral disorders and a typically developing group found that the autism group had fewer social interactions during a two-week camp session in comparison to other groups (Lord & Magill-Evans, 1995). Furthermore, autism-focused research has demonstrated a direct association between social impairment and adjustment difficulties. For example, White and Roberson-Nay (2009) demonstrated a negative correlation on parent reports of adjustment difficulties and social competence in a sample of youth with ASD. Additionally, Vickerstaff, Heriot, Wong, Lopes, and Dossetor (2007) found that self-

perceived social competence significantly predicted fewer depressive symptoms in youth with ASD, although parent and teacher reports of social competence and depressive symptoms did not yield similar results. Furthermore, Barnhill (2001) also found that adolescents with ASD who reported greater levels of depressive symptoms also attributed their social impairments to their own social inabilities.

It may be that compromised EF abilities are associated with increased social impairments as successful social interactions are likely the result of being able to process and organize verbal and non-verbal information (e.g., body language, topics of discussion) as well as inhibitory responses (e.g., resisting the urge to interrupt a friend who is talking) cognitive flexibility (e.g., talking about topics not related to their areas of interest), and emotional control (e.g., not crying out during class when upset or angry). Therefore, those with compromised EF skills who will not be able to process these social stimuli successfully may exhibit social impairments.

Current research suggests that the difficulty processing social stimuli outlined in the theory of mind and weak central coherence theory, can be a way to understand how compromised EF abilities are associated with difficulties with social interactions in youth with ASD (Bauminger et al., 2003). Theory of mind refers to the idea that a person may be unable to understand or recognize the minds of other people, which subsequently makes it difficult to interpret the mental states or underlying motivations of others (Bauminger & Kasari, 2000; Ghaziuddin et al., 2002). As a result, a person may be limited in his or her ability to do perspective taking in a social situation to understand the behavior of other people. Hughes (2009) review of the literature found that there is support for a link between theory of mind and dysfunction in the mirror neuron system in

the brain. However, some current research suggests that it may be likely that poor performance on theory of mind tests in research is really the result of compromised EF abilities (e.g. Joseph, 1999; Tonn & Obrzut, 2005). Recently, researchers have suggested that social processing deficits implicated in theory of mind can be a way to understand these real-world difficulties with social interactions in youth with ASD (Rogers & Bennetto, 2000). If one deconstructs the components of theory of mind, it can be suggested that EF may play a role the success of these tasks. For example, taking the perspective of another person may involve shifting off of social or situational cues to see what that person may be attending to. If someone demonstrates executive dysfunction related to set shifting, this may translate into difficulty with perspective taking and impair their ability to attend to socially relevant stimuli, which may reduce the chance that social interactions will be successful.

Another theoretical perspective linking EF and social impairment in the ASD population is the weak central coherence theory. This is different from the theory of mind because it considers the stimuli on which children focus (Happe & Frith, 1996). According to Happe and Frith (1996), youth with autism do not use the context of the stimuli (i.e., the whole) and focus more on the pieces of a stimulus. As opposed to not seeing the forest for the trees, this population tends to see only the trees and does not see the bigger picture of the forest, consequently processing more complicated stimuli as pieces rather than as an integrated whole (Joseph, 1999). A review of weak central coherence literature found mixed support for the theory, though several studies did report that ASD subjects emphasized details rather than the whole picture (Hughes, 2009). This awkward processing style may be explained by several domains of EF, including

cognitive rigidity and difficulty shifting back and forth, as the individual steps of a routine seem to be more important than the final outcome (Tonn & Obrzut, 2005). Therefore, it may be that EF deficits that are manifested through social impairments, including those theorized in the theory of mind and weak central coherence theories, may in turn lead to increased feelings of loneliness and elevated depressive symptoms.

Friendship Quality as a Mediator

While adjustment may be impacted by social impairment, it is also possible that the quality of one's friendships may affect a person's adjustment. Research has demonstrated that youth with ASD report having fewer friends and spend less time interacting with friends. A recent review of 235 adults and adolescents with autism found that only 8.1% reported interacting with same-aged friends on a weekly basis outside of an organized activity and 46.6% of the sample reported having no same-aged friends (Orsmond, Krauss, & Seltzer, 2004), suggesting that ASD youth have fewer opportunities to develop quality friendships. If a person does not have the opportunity to develop quality friendships in day-to-day life, the impact on their adjustment may be significant. Bauminger and Kasari (2000) noted that higher functioning ASD adolescents do have at least one friendship, but that those without friendships tend to report increased feelings of loneliness. A recent study attempted to better understand if and how behaviors consistent with ASD contributed to friendship qualities among normally developing college students (Jobe & White, 2007). In this study, the autism spectrum quotient (AQ) was administered in order to measure a non-disabled population's autistic tendencies. Although none of the participants reached the cutoff for an ASD, the more

autistic behaviors they endorsed, the shorter a period of time their friendships tended to last.

In addition, EF deficits may be negatively impacting the ability of ASD adolescents to develop quality friendships. Carrington, Templeton, and Papinczak (2003) interviewed five youth diagnosed with Asperger's Disorder and found that they demonstrated compromised EF abilities (i.e., cognitive inflexibility) when making decisions about friendships. For example, participants reported not being willing to make friends with someone who broke rules, even if it was for a valid reason. As a result, the quality of friendships that are being made and maintained in this population may be impacted by that person's EF abilities. Therefore, it is important to recognize that friendship quality may not only be contributing to increased levels of loneliness and depressive symptoms in the adolescent ASD population, but may be affected by compromised EF abilities.

A Developmental Mediational Model

While friendship quality may impact the relation between EF and adjustment, it is also possible that social impairment actually impacts friendship quality, which then, in turn impacts adjustment. In fact, friendship quality has been identified as a mediator of social impairment in the ASD population, with poorer friendship quality leading to greater adjustment difficulties (e.g., Orsmond et al., 2004). This model is also supported by the literature on brain structures and development in youth with ASD. As discussed previously, there is support for mirror neuron deficits in ASD, which translates into a difficulty processing socially relevant cues, including empathy and understanding thoughts and feelings of others in other people. This could lead to poorer friendship

quality, as these are qualities that would enhance a friendship. Furthermore, impact of this social impairment may be even further affected by poorer EF, making processing and utilizing social information even more challenging. Additionally, Jobe and White (2003) demonstrated that responses to the social impairment domains from the AQ measure contributed uniquely to the variance on a loneliness measure, with greater social impairment being related to increased self-reports of loneliness. Therefore, it may be that youth with ASD who have more compromised EF abilities have greater social impairment, which leads to poorer friendship quality and thus, poorer adjustment (e.g., greater levels of loneliness and depressive symptoms). Because of the previously discussed research supporting a link between social impairment and adjustment (e.g., Barnhill, 2001; Vickerstaff et al., 2007; White & Roberson-Nay, 2009), it may be important to take into account this direct relation when determining the fit of the model. Therefore, the current study tested both the proposed model (see Figure 1) as well as an alternate model adding an fourth direct pathway between social impairment and adjustment, which accounted for the relation between these two variables (see Figure 1).

Organized Activity Participation as a Moderator

In addition to understanding mediated pathways between EF, social impairment, friendship quality and adjustment in youth with ASD, it is also important to begin to identify potential buffers against poor adjustment. One factor that may protect against increased depressive symptoms and loneliness is organized activity involvement. Organized activities (OA) are a unique context for development, as people can participate in activities throughout childhood, adolescence, and even adulthood. OA are defined as activities that "are generally voluntary, have regular and scheduled meetings, maintain

developmentally based expectations and rules for participants in the activity setting (and sometimes beyond it), involve several participants, offer supervision and guidance from adults, and are organized around developing particular skills and achieving goals" (Mahoney, Larson, Eccles, & Lord, 2005, p. 4). Brown and Theobald (1998) found that a majority of adolescents participate in at least one OA during high school and many students are involved in more than one OA. Research has shown that OA involvement can have positive effects on a variety of outcomes, including lower levels of drug use, sexual activity, and criminal behavior (e.g., Barber, Eccles, & Stone, 2001; Feldman & Matjasko, 2005; Mahoney, 2000), even after controlling for demographic variables and prior adjustment.

Adolescents also report gaining a variety of social skills and knowledge from OA participation. Dworkin, Larson, and Hansen (2003) interviewed of 14-18 year old high school students who were actively involved in OA to begin to understand the benefits of OA participation from the adolescents' perspectives. The adolescents described feeling empowered by their activity experiences and recognized the control that they had to develop and change themselves and their interactions with others. Another study found that normally developing adolescents with lower levels of social competence felt accepted by a social network when participating in OA (Mahoney, Cairns, & Farmer, 2003). Furthermore, they demonstrated that those participating in OA had higher teacher ratings of popularity in comparison to those who were not involved in OA. Therefore, not only do adolescents see the benefits of OA, but those around them report positive effects of participation.

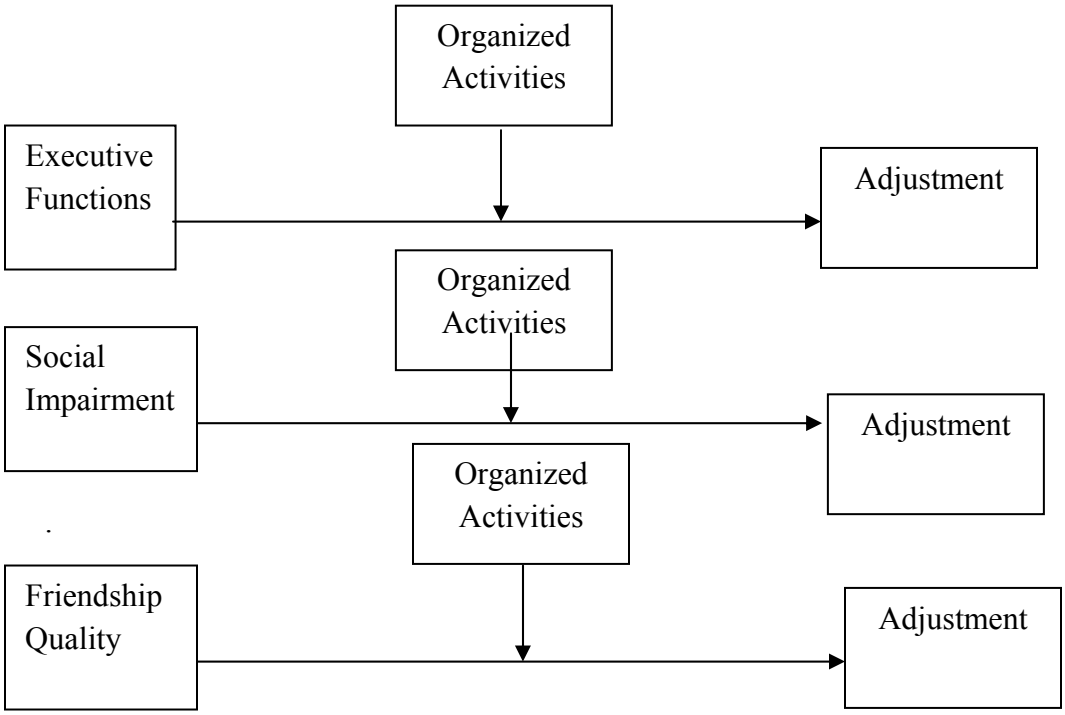
In addition to feeling more socially accepted and increasing social interactions with others, OA is also important to study because it can help increase the quality of a person's friendships. Feldman and Matjasko's (2005) review of the OA literature from the past twenty years found that not only did OA involvement provide an important context for development of skills and identity, but also allowed youth to begin developing more extensive networks of friends and adult/leader figures. OA participation therefore provides structured social opportunities for youth and allows them to step outside their friendship comfort zone. However, these studies were conducted with typically developing youth, who likely had better quality of friendships to begin with in comparison to same aged peers who are on the autism spectrum.

This experience may prove to be especially important to those youth who have difficulties navigating social situations and may provide a supportive environment to better develop their skills. Though little research has been conducted in this area, some reviews of school-based activity participation in youth with developmental disabilities have suggested positive outcomes, such as development of social skills, increased social interaction, and cooperation with non-disabled peers (e.g., Rynders, Schleien, Meyers, & Vandercook, 1993). Therefore, it is important to examine OA and friendship quality in the context of ASD to see whether OA can be a buffer against depressive symptoms and feelings of loneliness. While OA participation has been demonstrated to be a buffer against poor adjustment for typically developing youth (Barber et al., 2001; Eccles et al., 2003; Feldman & Matjasko, 2005; Fredricks & Eccles, 2006a; Gore et al., 2001; Mahoney, 2000; Posner & Vandell, 1999), it is not known whether this is true for youth with ASD. One possibility that will be examined in this study is whether those ASD

youth with less developed EF skills may benefit *more* from OA participation, as the context of an enriching activity may compensate for the less developed skills (Riggs & Greenberg, 2004). For example, consider a boy with an ASD who is attending a Boy Scout meeting and is attempting to join in conversations with his fellow scouts. If he participates in the scout meeting, he is not only provided with a model of successful social interactions, but is also able to practice his social skills and gets immediate feedback on his success, thus compensating for his less developed EF abilities.

Although not yet examined empirically, the current study considered whether OA participation moderates the relation between EF and adjustment, social impairment and adjustment, and friendship quality and adjustment, with OA participation serving as a potential buffer against greater depressive symptoms and feelings of loneliness (see Figure 2). In addition, the OA literature has demonstrated the unique impact of different indices of involvement on adjustment (e.g., Fredricks & Eccles, 2006b, Bohnert, Fredricks, & Randall, 2010). Therefore, number of activities, intensity, and breadth of participation will each be considered as a separate moderator.

Figure 2: Specific Moderated Pathways of Adjustment



Summary

While research has separately investigated social impairment and friendship quality, no study has looked at how these factors directly and indirectly impact the relation between EF and adjustment in youth with ASD. The current study proposed developmental mediational models that employ multiple methods to examine relations between EF, social impairment, friendship quality and adjustment among an sample of high functioning adolescents with ASD (see Figure 1 for the proposed models) as well as the potential moderating effect of organized activity involvement (see Figure 2).

As discussed previously, EF skills develop as a person matures into and through adolescence. Therefore, it is important to recognize that younger adolescents may not have as well-developed EF abilities in comparison to their older counterparts. Therefore,

the current study proposed to control for age in all analyses if necessary in order to address this potential confounding variable. Furthermore, as ASD are four times more common in males in comparison to females, preliminary analyses determined whether gender should be controlled for in all analyses to ensure that any significant findings are applicable to both genders.

Questions and Hypotheses

1. *What is the relation between executive functions and adjustment?* It is hypothesized that greater impairment in executive functions will be associated with an increased level of adjustment difficulties, including increased depressive symptoms and feelings of loneliness. EF domains of cognitive flexibility, shifting, inhibition, and emotional control will be tested, respectively. The model will also be run separately for depressive symptoms and loneliness, respectively.
2. *Does social impairment mediate the relation between executive functions and adjustment?* It is hypothesized that increased social impairment will mediate the relation between executive function and adjustment. Poorer executive function will lead to greater social impairment, which will impact adjustment, including increased levels of depressive symptoms and feelings of loneliness. EF domains of cognitive flexibility, shifting, inhibition, and emotional control will be tested, respectively. The model will also be run separately for depressive symptoms and loneliness, respectively.
3. *Does friendship quality mediate the relation between executive functions and adjustment?* It is hypothesized that friendship quality will mediate the relation between executive function ability and level of adjustment. Poorer executive function

will lead to poorer friendship quality, which will impact adjustment, including increased levels of depressive symptoms and feelings of loneliness. EF domains of cognitive flexibility, shifting, inhibition, and emotional control will be tested, respectively. The model will also be run separately for both depressive symptoms and loneliness, respectively.

4. *Is a developmental mediational model a good fit?* The current study hypothesizes that the overall model will be a good fit for explaining the impact of social impairment and friendship quality on the relation between executive function ability and adjustment in youth with ASD. Specifically, it is hypothesized that poorer executive functions will lead to greater social impairment, which will lead to poorer friendship quality, which will in turn impact adjustment. An alternate model, allowing social impairment to also directly relate to adjustment, will also be tested. EF domains of cognitive flexibility, shifting, inhibition, and emotional control will be tested, respectively. The model will also be run separately for both depressive symptoms and loneliness, respectively.
5. *Is organized activity involvement a buffer against increased adjustment difficulties?* The current study hypothesizes that increased organized activity involvement will moderate the relation between the independent variables and adjustment. Specifically, increased OA involvement (activity number, intensity, breadth) will buffer the relations between executive functions (cognitive flexibility, shifting, inhibition, and emotional control) and adjustment, social impairment and adjustment, and friendship quality and adjustment. These analyses will be run separately for both depressive symptoms and loneliness, respectively.

CHAPTER TWO

METHOD

Participants

Participants in this study included 127 (103 males, 24 females) adolescents previously diagnosed with an ASD and their parents/caregivers. Of the parents completing the questionnaires, 92.1% were biological mothers, 5.5% were biological fathers, 1.6% were grandmothers, and 0.8% were adoptive mothers. 24.4% of the youth had a current diagnosis of autism, 57.5% had a current diagnosis of Asperger's Disorder, and 18.1% had a current diagnosis of Pervasive Developmental Disorder Not Otherwise Specified. The average age of the youth was 13.95 (SD=1.60) with a range of 12 to 17. The ethnicity breakdown of the youth is as follows: 86.6% Caucasian, 4.7% Hispanic, 3.9% Biracial, 3.1% African American, and 1.6% Asian. Family income ranged from under $10,000 to over $200,000 with the greatest percentage (19.7%) of families reporting $40,000-$69,000. The greatest percentage of parents (28.4%) reported finishing high school or having some college education. Please see Figure 3-5 for detailed demographic data. The following inclusion criteria were used to identify a sample of adolescents with high functioning ASD. The youth must: (a) have a current diagnosis of an ASD diagnosed by a qualified professional (e.g., psychiatrist, psychologist, multidisciplinary/developmental team); (b) be

between 12 and 17 years of age; (c) be reading at a sixth grade reading level (in order to complete the questionnaires); and (d) be able to verbally communicate on a regular basis with family and peers.

Figure 3: Current Marital Status for Study Sample

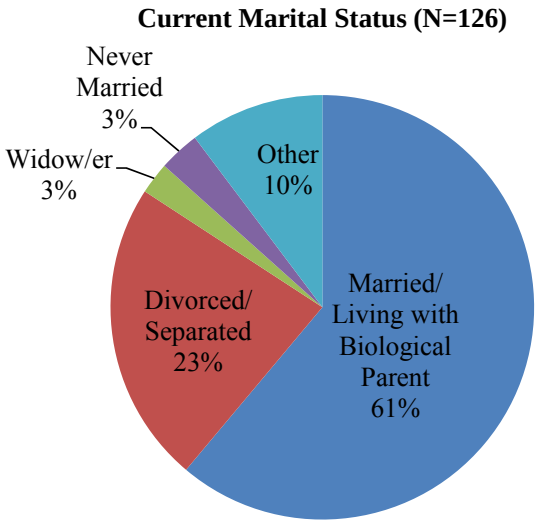


Figure 4: Parent Level of Education for Study Sample

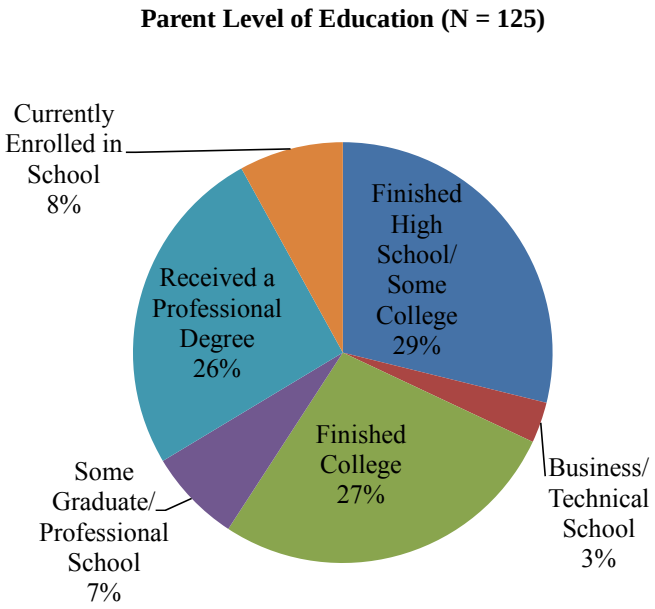
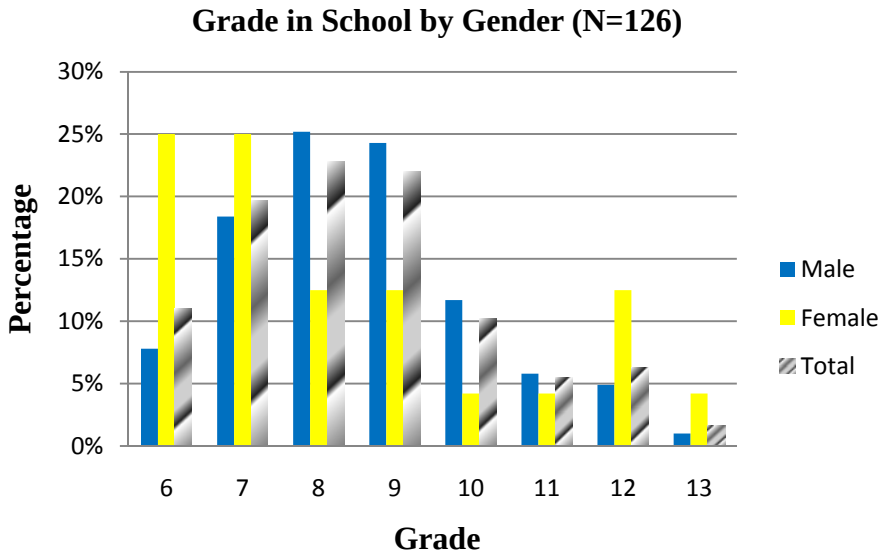


Figure 5. Grade Distribution by Gender for Study Sample



Procedure

Parent and adolescent dyads were recruited through online support groups (e.g., autism focused Yahoo groups), advocacy groups (e.g., Chicago Autism Connection, Autism Speaks), and clinics throughout the United States. Dyads were also recruited with the assistance of the Interactive Autism Network (IAN) Research Database at the Kennedy Krieger Institute and Johns Hopkins Medicine – Baltimore, sponsored by the Autism Speaks Foundation.

A brief description of the research and responsibilities of participating was provided with information regarding how to contact study staff in order to participate. Dyads were given the option of completing materials online or receiving paper copies; 29.9% chose to receive paper copies and 70.1% participated online. Those dyads that chose to participate were sent a packet of consent and assent forms, demographic information, questionnaires, and measures to fill out or emailed two secure links to the online parent and adolescent surveys, depending on their preference. A waiver of

documentation of informed consent was approved. Parents received a consent form and adolescents received an assent form. Each form concluded by stating that, by completing the measures and submitting them, dyads were giving their consent to participate. Follow-up emails were made to those participants who did not complete their packets after approximately four weeks in order to ensure that parents and youth received the packets and online links and to answer any questions or concerns. All dyads who completed and returned both the parent and adolescent packets received two $10 Target gift cards (one for the parent and one for the adolescent) as compensation for their time and effort. Surveys completed online were downloaded from the Opinio online survey website. Paper measures were entered, checked, and coded by trained graduate and undergraduate students. Identifying information was kept in a separate, secure database.

Measures

Demographic Information. Parents filled out demographic information including the age, gender, ethnicity, diagnoses, diagnosis date, and most recent IQ score of their child. Other demographic information included socioeconomic status (SES), parent level of education, and other psychological testing information.

Social Impairment

Social Responsiveness Scale (SRS). Parents completed the SRS in order to assess severity of social impairment. The SRS includes 65 items that are rated on a scale of "not true", "sometimes true", "often true", or "almost always true." Parents are instructed to identify how true each statement is, based on their child's behavior over the last six months. Examples of items include "would rather be alone than with others,"

"plays appropriately with children his/her age", and "knows when he/she is too close to someone or is invading someone's space." Composite scores were calculated based on all items included in the SRS. Previous examination of the psychometric properties of the SRS have demonstrated an internal consistency of $\alpha = .83$ over a 27-month period (Constantino et al., 2003). The current study demonstrated a similar reliability ($\alpha = .80$).

Behavior Rating Inventory of Executive Function, Parent Report, (BRIEF). Parents completed four subtests of the BRIEF in order to obtain a measure of their child's EF abilities on several domains. The BRIEF is an 86-item measure whereby the respondent is asked to identify whether each statement is true never, sometimes, or often. Examples of BRIEF statements include "becomes upset with new situation", "interrupts others", and "small events trigger big reactions." The measure assesses eight domains of EF and the current study focused on the 41 items for the Shift, Working Memory, Inhibit, and Emotional Control indices. Previous examination of the psychometric properties of the BRIEF subscales have demonstrated a good internal consistency for the eight domains ranging from $\alpha = .85$ to .98 in a clinical sample and $\alpha = .80$ to .97 in a normative sample (Gioia, Isquith, Guy, & Kenworthy, 2000). This was similar to the reliability for the current sample which ranged from $\alpha = .83$ to .92.

The Friendship Quality Questionnaire-Abbreviated edition (FQQ-A). This 21-item self-report measure assesses the quality of a person's friendship with his or her best friend. The abbreviated version was used in the National Institute of Child Health and Human Development (NICHD) study of early child care and youth development and is shortened from the original FQQ which is administered as an interview. Youth are

asked to rate each statement on a 5-point scale from “not at all true” to “really true” while thinking of relationship with their best friend. Examples of statements include “my best friend tells me I’m good at things”, “If other kids were talking behind my back, my best friend would always stick up for me”, and “my best friend makes me feel good about my ideas.” The current study also included questions about the number of friends the youth has, how many hours per week s/he spends with friends outside of school, as well as the name and age of the youth’s best friend. Previous examination of the original FQQ demonstrates an internal consistency of $\alpha = .91$ (Parker & Asher, 1993), which is consistent with what was found in the current study ($\alpha = 89$).

The Friendship Quality Questionnaire- Abbreviated Parent edition (FQQ-AP). This 21-item measure is a modification of the FQQ-A to assesses the quality of a person’s friendship with his or her best friend from the parent’s perspective. Parents are asked to rate each statement on a 5-point scale from “not at all true” to “really true” while thinking of relationship with their best friend. Examples of statements include “my child’s best friend says s/he’s good at things”, “If other kids were talking behind my child’s back, his/her best friend would always stick up for him/her”, and “my child’s best friend makes him/her feel good about his/her ideas.” The current study also included questions about the number of friends the youth has, how many hours per week s/he spends with friends outside of school, as well as the name and age of the youth’s best friend. The reliability demonstrated for the current study was very good ($\alpha = .91$).

Achenbach Child Behavior Checklist – Depression Scale (CBCL-D); Achenbach Youth Self Report – Depression Scale (YSR-D). Parents completed the

CBCL-D and adolescents filled out the YSR-D in order to assess parent and self-reported depressive symptoms. The CBCL-D and YSR-D are 15 items from the 118-item CBCL and YSR measures. Participants read each statement and are instructed to rate whether it is not true, somewhat true, or very true. Examples of the statements include "can't concentrate, can't pay attention", "feels worthless or inferior", and "withdrawn, uninvolved with others." The current study omitted the two questions regarding suicidality (i.e., harms self or attempts suicide, talks about killing self). Clarke, Lewinsohn, Hopes, and Seeley's (1992) examination of the psychometric properties of the CBCL-D demonstrated a good internal consistency (α = .81 for mothers, α = .76 for fathers), as did the YSR-D (α = .80), which is consistent with what was found in the current study (α = .79 for the CBCL-D, α = .79 for YSR-D).

The Loneliness Scale (LS). The Loneliness Scale is a 24-item self-report measure that assesses adolescent loneliness. Youth are asked to rate each statement on a 5-point scale from "not true at all" to "always true" based on how they have been feeling over the last few weeks. Sixteen of the items are related to loneliness. Examples of statements include "I have nobody to talk to," I can find a friend when I need to," and "I feel alone." There are also eight filler items, which include "I like to read", "I like school", and "I play sports a lot." Bauminger and Kasari's (2000) review of the psychometric properties noted an internal consistency of α = .90 and this measure has also been specifically used for youth with ASD. The reliability for the current sample was α =. 91.

The Loneliness Scale – Parent Report (LS-P). The LS-P is a 16-item amendment of the Loneliness Scale, which is appropriate for parents to report on their child's level of loneliness. For example, the statement "I have nobody to talk to," is changed to "My child has nobody to talk to." The eight filler items were removed for the LS-P. The reliability of the LS-P for the current sample was good (α = .84).

Organized Activities Inventory (OAI). Parents filled out the Organized Activities Inventory (OAI) to assess their child's current level of participation in OA (i.e., within the last calendar year). For each activity, parents were asked to record the average number of hours the child participates per week in the activity, the number of months they participated in that activity, and whether the activity includes interactions with typically developing youth or not. Total number of activities was calculated, as well as intensity of activity participation (i.e., number of hours per week divided by total duration of participation) and breadth (i.e., number of different categories of activities). Activities were coded into five categories – Religious, Service, Academic, Performance/Fine Arts, and Sports. Only activities that were considered structured, organized activities were included. Activities including summer camp and therapeutic activities were excluded. Activity coding was completed by two trained undergraduate students. Weekly meetings were conducted in order to discuss questions regarding activity coding. Twenty-five percent of the activity questionnaires were double coded. The interrater reliability was 93.38%.

CHAPTER THREE

RESULTS

Descriptive Statistics and Correlations

Composites were created for study measures. Missing data were imputed using PRELIS 2.80 in LISREL 8.80. Composites were imputed only if a participant skipped questions within the measure; data was not imputed if a participant left an entire measure blank. Examination of the means and standard deviations for all study variables revealed that OA intensity was significantly skewed. Based on previous literature and recommendations (Howell, 2010), a square root transformation was computed and used in all subsequent analyses. Means, standard deviations, and correlations between study variables are listed in Table 1. T-scores were calculated for the domains of the BRIEF and all four means were in the clinical range (i.e., T-score of 65 or greater) including Inhibit (Mean = 68.73, SD = 15.10), Shift (Mean = 75.84, SD = 12.31), Emotional Control (Mean = 67.15 SD = 13.27), and Working Memory (Mean = 70.13, SD = 13.43).

Parent and adolescent reports differed with respect to the number of close friends. A greater percentage of adolescents reported approximately four or more friends compared to parent report (see Figure 6). Conversely, when asked about the amount of time spent with friends outside of school, adolescent and parent report were generally consistent, with the greatest number of dyads reporting playing with a friend less than one time per week (see Figure 6). Although adolescents reported higher overall

Table 1: Means, Standard Deviations, and Bivariate Correlations Between Study Variables

Variables	1	2	3	4	5	6	7
1 Age	--						
2. BRIEF Inhibit	**-.23***	--					
3. BRIEF Shift	-.17	**.51****	--				
4. BRIEF EC	**-.32****	**.63****	**.65****	--			
5. BRIEF WM	-.09	**.50****	**.47****	**.45****	--		
6. SRS	**-.20***	**.55****	**.61****	**.52****	**.50****	--	
7. FQQ-AP	.07	**-.23****	**-.20***	**-.28****	-.17	**-.36****	--
8. FQQ-A	.16	-.04	-.04	-.12	-.08	-.12	**.45****
9. CBCL-D	-.08	**.36****	**.46****	**.53****	**.51****	**.43****	-.10
10. YSR-D	-.08	**.21***	**.34****	**.44****	**.34****	**.32****	**-.21***
11. LS-P	-.10	**.28****	**.45****	**.49****	**.32****	**.51****	**-.38****
12. LS	-.12	.07	**.19***	**.32****	**.24****	**.25****	**-.25****
13. OA Total Number	.12	-.20	-.11	**-.19***	-.11	**-.20***	-.17
14. OA Intensity	.16	-.03	-.09	-.13	-.15	**-.21***	.00
15. OA Breadth	.01	-.07	-.09	-.12	-.17	-.05	.12
Mean	13.95	19.85	18.43	21.24	22.54	96.39	64.63
SD	1.60	5.42	3.46	5.36	5.31	16.54	16.01
Range	12-17	10-30	8-24	10-30	11-30	53-137	35-101

Note. Higher scores on the BRIEF subscales, SRS, CBCL-D, YSR-D, LS-P, and LS indicate greater impairment; IQ is full scale IQ as reported by parent. * Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed).

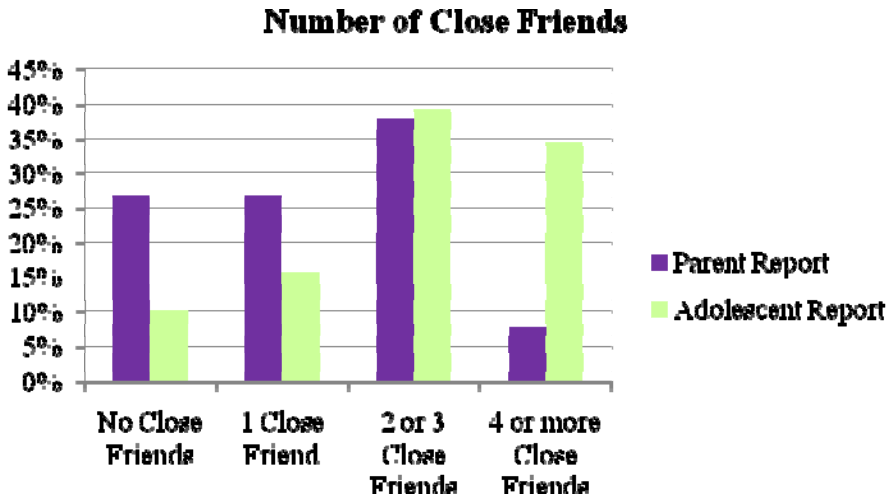
Table 1 continued

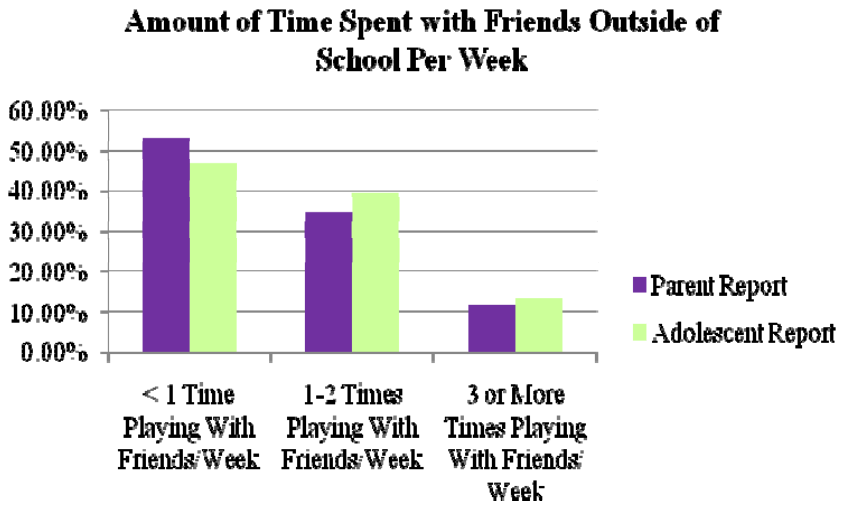
Variables	8	9	10	11	12	13	14	15
1 Age								
2. BRIEF Inhibit								
3. BRIEF Shift								
4. BRIEF EC								
5. BRIEF WM								
6. SRS								
7. FQQ-AP								
8. FQQ-A	--							
9. CBCL-D	.03	--						
10. YSR-D	-.07	**.61****	--					
11. LS-P	-.07	**.48****	**.41****	--				
12. LS	**-.43****	**.41****	**.60****	**.50****	--			
13. OA Total Number	.06	**-.25****	**-.31****	**-.27****	**-.26****	--		
14. OA Intensity	-.02	**-.25***	**-.19***	**-.27****	-.13	**.42****	--	
15. OA Breadth	.05	-.18	**-.23***	-.17	-.17	**.86****	**.33****	--
Mean	72.01	.71	.70	31.63	23.83	1.86	1.96	1.61
SD	14.53	.39	.39	9.14	11.99	1.42	2.16	.92
Range	37-97	0-1.62	0-1.69	3-52	0-51	0-5	0-10.80	0-4

Note. Higher scores on the BRIEF subscales, SRS, CBCL-D, YSR-D, LS-P, and LS indicate greater impairment; IQ is full scale IQ as reported by parent. * Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed).

friendship qualities compared to parent reports, parent and adolescent reports were significantly positively correlated for the FQQ-AP and FQQ-A ($p < .01$). Parents reported that their children participated in an average of 1.86 activities (SD = 1.43) with an average intensity of 1.96 hours per week (SD = 2.16) and an average breadth of 1.61 activity categories (SD = .92). Measures of OA were significantly correlated with each other, including total number and intensity ($p < .01$), total number and breadth ($p < .01$), and intensity and breadth ($p < .01$). OA total number was significantly negatively correlated with BRIEF Emotional Control and SRS ($p < .05$ for each), as well as depressive symptoms ($p < .01$). OA intensity was significantly negatively correlated with the SRS ($p < .05$), depressive symptoms ($p < .05$), and the parent report of loneliness ($p < .01$). OA Breadth was only significantly negatively correlated with the adolescent self-report of depressive symptoms ($p < .05$). These correlations suggest that increased activity participation is associated with fewer social impairments, depressive symptoms and loneliness.

Figure 6: Parent and Self-Report of Friendship Quantity on the Friendship Quality Questionnaire – Abbreviated Parent Report (FQQ-AP) and Child Report (FQQ-A).





Age was significantly negatively correlated with the BRIEF Inhibit ($p < .05$) and Emotional Control ($p < .01$) domains, indicating that increased age is associated with fewer inhibition and emotional control problems. All four domains of the BRIEF were significantly correlated with each other ($p < .01$ for all). Positive correlations were also found between the CBCL-D and YSR-D ($p < .01$), and LS-P and LS ($p < .01$). Due to the high correlations between parent and adolescent reports (see Table 1), parent and self reports averaged for the Friendship Quality Questionnaires (FQQ-AP, FQQ-A), CBCL-D and YSR-D, and the Loneliness Scales (LS, LS-P), which were used for all subsequent analyses.

As shown in Table 1, both loneliness and depressive symptoms were positively correlated with all four EF domains ($p < .05$ for Inhibit, $p < .001$ for Shift, Emotional Control, Working Memory for loneliness; $p < .001$ for all EF domains for depressive symptoms).

Comparing all demographic and study variables, there were significant gender differences between parent report of social impairment on the SRS and overall friendship

quality (parent and child mean score). On the SRS, parents rated females as having significantly greater social impairment ($t = -3.68$, $p < .01$). Conversely, females were rated as having better friendship quality compared to males ($t = -2.89$, $p < .01$). Furthermore, there were significant differences for mode of participation (online versus paper) for the loneliness and depression composites. Participants completing paper measures were significantly more likely to have increased levels of loneliness ($t = -2.14$, $p < .05$) and depressive symptoms ($t = -2.65$, $p < .01$). Due to these significant differences and the correlation of age to several study variables, all subsequent analyses were also run controlling for age, gender, and mode of participation.

Mediation Models

LISREL 8.80 was used to test all 16 mediation models. Traditionally, four criteria have been established for mediation: 1. Demonstrate a significant relation between the predictor (A) and the outcome (C), 2. Demonstrate a significant relation between A and the mediator (B), 3. Demonstrate a significant relation between B and C, and (4), Demonstrate that the A → C pathway is eliminated when including B as a mediator (e.g., Baron & Kenny, 1986; Kenny, Kashy, & Bolger, 1998). However, many researchers suggest that having the initial A → C significant pathway is too stringent and should not be required to determine mediation (Kenny, Kashy, & Bolger, 1998; Taylor, MacKinnon, & Tein, 2008). Because the relation between the predictor A (i.e., measures of EF) and the outcome C (i.e., measures of adjustment) is one of the primary questions for the current study, this relation was assessed in all 16 models. However, mediation was examined in all 16 models, regardless of whether the A → C pathway was significant. In addition, the Sobel test was used when the criteria for full mediation were

not met (i.e., criteria 2 and 3 were met but criteria 4 was not) to evaluate whether the presence of the mediator resulted in a significant drop in the A → C relation (i.e., indirect or partial mediation; Kenny, Kashy, & Bolger, 1998).

Social Impairment. Social impairment emerged as a significant mediator for all eight models (i.e., all four measures of EF for both loneliness and depressive symptoms, see Table 2). All of the eight models met the first mediation criteria (i.e., EF → adjustment). These results support Hypothesis 1, suggesting that there is a direct and positive association between EF and adjustment. Each of the eight models met the second mediation criteria (i.e., EF → social impairment). All eight models also met the third mediation criteria (i.e., social impairment→ adjustment). Finally, four of the eight models met the fourth mediation criteria, (i.e., non-significant EF → adjustment with the inclusion of the mediator). This included 1. Inhibit → loneliness, 2. Inhibit → depressive symptoms, 3. Shift → loneliness 4. Working Memory → loneliness. Furthermore, the Sobel test of indirect effect for each of the other four models was significant, suggesting that the effect of EF abilities on adjustment dropped significantly when social impairment was included in the model. Collectively, these results suggest that social impairment significantly mediates the relation between EF and adjustment, although for four of the models, social impairment does not account for the entire relation between the EF predictor and the adjustment outcome (i.e., partial mediation).

Table 2: Social Impairment as a Mediator

Model/Pathway	B	SE	Sobel Test
Inhibit → Social Impairment → Loneliness	--	--	**.41*****
Inhibit → Loneliness	**.31***	.15	--
Inhibit → Social Impairment	**1.63*****	.23	--
Social Impairment → Loneliness	**.25*****	.05	--

Inhibit → Social Impairment → Loneliness	-.10	.16	--
Inhibit → Social Impairment → Depressive Sxs	--	--	**.01***
Inhibit → Depressive Sxs	**.02***	.11	--
Inhibit → Social Impairment	**1.63***	.23	--
Social Impairment → Depressive Sxs	**.01***	.00	--
Inhibit → Social Impairment → Depressive Sxs	.01	.01	--
Shift → Social Impairment → Loneliness	--	--	**.54****
Shift → Loneliness	**.92***	.22	--
Shift → Social Impairment	**2.93***	.34	--
Social Impairment → Loneliness	**.18***	.06	--
Shift → Social Impairment → Loneliness	.38	.27	--
Shift → Social Impairment → Depressive Sxs	--	--	**.12***
Shift → Depressive Sxs	**.05***	.01	--
Shift → Social Impairment	**2.93***	.34	--
Social Impairment → Depressive Sxs	**.01***	.00	--
Shift → Social Impairment → Depressive Sxs	**.03****	.01	--
Emotional Control → Social Impairment → Loneliness	--	--	**.22****
Emotional Control → Loneliness	**.78***	.14	--
Emotional Control → Social Impairment	**1.61***	.24	--
Social Impairment → Loneliness	**.14****	.05	--
Emotional Control → Social Impairment → Loneliness	**.55***	.16	--
Emotional Control → Social Impairment → Depressive Sxs	--	--	**.01***
Emotional Control → Depressive Sxs	**.04***	.01	--
Emotional Control → Social Impairment	**1.61***	.24	--
Social Impairment → Depressive Sxs	**.00***	.00	--
Emotional Control → Social Impairment → Depressive Sxs	**.03***	.01	--
Working Memory → Social Impairment → Loneliness	--	--	**.30*****
Working Memory → Loneliness	**.55***	.15	--
Working Memory → Social Impairment	**1.56***	.24	--
Social Impairment → Loneliness	**.19***	.05	--
Working Memory → Social Impairment → Loneliness	.25	.16	--
Working Memory → Social Impairment → Depressive Sxs	--	--	**.01***
Working Memory → Depressive Sxs	**.03***	.01	--
Working Memory → Social Impairment	**1.56***	.24	--
Social Impairment → Depressive Sxs	**.01****	.00	--
Working Memory → Social Impairment → Depressive Sxs	**.02***	.01	--

Note: * $p \leq$ 0.05 (2-tailed), ** $p \leq$ 0.01 (2-tailed), *** $p \leq$ 0.001 (2-tailed).

Friendship Quality. Friendship quality emerged only as a significant mediator of the relation between BRIEF Emotional Control and loneliness (see Table 3). As discussed previously, each of the eight models met the first of Baron and Kenny's mediation criteria (i.e., EF → adjustment). Two of the eight models met the second mediation criteria (i.e., Emotional Control → friendship quality). Of those two models, only one met the third mediation criteria (i.e., friendship quality→ loneliness). However, this model did not meet the fourth mediation criteria, (i.e., non-significant Emotional Control → loneliness with the inclusion of the mediator), which indicates that, even with the presence of friendship quality in the model, there is still a significant relation between emotional control and loneliness. However, the Sobel test of the indirect effects for this model was significant, suggesting that the effect of emotional control on loneliness did drop significantly when friendship quality was included in the model. (Sobel = .12, $p <$ .05).

Table 3: Friendship Quality as a Mediator

Pathway	B	SE	Sobel Test
Inhibit → Friendship Quality → Loneliness	--	--	.10
Inhibit → Loneliness	**.31***	.15	--
Inhibit → Friendship Quality	-.39	.21	--
Friendship Quality → Loneliness	**-.26*****	.06	--
Inhibit → Friendship Quality → Loneliness	.21	.14	--
Inhibit → Friendship Quality → Depressive Sxs	--	--	.72
Inhibit → Depressive Sxs	**.02*****	.11	--
Inhibit → Friendship Quality	-.39	.21	--
Friendship Quality → Depressive Sxs	-.00	.00	--
Inhibit → Friendship Quality → Depressive Sxs	**.02*****	.01	--
Shift → Friendship Quality → Loneliness	--	--	.13
Shift → Loneliness	**.92*****	.22	--
Shift → Friendship Quality	-.54	.33	--
Friendship Quality → Loneliness	**-.25*****	.06	--

Shift → Friendship Quality → Loneliness	**.79*****	.21	--
Shift → Friendship Quality → Depressive Sxs	--	--	.00
Shift → Depressive Sxs	**.05*****	.01	--
Shift → Friendship Quality	-.54	.33	--
Friendship Quality → Depressive Sxs	-.00	.00	--
Shift → Friendship Quality → Depressive Sxs	**.04*****	.01	--
Emotional Control → Friendship Quality → Loneliness	--	--	**.12***
Emotional Control → Loneliness	**.78*****	.14	--
Emotional Control → Friendship Quality	**-.59****	.21	--
Friendship Quality → Loneliness	**-.21*****	.06	--
Emotional Control → Friendship Quality → Loneliness	**.65*****	.13	--
Emotional Control → Friendship Quality → Depressive Sxs	--	--	.00
Emotional Control → Depressive Sxs	**.04*****	.01	--
Emotional Control → Friendship Quality	**-.59****	.21	--
Friendship Quality → Depressive Sxs	.00	.00	--
Emotional Control → Friendship Quality → Depressive Sxs	**.04*****	.01	--
Working Memory → Friendship Quality → Loneliness	--	--	.09
Working Memory → Loneliness	**.55*****	.15	--
Working Memory → Friendship Quality	-.36	.22	--
Friendship Quality → Loneliness	**-.25*****	.06	--
Working Memory → Friendship Quality → Loneliness	**.46*****	.14	--
Working Memory → Friendship Quality → Depressive Sxs	--	--	.00
Working Memory → Depressive Sxs	**.03*****	.01	--
Working Memory → Friendship Quality	-.36	.22	--
Friendship Quality → Depressive Sxs	-.00	.00	--
Working Memory → Friendship Quality → Depressive Sxs	**.03*****	.01	--

Note: * $p \leq$ 0.05 (2-tailed), ** $p \leq$ 0.01 (2-tailed), *** $p \leq$ 0.001 (2-tailed).

Full Developmental Model

LISREL 8.80 was used to test all eight full models. For each models, an alternate model, which allowed social impairment to relate directly with the adjustment outcome, was tested along with the original model (see Figure 1). Of the eight models, none of the original models were found to be a good fit; however, four of the alternate models met the criteria for a good fitting model.

The first of these four models posited that increased inhibition problems would be associated with greater social impairment, leading to poorer friendship quality, and higher levels of loneliness. The original model provided poor absolute fit, χ^2 (3, N=127) =16.58, SRMR = .10, RMSEA=.18 and poor relative fit, CFI=.85, NNFI=.70. However, the alternate model which allowed social impairment to correlate with loneliness provided excellent absolute fit, χ^2 (2, N=127) =.426, SRMR = .01, RMSEA=0.0 and excellent relative fit, CFI=1.0, NNFI=1.0 (see Figure 7).

The second model hypothesized that increased inhibition problems would be associated with greater social impairment, which would be related to poorer friendship quality, and higher levels of depressive symptoms. Again, the original model provided poor absolute fit, χ^2 (3, N=127) =24.00, SRMR = .15, RMSEA=.22 and poor relative fit, CFI=.74, NNFI=.48. However, the alternate model, allowing social impairment to correlate with depressive symptoms, provided excellent absolute fit, χ^2 (2, N=127) =1.95, SRMR = .03, RMSEA= 0.0 and excellent relative fit, CFI=1.0, NNFI=1.0 (see Figure 8).

The third model posited that increased shifting problems would be associated with greater social impairment, which would be associated with poorer friendship quality, and higher levels of loneliness. As stated previously, the original model provided poor absolute fit, χ^2 (3, N=127) =19.15, SRMR = .13, RMSEA=.20 and poor relative fit, CFI=.86, NNFI=.71. However, the alternate model which allowed social impairment to correlate with loneliness provided good absolute fit, χ^2 (2, N=127) =3.00, SRMR = .03, RMSEA= .06 and good relative fit, CFI=.99, NNFI=.97 (see Figure 9).

The final model predicted that increased working memory problems would be associated with greater social impairment, which would be associated with poorer

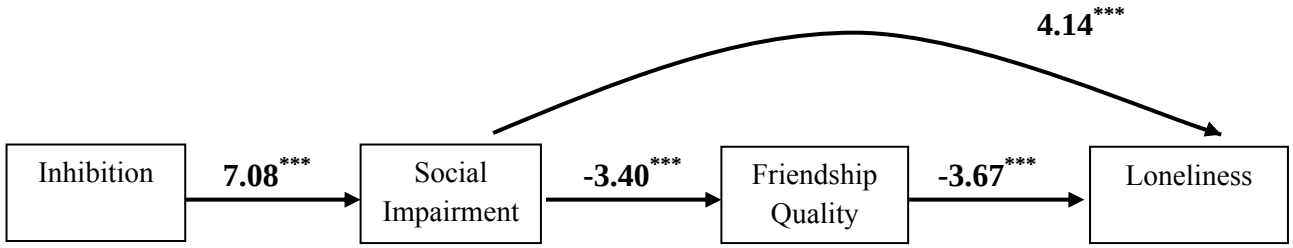
friendship quality, and higher levels of loneliness. The original model again provided poor absolute fit, χ^2 (3, N=127) =18.80, SRMR = .13, RMSEA=.20 and poor relative fit, CFI=.83, NNFI=.66. However, the alternate model which allowed social impairment to correlate with loneliness provided good absolute fit, χ^2 (2, N=127) = 2.64, SRMR = .03, RMSEA=.05 and good relative fit, CFI=.99, NNFI= .98 (see Figure 10).

Organized Activities

Hierarchical linear regression analyses were conducted to investigate whether the relations between study variables (i.e., EF, social impairment, and friendship quality) and adjustment outcomes were moderated by OA involvement. Hierarchical linear regressions were run separately using each independent variable (i.e., Inhibit, Shift, Emotional Control, Working Memory, social impairment, or friendship quality) as the first step of the regression. OA dimension (total number, intensity, or breadth), was entered as the second step. The interaction term (predictor X OA dimension) was entered as the third and final step. Each regression was run separately for depressive symptoms and loneliness as outcomes. All continuous variables in the model were centered prior to analysis and simple slopes analyses were conducted for all significant interactions according to recommendations by Holmbeck (1997; 2002) and Aikens and West (1991).

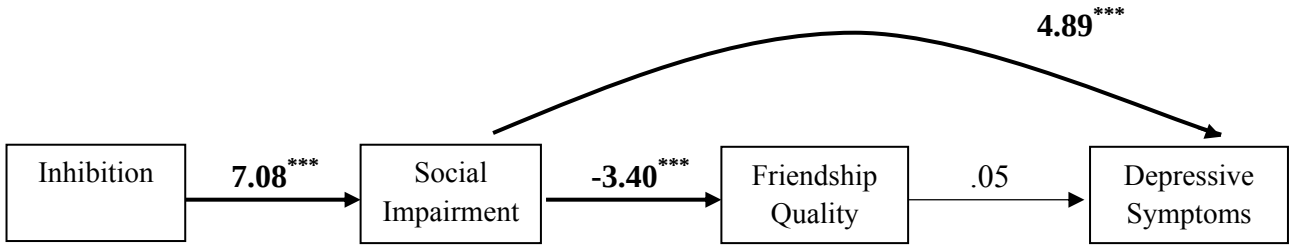
Total Number. Significant main effects of activity number were found for both depressive symptoms (β = -.31, $p < .001$) and loneliness (β = -.30, $p < .01$), suggesting that participation in more activities is associated with fewer adjustment difficulties. However, total number did not significantly moderate the relation between any of the study variables (i.e., measures of EF, social impairment, friendship quality) and adjustment.

Figure 7: Structural Equation Model Predicting Loneliness by Inhibition, Social Impairment, and Friendship Quality.[+]



Goodness of Fit Statistics:
Absolute Fit: SRMR = .01, RMSEA = .0; *Relative Fit:* CFI = 1.0, NNFI = 1.0

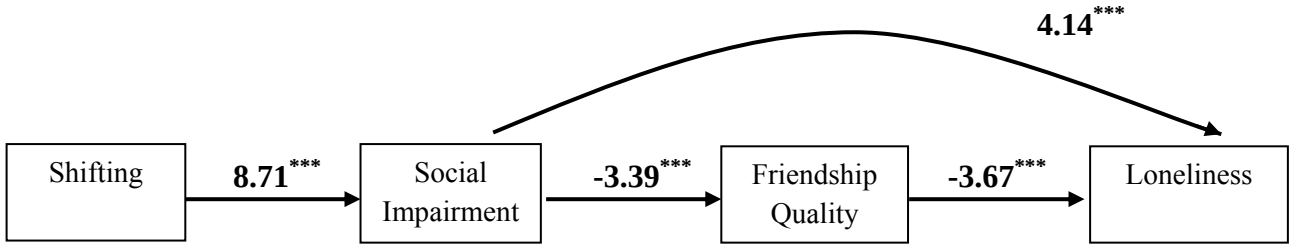
Figure 8: Structural Equation Model Predicting Depressive Symptoms by Inhibition, Social Impairment, and Friendship Quality. [+]



Goodness of Fit Statistics:
Absolute Fit: SRMR = .03, RMSEA = .00; *Relative Fit:* CFI = 1.0, NNFI = 1.0

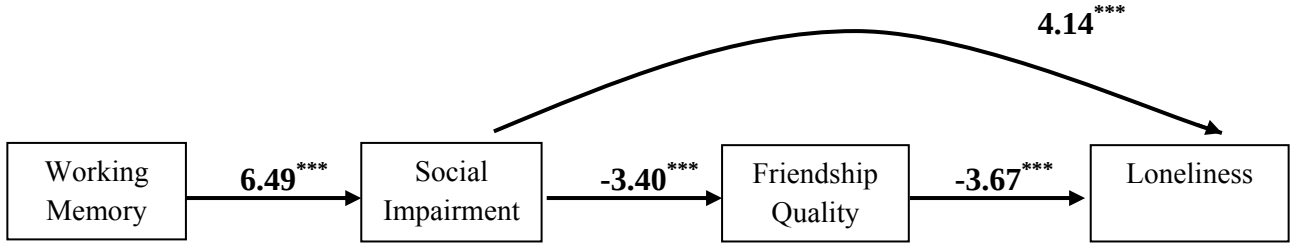
[+] Note that significant paths are in bold type, Z-scores are reported, * $p \leq$ 0.05 (2-tailed), ** $p \leq$ 0.01 (2-tailed), *** $p \leq$ 0.001 (2-tailed).

Figure 9: Structural Equation Model Predicting Loneliness by Shifting, Social Impairment, and Friendship Quality. [+]



Goodness of Fit Statistics:
Absolute Fit: SRMR = .03, RMSEA = .06; *Relative Fit:* CFI = .99, NNFI = .97

Figure 10: Structural Equation Model Predicting Loneliness by Working Memory, Social Impairment, and Friendship Quality. [+]

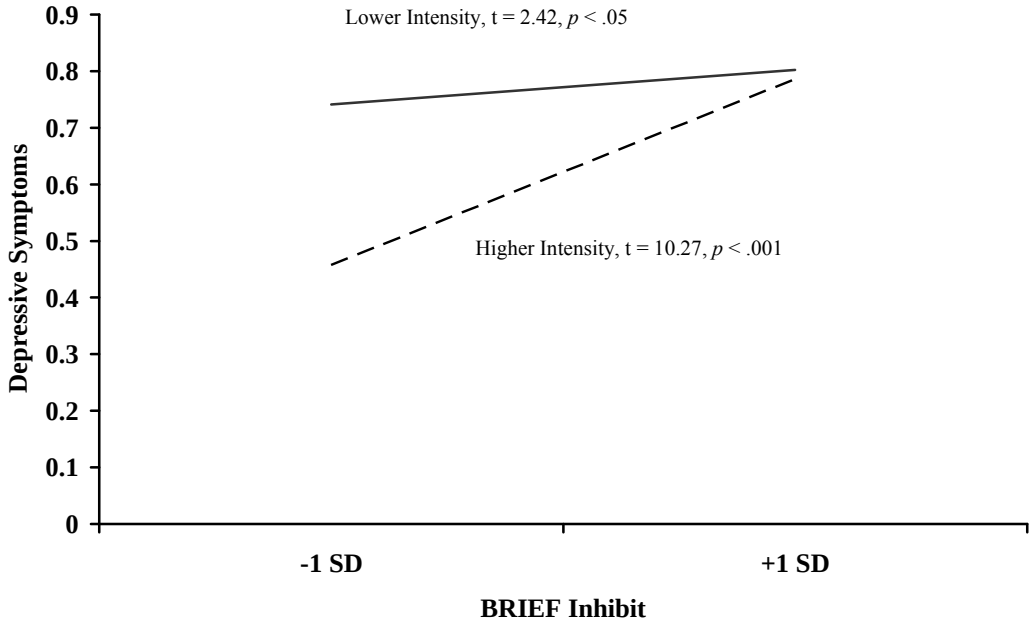


Goodness of Fit Statistics:
Absolute Fit: SRMR = .03, RMSEA = .05; *Relative Fit:* CFI = .99, NNFI = .98

[+] Note that significant paths are in bold type, Z-scores are reported, * $p \leq 0.05$ (2-tailed), ** $p \leq 0.01$ (2-tailed), *** $p \leq 0.001$ (2-tailed).

Intensity. A significant main effect of intensity was found for both depressive symptoms (β = -.25, p < .05) and loneliness (β = -.21, p < .05), suggesting that increased activity participation was associated with fewer adjustment difficulties. A significant interaction was detected between inhibition and OA intensity for depressive symptoms (β = .34, p < .05). As shown in Figure 11, post hoc analyses revealed that the relation between inhibition and depressive symptoms is dependent on the intensity of activity participation (p < .001). Specifically, greater OA intensity was associated with higher levels of depressive symptoms for those with poorer inhibition. OA intensity did not significantly moderate the relation between any other EF or social measure (i.e., Shift, Emotional Control, Working Memory, social impairment, or friendship quality) and adjustment.

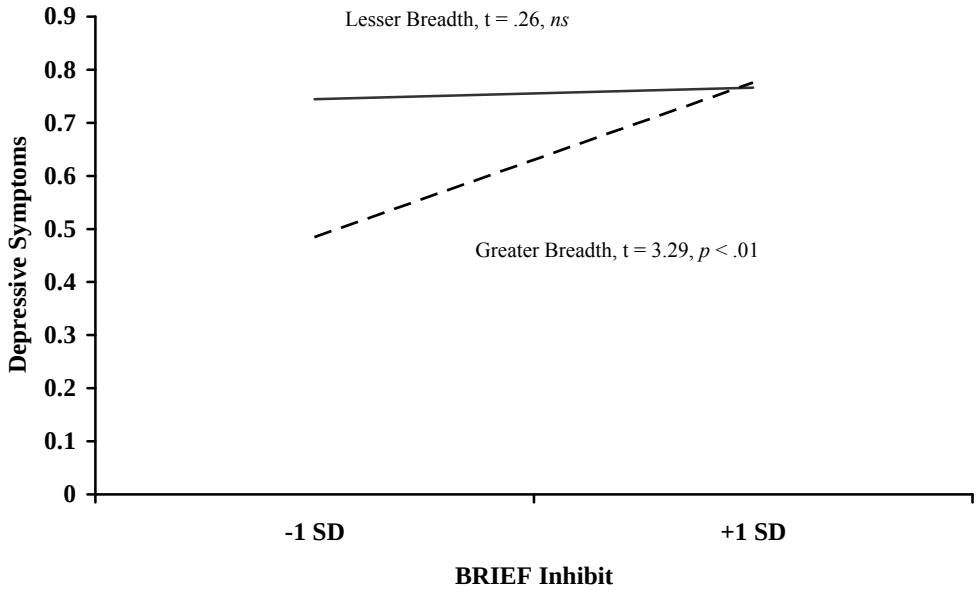
Figure 11: Simple Slopes Demonstrating the Relation Between BRIEF Inhibit Scores and Depressive Symptoms Moderated by Intensity of OA Involvement.



Note that higher scores on the BRIEF Inhibit Scale indicate greater impairment.

Breadth. A significant main effect of breadth was also found for both depressive symptoms (β = -.23, p < .05) and loneliness (β = -.20, p < .05), suggesting that increased participation in a variety of activity categories was associated with fewer adjustment difficulties. Significant moderation was found between inhibition and OA breadth for depressive symptoms (β = .78, p < .05). As shown in Figure 12, post hoc analyses revealed that greater OA breadth was associated with higher levels of depressive symptoms only for those with poorer inhibition (p < .01). OA breadth did not significantly moderate the relation between any other EF or social measure (i.e., Shift, Emotional Control, Working Memory, social impairment, or friendship quality) and adjustment. [1]

Figure 12: Simple Slopes Demonstrating the Relation Between BRIEF Inhibit Scores and Depressive Symptoms Moderated by Breadth of OA Involvement.



Note that higher scores on the BRIEF Inhibit Scale indicate greater impairment.

[1] All study analyses were also run controlling for age, gender, and the mode of completing the survey (i.e., online vs. paper) with the same results obtained.

CHAPTER FOUR

DISCUSSION

The goal of this study was to investigate the impact of several factors on adjustment in high functioning adolescents with ASD. Specifically, relations between executive functions, social impairment, and friendship quality and their contributory impact on adjustment were examined. In addition, this study sought to gain a better understanding of how organized activity participation is related to adjustment in this population. The results of this study offer unique insights into the development of adjustment difficulties in this population.

Adjustment in Autism Spectrum Disorders

As discussed, it is important to better understand adjustment in high functioning adolescents with ASD, as these adolescents have an awareness that they are different from others which can contribute to feelings of isolation, depression, and loneliness (Klin et al., 2005; Volkmar & Klin, 2005). While much of the research to date has focused on adjustment in youth with ASD and specific predictors of adjustment (e.g., social impairment), the current study expands on this in several ways, by not only identifying several contributing factors to adjustment difficulties, but also studying their influence on each other. This provides a more comprehensive model of understanding adjustment in

this population. While research has recently focused on both individual factors impacting adjustment (e.g., social impairment) as well as identifying mediators of these factors on adjustment (e.g., friendship quality), few studies have attempted to develop a more complex, comprehensive model of adjustment and to this author's knowledge, this is the first study to date that has included EF as a significant factor. This has several implications. First, while the ASD research has focused mainly on identifying specific EF deficits, this research defines a clear relation between several parent reports of EF domains and adjustment, even after controlling for age. This is consistent with the literature suggesting a link between EF and depressive symptoms in typically developing populations (e.g., Rogers et al., 2004; Austin et al., 1999). Furthermore, while autism-focused research has found less support for impairment in certain EF domains such as inhibition, the current study found that inhibition difficulties do impact adjustment in youth with ASD. This suggests that it is equally important to both identify clinical impairment in specific EF domains, and also focus research efforts to better understand the real world relations between EF difficulties and factors including adjustment difficulties. However, due to the cross-sectional nature of this study, the directionality of this relation cannot be identified. Therefore, it may be that those with poorer adjustment may have more impairment in EF skills. Therefore, longitudinal research is needed in order to determine how these variables influence each other.

Additionally, the results of the current study expand on previous research to better understand the mechanism by which EF is associated with adjustment. It is not enough to recognize that an association exists, but it is important to identify *how* EF difficulties

translate into poorer adjustment. Although previous literature has often focused on social impairment and friendship quality as predictors of adjustment (e.g., Bauminger & Kasari, 2000; Klin et al., 2005), this study evaluates both as mediators for this newfound relation between EF and adjustment. Consistent with the second hypotheses, the relations between all EF domains and adjustment were mediated by social impairment. However this was not the case for friendship quality, which only mediated the relation between emotional control and loneliness. This is surprising since the ASD literature links friendship quality with adjustment (e.g., Bauminger & Kasari, 2000), and the fact that qualititative research has demonstrated that executive dysfunction in the area of cognitive rigidity is associated with diminished friendship quality (Carrington et al., 2003). Furthermore, the current study is also the first to this author's knowledge to find a positive, direct association between EF abilities and social impairment. These findings lend support for the theory of mind and weak central coherence theory (e.g., Bauminger et al., 2003; Joseph, 1999; Tonn & Obrzut, 2005). Although the current study did not explicitly evaluate participants' abilities to complete theory of mind tasks or measure central coherence abilities, the consistent positive relation between better EF and social impairment suggests that successful processing of social information may be partly related to a person's EF abilities. However, further research should directly assess whether enhancing EF skills leads to more success on theory of mind and central coherence tasks.

These positive and negative findings are far reaching and have implications for the development of interventions with this population. Until this point, our understanding of adjustment in this population has been somewhat limited by the models that have been

identified. This in turn means that interventions and treatments are being designed with only a partial understanding of how depression and loneliness are manifested. The current study has identified the importance of taking into account both intrinsic factors (i.e., EF development) as well as extrinsic factors (i.e., social skill impairment) when designing a successful treatments for depression and loneliness in adolescents with ASD. Many traditional models of treating adjustment for typically developing populations (e.g., talk therapy, cognitive-behavioral therapy) may not be sufficient for youth with ASD. The current findings suggest that EF deficits are associated with impaired social abilities, which in turn manifests into increased adjustment difficulties. Therefore, having a better understanding of and even addressing a person's EF abilities as well as their social skills may be important components of successful interventions for ASD adolescents. For example, when designing an intervention to help reduce feelings of loneliness in high functioning adolescents with ASD, the current results suggest that it may be important to recognize the contributing factors of the youth's ability to shift between information sets, as these abilities may influence a person's social abilities (e.g., being able to follow along several topics during a conversation with a friend) and loneliness (e.g., not being invited to spend time with that peer). Therefore, a person with poor shifting abilities may have more social impairments, and an intervention that targets only social skills may not be as effective as one that includes some EF skill development. In fact, Solomon et al. (2004) found that a social adjustment enhancement intervention for high functioning youth with ASD which included a real-world EF teaching component lead to increases in problem solving and emotional awareness compared to the waiting list control group. Future research should use these newly identified models to begin to ascertain whether

interventions that promote the development of EF skills have more of an impact on adjustment and whether people with better EF skills will have more success in traditional social skills training as they may have a better ability to process the social stimuli. This information could create an even more comprehensive understanding of adjustment and help further refine interventions to effectively target the contributing factors to adjustment difficulties.

These results suggest that social impairment and, to a lesser degree, friendship quality mediate the relations between EF and adjustment. However, the current study went a step further to evaluate an even more comprehensive model of adjustment. Consistent with the fourth hypothesis, four of the eight proposed developmental models demonstrated good fit, which contributes to our understanding of the interplay between EF, social impairment, and friendship quality on adjustment. Of these four significant models, three included loneliness as the outcome. There are several reasons why loneliness was a more relevant adjustment outcome. First, it may be that loneliness is a more salient measure of adjustment for this population. As discussed previously, this population is aware of their differences and can recognize and identify both the concept of loneliness and how it feels to them (Bauminger et al., 2003). It may also be that loneliness is more directly related to friendship quality compared with depressive symptoms. Those with few friends or poor quality friendships may find that the direct consequence is feeling lonely, while depressive symptoms may be the result of the loneliness or are more influenced by another social factor such as bullying or negative peer feedback. Interestingly, the only developmental model of loneliness which did not fit well (emotional control → social impairment → friendship quality → loneliness) is an

expansion of the only model for which friendship quality significantly mediated the relation between EF and adjustment (emotional control → friendship quality → loneliness). This suggests that, while friendship quality independently mediates the relation between emotional control and loneliness, social impairment plays less of a role for this specific relation. Difficulty with emotional control may be something that peers or friends are more able to overlook in the context of a conversation or friendship. Therefore, it may be less helpful for future research to focus on emotional control as a predictor of loneliness among adolescents with ASD.

Additionally, while the relation between EF and adjustment was more often mediated by social impairment than friendship quality, the significant full models demonstrate that it is important to factor in the contribution of friendship quality on adjustment as well. These results are consistent with research that is focused on friendship quality mediating the relation between social impairment and adjustment in ASD youth (e.g., Orsmond et al., 2004). The current findings suggest that EF abilities indirectly influence the relation between friendship quality and adjustment through social impairment. Once explanation is that friendship quality may not be as influenced by EF skills. For example, while successful social interactions may involve shifting attention between verbal and visual information during a conversation or inhibiting comments not relevant to the discussion, a good quality friendship is about supporting each other and spending time together. Therefore, it may be that a person's EF skills may not impact the ability to be a good friend. However, it may also be that the Friendship Quality Questionnaires did not adequately assess ASD youths' friendship quality. The measure asks participants to think about a good or best friend when answering the questions and

many of these participants may not have had a friend to think of. In fact, several participants either noted "do not have a best friend" or did not fill in the name of the best friend that they were referencing in the measure when asked. Therefore, it may be that a more sensitive and ASD-focused measure would better assess actual friendship quality in this population.

Furthermore, with the four good fitting models, three of the four measures of EF (inhibition, shifting, working memory) were represented. All three of these domains appear to be relevant for successful social interactions. For example, in order to have a conversation with a peer about one of her favorite books, is necessary to be able to shift back and forth between listening and talking about the book or between why she liked the book and what other books the author has written (i.e., shifting), take in and process both what she is saying about the book and the non verbal cues that she is giving to show that she enjoys talking about the book (i.e., working memory), and finally try not to interrupt her or grab the book out of her hands (i.e., inhibition). Without these abilities, a successful conversation with this peer may prove to be difficult. Therefore, these domains are relevant to social interactions and their presence may enhance a person's friendship quality and reduce adjustment difficulties. Interestingly, emotional control did not emerge as a significant predictor within any of the full models. This is surprising, as emotional control was found to be directly related to both depressive symptoms and loneliness in the current study. This suggests that emotional control is not as salient a skill as the other domains in the context of adjustment and may not be a necessary component for ensuring better success of social interactions and better friendship quality. As discussed previously, perhaps the other areas of behavioral regulation (i.e., shifting,

inhibition) are more necessary or relevant to social interactions, while difficulty with emotional control may be something that peers or friends are more able to overlook in the context of a friendship.

Finally, it is important to recognize, there may be other measures of EF (e.g., planning and organizing, initiation) that may also influence social impairment, friendship quality, and adjustment. In fact, while the current results identified several good fitting models, there may be other equally good fitting models that exist. Future research should address whether adjustment is also well explained by other factors including additional EF domains.

Organized Activities

The second focus of this study investigated the impact of organized activity involvement in high functioning adolescents with ASD. This is the first study to address the impact of OA involvement in an ASD population and the implications are far reaching. Consistent with much of the OA research that has found factors that influence the impact of activities on positive outcomes (see Bohnert et al., 2010 for a review of the literature), results indicated that adolescents who were involved in more activities, more intensely involved, and had more breadth of involvement reported fewer adjustment problems. These findings suggest that activity involvement may serve as a buffer against feelings of depression and loneliness in this developmentally delayed population. This has implications for treatment, as there are often many low cost opportunities to get involved in structured, after school activities, including school clubs and community organizations. Furthermore, being involved in activities provides an opportunity for youth with ASD to interact with typically developing peers who can model appropriate

social interactions and promote skill development. Due to the cross-sectional nature of the study, it may also be that adolescents with less adjustment problems get more involved in activities. Therefore, it will be important to continue to investigate the directionality of this relation in order to better understand the potential benefit of OA involvement.

Moderational analyses suggested that, while increased participation may generally be good, involvement may not be equally relevant for all individuals. Specifically, for those with inhibition difficulties, more OA involvement was actually a risk factor for adjustment difficulties. This is not surprising, given the fact that successful involvement often includes turn-taking with others and regulating responses and actions. For example, when participating in an academic trivia game, it is necessary to inhibit the urge to call out the answer before being called on, and allow others to have a turn at answering the questions. Those with difficulty inhibiting may struggle more with these aspects of participation which may lead to further difficulty engaging with other activity members, thus increasing adjustment difficulties. However, it should be noted that this sample did not report being very depressed, with the mean depressive symptoms score designated as being "sometimes" a problem. Therefore, the clinical utility of these moderational findings may be limited. Future research should attempt to recruit a sample that includes youth who report significant depressive symptoms in order to better understand whether this relation continues to hold true.

None of the other EF domains (shifting, emotional control, working memory) were significantly associated with activity involvement. There are several reasons why this may be the case. While the current study focused on total number, intensity and

breadth of OA involvement, it may be that specific categories or types of activities are associated with certain domains of EF while others are not. For example, participating in drama club may call for a good working memory ability (e.g., memorizing lines, knowing when to enter and exit the stage) while participating in Spanish club may be more focused on another EF domain such as planning and organizing. Therefore, by focusing specifically on intensity and breadth, the unique contributions of EF to certain categories of activities may have been overlooked. Furthermore, having the structure and positive adult role models overseeing the activity may account for better adjustment more than EF abilities. As cognitive rigidity is a feature often seen in youth with ASD, having a structured activity with clear meeting times and expectations may be of benefit to those who do better with structure. Additionally, having an adult figure to model appropriate interactions and support individuals who need additional assistance may also be a more salient feature of OA that can lead to better adjustment. However, further research is needed in order to better understand how both EF abilities and other features of activity involvement promote better adjustment.

Thought not an aim of the current study, the high correlation between parent and self report is of note. Prior research has often assessed adjustment using either parent report (e.g., Kim et al., 2000) or self report (e.g., Bauminger & Kasari, 2000; Lasgaard et al., 2009), but the current study utilizes both parent and self report to assess adjustment. Surprisingly, although research suggests that adolescents with ASD may have less awareness of themselves and their psychological states (see Williams, 2010), the parent and self reports in the current study were very consistent suggesting consistent perceptions of participants' adjustment. However, this should be interpreted with

caution, as we were unable to ensure that parents and children each filled out their questionnaires independently. While every effort was made to ensure that parents did not assist their children in completing the survey, we cannot know for sure. Therefore, future research should continue to address the question of how consistent are parent and child reports of adjustment.

Limitations and Future Directions

The current study is one of the first to consider the impact of both EF and OA on adjustment in high functioning adolescents with ASD; however, there were several limitations. First, males were overrepresented in the sample. Although ASD are diagnosed significantly more frequently in males than in females, the high percentage of males in the current study make it difficult to generalize the findings to a female ASD population. In addition, the high percentage of Caucasians in the study makes results less generalizeable to other ethnic groups. Future studies should continue to recruit females with ASD as well as those from a variety of ethnic backgrounds. Furthermore, the current study only evaluated adolescents with ASD and was not able to compare the results to a typically developing population or to other childhood disorders (e.g., ADHD, OCD, learning disabilities). Therefore, it is important for future research to address whether this model is unique to the ASD population or whether it is a consistent pattern among typically developing youth.

Another limitation of the study was the inability to confirm ASD diagnoses. Although a majority of the participants were recruited through the Interactive Autism Network which screens for ASD diagnosis, the nature of the study did now allow for researchers to independently screen all youth to confirm a diagnosis. However, data was

excluded from analyses if the parent reported receiving a diagnosis from someone other than a psychologist,/psychiatrist,, neuropsychologist, or multidisciplinary/developmental team (e.g., Treatment and Education of Autistic and Communication Related Handicapped Children [TEACCH] clinic).

In addition, the cross-sectional design of the study limits what can be concluded about the directionality of these findings. Therefore, future research should utilize a longitudinal design which can assess the change and development of EF abilities, social impairment, friendship quality, and adjustment. It is also important to evaluate OA participation over time to allow for a better understanding of the impact of continued activity involvement in this population and to establish whether increased activity participation is impacting adjustment or whether a person's adjustment level is determining how much s/he participates. Furthermore, since much of the OA research has demonstrated the unique effects of different categories or clusters of activities (e.g., Bartko & Eccles, 2003, Linver, Roth, & Brooks-Gunn, 2009) future research should attempt to elucidate whether there are certain patterns or types of involvement that lead to better adjustment in youth with ASD.

Lastly, several measures in the study were not specifically designed for youth with ASD, including the BRIEF, the Friendship Quality Questionnaire, the CBCL-D/YSR-D, and the Loneliness Scale. Although these measures are well used in the research literature, they were designed for more typically developing populations. Future research should begin to develop measures for these and other domains that are specifically designed for youth with developmental disabilities in order to ensure that accurate accounts of their abilities are being ascertained. Furthermore, two of the main

predictor variables in the study (EF domains, social impairment) were parent report. While parents may be equally, if not more accurate reporters of their children's everyday abilities, future research should include laboratory measures of EF and social impairment in order to get an objective measure of participants' observed skill levels.

Conclusion

The current study is one of the first to investigate both intrinsic and extrinsic factors impacting adjustment in high functioning youth with ASD. Results indicated a significant relation between several domains of EF and adjustment, as well identified mediators of these relations. In addition, several comprehensive models of adjustment in this population were identified, which provides valuable information regarding the presentation of depressive symptoms and loneliness. These results, combined with the demonstrated positive impact of OA involvement for high functioning adolescents with ASD will help inform treatments that focus on the promotion of better adjustment. As research identifies which factors influence adjustment and how they influence each other, more comprehensive treatments can be adopted in order to target the development of specific areas and skills that will lead to fewer feelings of depression and loneliness. Furthermore, this understanding of how better adjustment can be achieved can lead to the development of programs aimed at preventing significant adjustment difficulties for high functioning youth with ASD. This study is an important first step toward achieving this goal of positive youth development and promotion of better mental health in this population.

APPENDIX A:

DEMOGRAPHIC QUESTIONNAIRE

Please complete this survey separately from your child and alone in order to ensure that your responses are kept private.

PLEASE NOTE: Do not write your name or your child's name on any of the following pages.

1. Today's Date: _____
Month Day Year

2. Are you this child's:
1. _____ Mother
2. _____ Father
3. _____ Step-mother
4. _____ Step-father
5. _____ Adoptive mother
6. _____ Adoptive father
7. _____ Grandmother
8. _____ Grandfather
9. _____ Other Relation? _____

3. YOUR Date of Birth: _____ YOUR Age: _____

4. YOUR Ethnicity/Race:
1. _____ White
2. _____ African-American
3. _____ Hispanic
4. _____ Asian
5. _____ Other _____

5. Your CHILD'S Date of Birth: _____ Your CHILD'S Age: _____

6. Your CHILD'S Ethnicity/Race:
1. _____ White
2. _____ African-American
3. _____ Hispanic
4. _____ Asian
5. _____ Other _____

8. Your CHILD'S Grade: _____ 9. Your CHILD'S Gender: _____

10. Your CHILD'S current diagnosis (please check one):
_____ Autism
_____ Asperger's Disorder
_____ Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS)

11. When did your CHILD receive this diagnosis: _____ (month/year)

12. Who provided this diagnosis to your CHILD (please check one):

_____ Pediatrician
_____ Neuropsychologist
_____ School
_____ Other (please explain) _____

13. What is your CURRENT MARITAL STATUS (please circle one):
    a. **Married** to child's biological father/mother
    b. **Separated** from child's biological father/mother
    c. **Divorced** from child's biological father/mother and not remarried
    d. **Divorced** from child's biological father/mother and remarried
    e. **Divorced** from child's biological father/mother and currently living with a significant other
    f. **Divorced or separated** from child's stepfather/stepmother and not remarried
    g. **Divorced** from child's stepfather/stepmother and remarried
    h. **Widow or widower** and have not remarried
    i. **Widow or widower** and have remarried
    j. **Widow or widower** and currently living with a significant other
    k. **Never married** and currently living with child's biological father/mother
    l. **Never married** and currently living with a significant other
    m. **Never married**
    n. **Other** (please explain) _____

14. How long have you and your current SPOUSE / SIGNIFICANT OTHER been married or living together?
    _____ Years

15. Check the highest level of education that you completed:
    1. _____ some grade school
    2. _____ finished grade school
    3. _____ some high school
    4. _____ finished high school
    5. _____ business or technical school
    6. _____ some college
    7. _____ finished college
    8. _____ attended graduate school or professional school after college
    9. _____ received a professional degree
    10. _____ I am currently enrolled in the following: _____

16. Check the highest level of education that your SPOUSE / SIGNIFICANT OTHER completed:
    1. _____ some grade school
    2. _____ finished grade school
    3. _____ some high school
    4. _____ finished high school
    5. _____ business or technical school
    6. _____ some college
    7. _____ finished college
    8. _____ attended graduate school or professional school after college
    9. _____ received a professional degree

10. _____ S/he is currently enrolled in the following: _____

17. Check the highest level of education you think that your child will complete:
    1. _____ some grade school
    2. _____ finished grade school
    3. _____ some high school
    4. _____ finish high school
    5. _____ business or technical school
    6. _____ some college
    7. _____ finish college
    8. _____ attend graduate school or professional school after college
    9. _____ receive a professional degree

18. What is your family's total yearly income?

1. _____ under $10, 000
2. _____ 10,000-19,999
3. _____ 20,000-29,999
4. _____ 30,000-39,999
5. _____ 40,000-49,999
6. _____ 50,000-59,999
7. _____ 60,000-69,999
8. _____ 70,000-79,999
9. _____ 80,000-89,999
10. _____ 90,000-99,999
11. _____ 100,000-109,999
12. _____ 110,000-119,999
13. _____ 120,000-129,999
14. _____ 130,000-139,999
15. _____ 140,000-149,999
16. _____ 150,000-159,999
17. _____ 160,000-169,999
18. _____ 170,000-179,999
19. _____ 180,000-189,999
20. _____ 190,000-199,999
21. _____ over 200,000

APPENDIX B:

SOCIAL RESPONSIVENESS SCALE (SRS)

For each item, please choose the statement that best describes your child's behavior over the last six months:

Not true, sometimes true, often true, almost always true, does not apply

1. Seems much more fidgety in social situations than when alone
2. Expressions on his/her face don't match what he/she is saying
3. Seems self-confident when interacting with others
4. When under stress, child seems to go on "auto-pilot" (for example, shows rigid or inflexible patterns of behavior which seem odd)
5. Doesn't recognize when others are trying to take advantage of him/her
6. Would rather be alone than with others
7. Is aware of what others are thinking or feelings
8. Behaves in ways which seem strange or bizarre
9. Clings to adults, seems too dependent on the
10. Takes things too literally and doesn't "get" the real meaning of a conversation
11. Has good self confidence
12. Is able to communicate his or her feelings to others
13. Is awkward in turn-taking interactions with peers (for example, doesn't seem to understand the give and take of conversations)
14. Is not well coordinated in physical activities
15. Is able to understand the meaning of other people's tone of voice and facial expressions
16. Avoids eye contact, or has unusual eye contact
17. Recognizes when something is unfair
18. Has difficulty making friends, even when trying his/her best
19. Gets frustrated trying to get ideas across in conversations
20. Shows unusual sensory interests (such as mouthing or spinning objects) or strange ways of playing with toys
21. Is able to imitate others' actions
22. Plays appropriately with children his/her age
23. Does not join group activities unless told to do so
24. Has more difficulty than other children with changes in his/her routine
25. Doesn't seem to mind being "out of step" or not on the "same wavelength" with others
26. Offers comfort to others when they are sad
27. Avoids <u>starting</u> social interactions with peers or adults
28. Thinks or talks about the same thing over and over
29. Is regarded by other children as odd or weird
30. Becomes upset in a situation with lots of things going on
31. Can't get his/her mind off something once he/she starts thinking about it
32. Has good personal hygiene
33. Is socially awkward, even when he/she is trying to be polite
34. Avoids people who want to be <u>emotionally</u> close to him/her

35. Has trouble keeping up with the flow of a normal conversation
36. Has difficulty “relating” to adults
37. Has difficulty “relating” to peers
38. Responds appropriately to mood changes in other (for example, when a friend’s or playmate’s mood changes from happy to sad)
39. Has a restricted (or unusually narrow) range of interests
40. Is imaginative, good at pretending (without losing touch with reality)
41. Wanders aimlessly from one activity to another
42. Seems overly sensitive to sounds, textures, or smells
43. Separates easily from caregivers
44. Doesn’t understand how events are related to one another the way other children his/her age do (e.g., has problems with understanding cause and effect)
45. Focuses his/her attention to where others are looking or listening
46. Has overly serious facial expressions
47. Is too silly or laughs inappropriately
48. Has a sense of humor, understands jokes
49. Does extremely well at a few tasks, but does not do as well at most other tasks
50. Has repetitive, odd behaviors such as hand flapping or rocking
51. Has difficulty answering questions directly and ends up talking around the subject
52. Knows when he/she is talking too loud or making too much noise
53. Talks to people with an unusual tone of voice (for example, talks like a robot or like he/she is giving a lecture)
54. Seems to react to people as if they are objects
55. Knows when he/she is too close to someone or is invading someone’s space
56. Walks in between two people who are talking
57. Gets teased a lot
58. Concentrates too much on parts of things rather than “seeing the whole picture” (for example, if asked to describe what happened in a story, child may talk only about the kind of clothes the characters were wearing)
59. Is overly suspicious
60. Is emotionally distant, doesn’t show his/her emotions
61. Is inflexible, has a hard time changing his/her mind
62. Gives unusual or illogical reasons for doing things
63. Touches others in an unusual way (for example, child may touch someone just to make contact and then walk away without saying anything)
64. Is too tense in social settings
65. Stares or gazes off into space

APPENDIX C:

BEHAVIOR RATING INVENTORY OF EXECUTIVE FUNCTION (BRIEF)

Think about your child's behaviors over the past six months. Choose whether the following problems are: Never (0), Sometimes (1), or Often (2) a problem

1. Overreacts to small problems
2. When given three things to do, remembers only the first or last
3. Is not a self-starter
4. Resists or has trouble accepting a different way to solve a problem with schoolwork, friends, chores, etc.
5. Becomes upset with new situations
6. Has explosive, angry outbursts
7. Tries the same approach to a problem over and over even when it does not work
8. Has a short attention span
9. Needs to be told to begin a task even when willing
10. Acts upset by a change in plans
11. Is disturbed by change of teacher or class
12. Has trouble coming up with ideas for what to do in play or free time
13. Has trouble concentrating on chores, schoolwork, etc.
14. Is easily distracted by noises, activity, sights, etc.
15. Becomes tearful easily
16. Resists change of routine, foods, places, etc.
17. Has trouble with chores or tasks that have more than one step
18. Has outbursts for little reason
19. Mood changes frequently
20. Needs help from an adult to stay on task
21. Has trouble getting used to new situations (classes, groups, friends)
22. Forgets what he/she was doing
23. When sent to get something, forgets what he/she is supposed to get
24. Has trouble finishing tasks (chores, homework)
25. Acts wilder or sillier than others in groups (birthday parties, recess)
26. Thinks too much about the same topic
27. Interrupts others
28. Gets out of seat at the wrong times
29. Gets out of control more than friends
30. Reacts more strongly to situations than other children
31. Blurts things out
32. Mood is easily influenced by the situation
33. Acts too wild or "out of control"
34. Has trouble putting the brakes on his/her actions
35. Gets in trouble if not supervised by an adult
36. Has trouble remembering things, even for a few minutes
37. Becomes too silly
38. Angry or tearful outbursts are intense but end suddenly
39. Small events trigger big reactions
40. Talks at the wrong time
41. Becomes upset too easily

APPENDIX D:

THE FRIENDSHIP QUALITY QUESTIONNAIRE – ABBREVIATED (FQQ-A)

About how many close friends do you have? (circle 1)

None 1 2 or 3 4 or more

About how many times a week do you do things with any friends outside of regular school hours? (circle 1)

Less than 1 1 or 2 3 or more

Now I want to talk about your very best friendship. These questions are not a test; there are no right or wrong answers. I just want to know what you think about your friendship with your best friend. Please write your best friend's name in the blanks in the questions below.

Do you and your best friend go to the same school? Yes No
If Yes: Are you and your best friend in the same class? Yes No
How old is your best friend? _____

For the following, choose: Not At All True, A Little True, Somewhat True, Mostly True, or Really True

1. _____ and I live really close to each other.
2. _____ and I always sit together at lunch. *If _____ was in my school/class, we would always sit together at lunch.*
3. _____ and I get mad at each other a lot.
4. _____ tells me I'm good at things.
5. If other kids were talking behind my back, _____ would always stick up for me.
6. _____ and I make each other feel important and special.
7. _____ and I always pick each other as partners. *If _____ was in my class, we would always pick each other as partners.*
8. _____ tells me I'm pretty smart.
9. _____ and I are always telling each other about our problems.
10. _____ makes me feel good about my ideas.
11. When I'm mad about something that happened to me, I can always talk to _____ about it.
12. _____ and I argue a lot.
13. When I'm having trouble figuring something out, I usually ask _____ for help and advice.
14. _____ and I always make up easily when we have a fight.
15. _____ and I fight.
16. _____ and I loan each other things all the time.
17. _____ often helps me with things so I can get done quicker.
18. _____ and I always get over our arguments really quickly.
19. _____ and I always count on each other for ideas on how to get things done.
20. _____ doesn't listen to me.
21. _____ and I tell each other private things a lot.

APPENDIX E:

THE FRIENDSHIP QUALITY QUESTIONNAIRE – ABBREVIATED PARENT (FQQ-AP)

About how many close friends does your child have? (circle 1)

None 1 2 or 3 4 or more

About how many times a week does your child do things with any friends outside of regular school hours? (circle 1)

Less than 1 1 or 2 3 or more

Now I want to talk about your child's very best friendship. These questions are not a test; there are no right or wrong answers. I just want to know what you think about your child's friendship with his or her best friend. Please write the best friend's name in the blanks in the questions below.

Does your child and his/her best friend go to the same school? Yes No
If Yes: Are your child and his/her best friend in the same class? Yes No
How old is your child's best friend? _____

For the following, choose: Not At All True, A Little True, Somewhat True, Mostly True, or Really True

1. _____ and your child live really close to each other.
2. _____ and your child always sit together at lunch. *If _____ was in his/her school/class, they would always sit together at lunch.*
3. _____ and your child get mad at each other a lot.
4. _____ tells your child he/she is good at things.
5. If other kids were talking behind your child's back, _____ would always stick up for him/her.
6. _____ and your child make each other feel important and special.
7. _____ and your child always pick each other as partners. *If _____ was in your child's class, they would always pick each other as partners.*
8. _____ tells your child he/she is pretty smart.
9. _____ and your child are always telling each other about their problems.
10. _____ makes your child feel good about his/her ideas.
11. When your child is mad about something that happened to him/her, your child can always talk to _____ about it.
12. _____ and your child argue a lot.
13. When your child is having trouble figuring something out, your child usually asks _____ for help and advice.
14. _____ and your child always make up easily when they have a fight.
15. _____ and your child fight.
16. _____ and your child loan each other things all the time.
17. _____ often helps your child with things so your child can get done quicker.
18. _____ and your child always get over their arguments really quickly.
19. _____ and your child always count on each other for ideas on how to get things done.
20. _____ doesn't listen to your child.
21. _____ and your child tell each other private things a lot.

APPENDIX F:

THE CHILD BEHAVIOR CHECKLIST – DEPRESSION SCALE (CBCL-D)

For each item that describes your child now or within the past 6 months, please circle whether it is not true, somewhat true, or very true for your child.

1. Can’t concentrate, can’t pay attention
2. Cries a lot
3. Doesn’t eat well
4. Feels worthless or inferior
5. Feels too guilty
6. Overtired
7. Sleeps less than most children
8. Sleeps more than most children
9. Trouble sleeping
10. Underactive, slow moving, lacks energy
11. Unhappy, sad, or depressed
12. Withdrawn, uninvolved with others
13. Worrying

APPENDIX G:

THE YOUTH SELF REPORT – DEPRESSION SCALE (YSR-D)

For each item that describes you now or within the past 6 months, please circle whether it is not true, somewhat true, or very true for you.

1. I have trouble concentrating or paying attention
2. I cry a lot
3. I don’t eat as well as I should
4. I feels worthless or inferior
5. I feel too guilty
6. I feel overtired without good reason
7. I sleep less than most kids
8. I sleep more than most kids during the day or night
9. I have trouble sleeping
10. I don’t have much energy
11. I am unhappy, sad, or depressed
12. I keep from getting involved with others
13. I worry a lot

APPENDIX H:

THE LONELINESS SCALE (LS)

Think about how you have been feeling in the past few weeks. How much do you feel each statement is true?

Not true at all (1), hardly ever true (2), sometimes true (3),
true most of the time (4), always true (5)

1. It easy for me to make friends
2. I like to read
3. I have nobody to talk to
4. I am good at working with others
5. I watch TV a lot
6. It's hard for me to make new friends
7. I like school
8. I have lots of friends
9. I feel alone
10. I can find a friend when I need one
11. I play sports a lot
12. It's hard to get others to like me.
13. I like science
14. I don't have anyone to spend time with
15. I like music
16. I get along well with others
17. I feel left out of things
18. There's no one I can go to when I need help
19. I like to draw
20. I don't get along well with other people
21. I'm lonely
22. I am well liked by other people in school
23. I like playing video games a lot.
24. I don't have any friends

APPENDIX I:

THE LONELINESS SCALE – PARENT VERSION (LS-P)

Think about how your child has been feeling in the past few weeks. How much do you feel each statement is true?

Not true at all (1), hardly ever true (2), sometimes true (3),
true most of the time (4), always true (5)

1. It easy for my child to make friends
2. My child has nobody to talk to
4. My child is good at working with others
5. It's hard for my child to make new friends
6. My child has lots of friends
7. My child feels alone
8. My child can find a friend when s/he needs one
9. It's hard to get others to like my child.
10. My child doesn't have anyone to spend time with
11. My child gets along well with others
12. My child feels left out of things
13. There's no one my child can go to when s/he needs help
14. My child doesn't get along well with other people
15. My child is lonely
16. My child is well liked by other people in school
17. My child doesn't have any friends

APPENDIX J:

ORGANIZED ACTIVITY INVENTORY (OAI)

Please identify all of the organized activities (both within and outside of school) that your child has participated in within the last 12 months. For each activity, please record the average number of hours they participate(d) per week in the activity, the number of months they participate(d) in that activity, and whether the activity includes interactions with typically developing youth or not. Please see the first line for an example.

Name of Activity	Average hours/week	Total months of participation	Interactions w/typically developing youth (Y/N)
High School Swim Team	5	2	Yes

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VITA

The author, Rebecca Wasserman Lieb, is originally from Piedmont, California. She began her undergraduate career at the University of California, Los Angeles in 1998. She graduated Cum Laude in 2002 with a Bachelor of Arts in Psychology and a minor in Spanish. While at UCLA, she was accepted into the Developmental Disabilities Immersion Program (DDIP), where she completed clinical work and research related to the field of developmental disabilities. The results of her research were presented at the DDIP annual research symposium and published in the 2005 issue of NeuroReport. In 2005, Mrs. Lieb began her graduate studies in Clinical Psychology at Loyola University Chicago. She received her Master of Arts degree in 2007. While at Loyola, Mrs. Lieb was a guest student editor for the 2010 special issue of the American Journal of Community Psychology, served on the emerging scholars committee for the Society for Research in Adolescence, taught undergraduate Research Methods in Psychology classes, and guest lectured for several graduate courses. She was also involved in several research projects at Loyola University Chicago with both the psychology and nursing departments as well as neuropsychology research at Children's Memorial Hospital Chicago. Mrs. Lieb will complete her predoctoral clinical psychology internship at the University of North Carolina (UNC), Chapel Hill in August 2011, with major rotations at the Carolina Institute for Developmental Disabilities (CIDD), the clinic for the Treatment and Education of Autistic and Communication Related handicapped Children (TEACCH), and the child psychiatry inpatient unit at UNC Memorial Hospital. Mrs. Lieb

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