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Research among typically developing boys aged 8-12 has found affective sharing to be a key distinguishing characteristic of friendship. However, to date no research exists that further examines and builds upon these findings among boys with Autism Spectrum Disorders. This study examined whether affective sharing (defined as positive social engagement and synchrony, which consisted of time spent in synchronous interaction and responsiveness) predicted friendship reciprocity and quality over and above opportunities to participate in activities with other children. Additionally, this study examined whether affective sharing, friendship reciprocity, and overall friendship quality are predictive of lower rates of internalizing symptoms and higher rates of adaptive behavior among boys with ASD. Findings suggest a comparable pattern of friendship behavior among children with ASD and typically developing (TD) boys during friend interactions, albeit with lower mean rates of affective sharing among children with ASD. However, affective sharing did not mediate the relation between participation in surface level activities with peers and friendship quality, internalizing symptoms, or adaptive behavior. Additionally, a distinct pattern of characteristics of children who were not able to identify a friend to participate in the second visit emerged among participants with ASD, suggesting differences may lie between children with ASD and TD peers *without* reciprocated friendships.

*Keywords:* ASD, friendship, affective sharing, synchrony psychosocial functioning

AFFECTIVE SHARING, FRIENDSHIP, AND OUTCOMES AMONG BOYS  
WITH AUTISM SPECTRUM DISORDERS

by

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For D.

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## CHAPTER I

### INTRODUCTION

Friendship has been defined as “a mutual relationship between two children in which reciprocal liking is quintessential” (Bagwell, Newcomb, & Bukowski, 1998, p. 140). Hartup and Stevens (1997), as well as Clark and Reis (1988), conceptualize friendship as consisting of two main levels: a deep structure, defined as a sense of reciprocity between friends, and a surface structure, consisting of developmentally and culturally contingent behaviors and activities that serve to reinforce and maintain this reciprocity (see Appendix A, Figure 1, adapted from Hartup & Stevens, 1997; Figure 1 and all subsequent figures are located in Appendix A). As the authors state,

We use deep structure to refer to the social meaning (essence) of relationships and surface structure to refer to the social exchanges that characterize them at any given moment or in any given situation—a convention that is similar to the one used in linguistics (Chomsky, 1965). (Hartup & Stevens, 1997, p. 356)

#### **Surface Level Activities and Friendship**

The activities comprising surface structure shift and change over the course of development, serving distinct developmental needs. Surface-level activities serve as the vehicle through which children establish similarities in attitudes and preferences that have been found to be key to forming meaningful relationships with other children (Gottman, 1983). Surface-level activities also serve the key role of providing opportunities to establish affective closeness, which has been found to further contribute

to reciprocity in typical friendships across development (Hartup & Stevens, 1997). McGuire and Weisz (1982) define friendship as “ongoing *reciprocal liking* [emphasis added] and behavioral involvement between two individuals” (p. 1479). Mutual affection and affective reciprocity are commonly considered “quintessential elements” of dyadic friendships (Hartup, 1993), with some common definitions of friendship relying entirely on the affective tie between two individuals, and with some research to support this hypothesis (e.g., Bagwell, 2004). In fact, Berscheid (1983) conceptualized the degree of closeness and interdependence in a relationship as a function not only of the degree to which behavior sequences are intertwined, but also ultimately of the degree to which disruptions in those behavior sequences elicit emotional arousal. This “liking” can be described as the “emotional experience” of friendship, also known as affective closeness (Howes, 1996). Affective closeness has been conceptualized as the key distinction between neutral exchange relationships, such as those found between acquaintances and strangers, and the close interpersonal bonds found between family members, romantic partners, and friends (Clark & Reis, 1988).

### **Affective Sharing and Friendship**

Affective sharing is defined as the expression and perception of, as well the response to, emotional states in oneself and others through voice, gesture, facial expression, and verbal statements. Affective sharing has been found to be crucial to the establishment of affective closeness. Baumeister and Leary (1995) note the centrality of affectively pleasant interactions that “take place in the context of a temporally stable and

enduring framework of affective concern for each other's welfare" for friendship

(Baumeister & Leary, 1995, p. 497).

The time friends spend with one another is characterized by a willingness to share, cooperate, and help and by positive affective exchange. The intense affective component of friendship is manifested in more frequent smiling, looking, laughing, and touching among friends than among non-friends. In addition, friends engage in more conversation and talking than do non-friends. Although the components of this basic core of friends' interactions might be similar across different types of positive peer relationships, the intensity and frequency of these positive interactional elements are greater for friends than for relations with lesser affective ties. (Newcomb & Bagwell, 1995, p. 337)

Among younger children, shared positive affect has been found to be the key distinguishing feature among friend versus non-friend dyads, as opposed to preference for the other child or skillful play (Howes, 1983), suggesting that, although both friends and non-friends may engage in surface level activities together, affective sharing occurs to a significantly greater degree among children in reciprocal friendships. In a large meta-analysis of studies comparing friends to non-friends among children and pre-adolescents, liking and positive engagement were found to be the key distinguishing features between friend and non-friend dyads, with children providing greater emphasis on the affective component of friendship as they entered preadolescence and adolescence, and friends engaging in substantially more frequent expressions of amity than non-friends. Positive engagement with each other has also been found to be a key distinguishing characteristic between unilateral and mutual friendships, with children in mutual friendships evincing significantly greater degrees of positive engagement (Newcomb & Bagwell, 1995). Similarly, affective responsivity, such as laughing in response to a friend's laugh, has

been found to be more common among friends than non-friends (e.g., Newcomb & Brady, 1982).

Affective sharing plays a crucial role in the establishment of mutual liking, as supported by the finding that friends have been found to report greater liking of one another, and that the experience of friendship has been found to offer a more emotionally intense connection than that experienced in general peer relations (Bukowski & Hoza, 1989). Shared humor and “silliness” have been found to emerge as key to the establishment of reciprocity in friendships among children in the 8-12 age range (Howes, 1996). Friends have been found to engage in more laughing, smiling, looking, talking, and touching, and are more responsive to each other than non-friends (for example, laughing in response to a friend’s laugh; Foot, Chapman, & Smith, 1977). Overall, children have been shown to demonstrate greater frequency of positive behavior, including a greater degree of positive affective exchange, when interacting with a friend (e.g., Dunn, 2002; Howes, 1983; Lederberg, Chapin, Rosenblatt & Vandell, 1986). Along these lines, friends have been found to provide more positive affective response than non-friends, much of this in the form of affection and personal acceptance (Hartup, Glazer, & Charlesworth, 1967). These positive affective qualities, including mutual validation through affect and verbal statements, have been associated with greater stability of friendships (Ladd, Kochenderfer, & Coleman, 1996), further indicating their importance to the establishment of both the mutual liking and affective sharing that comprise deep structure.

Across the preschool to adolescent age ranges, affective sharing in friendship has been found to increase substantially over time. In fact, the increasing importance of affective sharing may drive overall changes in friendship characteristics as children age (Newcomb & Bagwell, 1995). As boys enter preadolescence, friendship has been found to serve increasingly as a forum for self-disclosure and emotional support, both of which rely heavily on a child's ability to engage in affective sharing (Buhrmester, 1996; Gottman & Mettetal, 1986; Newcomb & Bagwell, 1995; Parker & Gottman, 1989; Parkhurst & Hopemeyer, 1999; Rose & Rudolph, 2006). Additionally, affective sharing is likely also key to the establishment of behavioral reciprocity, as evidenced by the finding that friends' action sequences tend to be more closely intertwined than those of non-friends (Bukowski, Motzoi, & Meyer, 2009; Newcomb & Bagwell, 1995).

Thus, participation in surface level activities alone is not sufficient for typically developing (TD) children to form what most would consider a truly reciprocal friendship. In fact, considering the abundance of literature emphasizing the importance of affective sharing, surface level activities likely derive their importance through the opportunity they provide for affective sharing. Affective sharing, in turn, contributes to affective closeness and a lasting sense of reciprocity that goes beyond a basic exchange of resources or sharing of interests. Affective sharing is an ongoing process during friend interactions of TD boys, an undercurrent that adds emotional significance to the sharing of activities and contributes to a lasting, reciprocal bond between friends (Clark & Reis, 1988).

## **Positive Functions of Friendship**

### **Psychosocial Function: Social Skills**

These positive affective exchanges that take place in the context of reciprocal friendship have been linked to a range of positive outcomes among typically developing children. Friendship contributes to adaptive psychosocial functioning through the provision of crucial developmental experiences (Sullivan, 1953). The positive affect expressed by a friend in response to a behavior can serve as reinforcement that encourages a child to engage in that behavior again (Adams, Bukowski, & Bagwell, 2005), giving friendship a role in the enforcement of social norms. This positive affective reinforcement can also serve to teach social skills, such that friendship, also offers important opportunities to develop social competency that can have ongoing benefits as children transition into adolescence and adulthood (Furman & Robbins, 1985; Hartup, 1996; Weiss, 1974).

### **Psychosocial Function: Mental Health**

The positive affective quality of friendship has been hypothesized to play a key role in serving a fundamental need for connectedness (e.g., Baumeister & Leary, 1995), such that a lack of friendships has consistently been associated with negative outcomes, including higher rates of depression and sadness among typically developing children (Bukowski, Laursen, & Hoza, 2010; Demir & Urberg, 2004). Further supporting this hypothesis, friendship has also been found to serve as a buffer against negative life experiences and strains on other important relationships among typically developing



children (Gauze, Bukowski, Aquan-Assee, & Sippolas, 1996; Hartup & Stevens, 1997; Nangle, Erdley, Newman, Mason, & Carpenter, 2003; Renshaw & Brown, 1993).

### **Developmental Function: Self-evaluation**

Finally, the positive affective exchange that takes place during reciprocal friendships has been found to serve an important role in the processes involved in positive self-evaluation and validation, contributing to the development of a sense of self-worth (Furman & Robbins, 1985; Hartup, 1996; Hartup & Sancilio, 1986; Newman Kingery, Erdley, & Marshall, 2011). Sullivan (1953) conceptualized positive self-evaluation and development of a positive sense of self as among the key provisions of friendship, arguing that supportive friendships promote well-being by validating self-worth, while fostering social competencies. Similarly, Blieszner and Roberto (2004) postulate that friendship benefits children in the 8-12 age range mainly through its role as a source of emotional support and interpersonal validation, which in turn helps children to meet academic challenges and gain a sense of their own competence. Supporting this conceptualization, children with friends have been found to be more self-confident than those without (Hartup, 1996; Newcomb & Bagwell, 1995), and children with at least one friend have been found to demonstrate improved self-esteem over time (Bolger, Patterson, & Kupersmidt, 1998).

### **Friendship and Autism Spectrum Disorders**

Although an extensive body of literature exists describing characteristics of individuals with Autism Spectrum Disorders (ASD), research regarding the characteristics of friendships among these individuals is in its nascent stages. Moreover,

research examining the processes whereby children with ASD maintain friendships is extremely limited, and research pertaining to the function friendship serves for these individuals, is, to date, non-existent.

### **Autism Spectrum Disorder: A Brief Overview**

Autism Spectrum Disorder is defined in the DSM-5 as comprised of impairment across two domains: social communication and interaction, and restricted and repetitive behaviors (American Psychological Association [APA], 2013). Challenges with social communication include difficulty understanding and engaging in nonverbal communication, including difficulty using language and nonverbal behaviors functionally for the purpose of communication. Relatedly, difficulty engaging in social interactions includes difficulty with socio-emotional reciprocity that contributes to challenges developing, maintaining, and understanding relationships. Difficulties with restricted and repetitive behaviors include engagement in stereotyped and repetitive motor movements, insistence on sameness, restricted and circumscribed interests, and hyper- or hypo-sensitivity to sensory input. These difficulties must result in significant impairment in social or other forms of functioning. Thus, by definition, ASD involves difficulty with friendship-formation. Clinicians assign a rating of 1, 2, or 3, based on severity of impairment. These ratings denote severity levels based on the degree of support needed for daily functioning, with a designation of level 1 indicating the need for minimal to moderate support, level 2 indicating the need for “substantial” support, and level 3 designating the need for “very substantial” support (APA, 2013).

## **Boys with ASD and Friendship**

A common and reliable means of assessment of children's friendship is asking children to nominate one or several best friends, and then using sociometric measures to determine whether these friend nominations are reciprocated (e.g., Bukowski et al., 2009; Erdley, Nangle, & Gold, 1998; Gifford-Smith, & Brownell, 2003). However, despite statistics indicating that children with ASD are likely to report at least one friend, maternal and teacher reports, as well as sociometric ratings by peers, frequently reveal the reported friendships of children with ASD to be more likely to be unreciprocated than those of their TD peers (e.g., Bauminger & Kasari 2000; Carrington, Templeton, & Papinczak, 2003; Chamberlain, Kasari, & Rotheram-Fuller, 2007; Marks, Schrader, Longaker, & Levine, 2000; Rotheram-Fuller, Kasari, Chamberlain, & Locke, 2010). Nonetheless, a recent meta-analysis of the 18 studies concerning friendship among boys with ASD published in the literature as of November 2014 revealed that majority of children with ASD across studies *did* have at least one truly reciprocated friendship (based on sociometric data), despite higher rates of unreciprocated friendships than their TD peers. However, these friendships were also consistently lower in both number and quality than those of same-aged TD boys (Mendelson, Gates, & Lerner, 2016). Importantly, observational data could not be included in this meta-analysis as it was only available from a single research sample (reported upon in Bauminger, Solomon, Aviezer, Heung, Brown, et al., 2008; Bauminger, Solomon, Aviezer, Heung, Guzit, et al., 2008; Bauminger, Solomon, & Rogers, 2010; and Solomon, Bauminger, & Rogers, 2011), and

as such the relation between specific aspects of friend interactions and friendship reciprocity/quality remains unknown.

Given that impairment in social interactions is among the key diagnostic criteria for ASD, boys with ASD could very reasonably be expected to experience more difficulty engaging in affective sharing and, as a result, friendship formation, than their TD peers. Unsurprisingly considering the difficulty understanding nonverbal and implicit meaning to communications (APA, 2013), individuals with ASD have been found to rely almost entirely on concrete concepts, such as proximity and shared activities, in their definitions of friendship and the identification of friends (e.g., Bauminger & Kasari, 2000; Carrington et al., 2003; Chamberlain et al., 2007; Marks et al., 2000). Moreover, children with ASD have been found to demonstrate odd facial expressions and lower levels of positive affective responses from infancy into the 8-12 age range, further complicating their ability to engage in affective sharing (e.g., Kerbeshian, Burd, & Fisher, 1990; Macdonald et al., 1989; Tantam, 1988; Volker, Lopata, Smith, & Thomeer, 2009; Yirmiya, Kasari, Sigman, & Mundy, 1989). Along these lines, children with ASD have been found to make fewer social overtures toward their peers, as well as to be less responsive to those from other children (Sigman & Ruskin, 1999). Taken together, these findings suggest that children with ASD may be more likely to misperceive the presence of the deep structure of friendship due to difficulty participating in affective sharing. Considering the difficulty children with ASD experience in terms of comprehending the emotional perspectives of others (e.g., Yirmiya et al., 1989), as well as demonstrating their own affective responses (e.g., Macdonald et al., 1989; Volker et al., 2009; Yirmiya

et al., 1989), they may experience the benefits of friendship associated with shared positive affective engagement to a lesser degree than do typically developing children. While typically developing children look to affective cues to determine if the other child is a friend or simply a neutral acquaintance (e.g., Newcomb & Bagwell, 1995), children with ASD may fail to comprehend the social import of these cues, leaving them instead to label children as friends based on shared activities and proximity. This difficulty comprehending affective cues may also hinder the ability of children with ASD to demonstrate appropriate responsiveness to their peers, negatively impacting their ability to engage in affective reciprocity.

When children with ASD do engage in activities with self-selected friends, observational studies of friendship among children with ASD have found them to be characterized by less flexible conversation, less harmony, and less coordinated play than friendships among typically developing children (Bauminger, Solomon, Aviezer, Heung, Guzit, et al., 2008), suggesting overall lower levels of affective sharing during these interactions. Given the likely difficulty children with ASD experience in comprehending affective cues and conveying affective responses, relationships with children with ASD may be unsatisfying for typically developing children, who rely on these cues to establish both behavioral and affective reciprocity. In a 2008 study that included a dyadic observation of a child with ASD and a self-selected best friend engaging in various play activities, children with ASD were found to engage in lower levels of expression of positive affect across several domains of the interaction, including a lower level of shared fun overall and lower levels of self-reported closeness and intimacy by both the child

with ASD and the best friend (Bauminger, Solomon, Aviezer, Heung, Guzit, et al., 2008). Moreover, descriptions of friendship provided by children with ASD are often limited or one-sided, such as in a case study presented in Marks and colleagues' (2000) publication. One adolescent with ASD, referred to as "Jay," cites friends as being his favorite thing about school. When the examiner asks him to describe his friends, he responds, "They're nice, they give me high-fives and stuff like that," and then later "they're nice to me . . . that's all." Noticeably lacking from this example is any mention of shared activity or interest, as well as any reciprocation of sentiment on Jay's part. Jay's parents indicate that he actually has no reciprocated friendships, but did have one good year at school during which the teacher was able to encourage his classmates to be nice to him. He now considers these classmates to be his friends. One can imagine how this one-sided definition of friendship might relate to unsatisfying interactions, were Jay's classmates to seek to further their relationships with him. Similarly, in a 2010 study, Locke, Ishijima, Kasari, and London found that children with ASD did use affective terms such as trust and loyalty to describe friendships. However, they did not then describe themselves using these qualities, as did TD children. Instead, children with ASD tended to include school and personal achievements in their self-descriptions, rather than the qualities they described as desirable in a friend. Interestingly, many indicated that they lacked the qualities they desired in a friend and expressed dislike of this deficiency, but nonetheless expected their friends to demonstrate these qualities (Locke et al., 2010). By failing to establish reciprocal affective ties, children with autism may create a snowball-effect of social isolation, such that the majority of typically developing children find interactions

with children with ASD affectively unsatisfying, and subsequently decline to engage in surface level activities with them, further reducing their opportunities to form reciprocal friendships. Nonetheless, findings from a recent meta-analysis indicate that boys with ASD *do* experience some success in terms of friendship-formation (Mendelson et al., 2016), despite differences in friend interactions and in their understanding of friendship. However, to date no research exists exploring the processes whereby boys with ASD achieve reciprocal friendship.

### **Boys with ASD and the Functions of Friendship**

Several interventions geared toward promoting friendship-making skills among children with ASD currently exist (Frankel et al., 2010; Frankel & Whitham, 2011). The motivation for these interventions is based on the consistently positive outcomes associated with friendship among TD peers, as well as a broadly held and thus far empirically supported belief that friendship is essential for well-being (Sullivan, 1953). However, the research linking friendship to commonly associated outcomes among boys with ASD is very limited, and what research does exist has yielded conflicting findings. Although children with ASD almost universally report wanting friends (e.g., Bauminger & Kasari, 2000; Carrington et al., 2003; Solomon et al., 2011), and most do have at least one reciprocated friendship, these friendships have consistently been found to be lower in quality than those of their TD peers (Mendelson et al., 2016). However, poorer friendship quality has not been consistently linked to loneliness among children with ASD as it has among TD peers (Bauminger & Kasari, 2000). Similarly, although friendship has been associated with self-worth among children with ASD (Bauminger, Shulman, & Agam,

2004), children with ASD have been found to evaluate themselves differently than TD children. While TD children evaluate their self-image and competence based in part on positive affective responses from others, children with ASD tend to look to more concrete concepts, such as perceived number of friends and frequency of friend interactions (Bauminger et al., 2004; Bauminger & Kasari, 2000; Carrington et al., 2003; Marks et al., 2000). Because children with ASD are more likely to describe their own loneliness in cognitive and concrete terms (such as perceiving themselves to have a low number of friends), rather than affective terms (Bauminger & Kasari, 2000), it has been suggested that children with ASD may derive a feeling of connectedness directly from participation in surface level activities, rather than from positive affective exchanges (See Appendix A, Figure 2). Consistent with this hypothesis, children with ASD are often found to be “happily oblivious” to peer rejection (e.g., Chamberlain et al., 2007; Solomon et al., 2011), prompting Chamberlain and colleagues to conclude:

If a child with autism is genuinely satisfied with the social experiences available in a regular classroom, then perhaps full emotional reciprocity in a traditional sense is not so necessary. (Chamberlain et al., 2007, p. 239)

Research examining the association between friendship and outcomes among children with ASD is in its early stages, with some findings suggesting that children with ASD and a limited number of friendships may actually experience *higher* levels of anxiety than those with no friendships at all, suggesting a more complex relation between friendship and internalizing symptoms than has been found among TD populations (Mazurek & Kanne, 2010).



Inconsistent and counterintuitive relations between reciprocal friendship and associated outcomes among boys with ASD may map onto findings that children with ASD report enjoying friendships that rely less on emotional connectedness than do their typical peers (Calder, Hill, & Pellicano, 2013). Similarly, children with ASD have been found to demonstrate significant improvements in a social intervention simply by spending recreational time with others with ASD (Hesselmark, Plenty, & Bejerot, 2013). Nonetheless, a recent meta-analysis of friendship among boys with ASD reveals that the majority of boys with ASD *do* engage in truly reciprocal friendships, as evidenced by sociometric reports, although these friendships are overall lower in number (based on sociometric and parent-report data) and self-reported quality (Mendelson et al., 2016). While research seems to indicate that TD boys experience the majority of benefits from friendship directly from affective sharing (e.g., Newcomb & Bagwell, 1995), boys with ASD may experience these benefits as the result of distinct processes. However, to date, whether and how processes involved in establishing friendships among boys with ASD differ from TD boys remains unknown. Additionally, research to date exploring the relation between friendship and commonly associated outcomes suggests that this relation may be more complex among children with ASD than among TD peers (Mazurek & Kanne, 2010). Nonetheless, no studies currently exist that directly examine the relation between specific friendship processes and commonly associated outcomes among boys with ASD.

Differences in affective display commonly found among individuals with ASD (e.g., Kerbeshian et al., 1990; Macdonald et al., 1989; Tantam, 1988; Volker et al., 2009;

Yirmiya et al., 1989) suggest that outwardly successful demonstration of social skills may not necessarily be indicative of a positive internal experience in this population.

Considering that Verbal IQ has been related to the ability to understand emotions and social situations among individuals with ASD to a greater degree than among typically developing individuals (Hughes & Leekam, 2004; Kasari, Chamberlain, & Bauminger, 2001; Yirmiya, Sigman, Kasari, & Mundy, 1992), IQ could reasonably be expected to play an important role in friendship processes among boys with ASD. Moreover, considering the varying relation between friendship, social skills, and outcomes among children with ASD in mainstream versus special education classrooms (e.g., Strang et al., 2012), as well as the likelihood for high variability of social experience between verbal and minimally verbal individuals, a consideration of the role of symptom severity is also warranted. However, no research exists to date linking how internal affect, social skills, Verbal IQ, and symptom severity relate to friendship processes and commonly associated outcomes among boys with ASD.

### **Limitations of the Current Literature**

In the only study to date directly linking friendship to outcomes among individuals with ASD, Mazurek and Kanne (2010) measured friendship through parent report to item #65 on the Autism Diagnostic Interview–Revised (ADI–R; Lord, Rutter, & Le Couteur, 1994), which asks parents to rate their child’s friend interactions on a 0–3 scale, listed below:

0. One or more relationship with a (approximately) same-aged peer that includes sharing personal activities and seeing each other outside of pre-arranged groups. This relationship has clear reciprocity.

1. One or more relationships that have some shared activities outside a pre-arranged group, includes some initiation, but may be limited in interests or reciprocity.
2. Personal relationships with others that includes seeking contact, but only in groups, school, or work.
3. No peer relationships that involve reciprocity. (Mazurek & Kanne, 2010, p. 1515)

In addition to the issues inherent to relying solely on parent reports without including any measure of child-reported friendship, this item relies heavily on shared activities in the definition of reciprocity, such that side-by-side participation in activities may have been confused with reciprocal friendship by some reporters. Moreover, this item includes no measure of mutual liking or the affective quality of friendship, despite the key role it has been found to play among typically developing children (e.g., Newcomb & Bagwell, 1995). Additionally, the sample in Mazurek and Kanne's (2010) publication included children aged 4-17, and did not control for gender. Friendship can change considerably across this age range, as well as across genders (e.g., Rose & Rudolph, 2006). Nonetheless, this study yielded an important and counterintuitive finding—that children with ASD who were reported to have at least one reciprocated friendship had higher levels of anxiety than those who did not (Mazurek & Kanne, 2010). Thus, while these findings suggest that friendship may relate differently to internalizing symptoms among children with ASD than it does among their TD peers, how these findings apply to children of different genders and developmental periods remains to be seen. Considering these questions in light of the growing number of friendship interventions geared toward this population (e.g., Frankel et al., 2010; Frankel & Whitham, 2011), further examination of whether comparable friendship processes

(specifically, affective sharing) provide similar benefits for children with ASD to those found among typically developing children is crucial.

Despite findings from typically developing children indicating affective sharing as a defining process of reciprocal friendships (Newcomb & Bagwell, 1995), the majority of research among children with ASD continues to focus on characteristics, rather than processes, of friend interactions, with heavy reliance on self-report measures that do not include an assessment of affective sharing (e.g., Bauminger & Kasari, 2000). What little research has included observational measures has found lower levels of affective sharing among individuals with ASD as compared to typically developing children. However, this research consists of either multiple studies published based on a single sample of 44 individuals with ASD (Bauminger, Solomon, Aviezer, Heung, Brown, et al., 2008; Bauminger et al., 2010, Solomon et al., 2011), or a preschool-aged population (Bauminger-Zviely & Agam Ben-Artzi, 2014). Moreover, no research exists examining what implications reduced levels of affective sharing might have for positive outcomes commonly associated with friendships among typically developing children.

It remains unseen whether surface level activities and a reduced level of affective sharing are sufficient for children with ASD to derive the full range of benefits commonly associated with friendship. However, findings in the literature indicating higher levels of loneliness, depression, anxiety, and suicidality within this population (e.g., Mayes, Gorman, Hillwig-Garcia, & Syed, 2013; Strang et al., 2012) suggest otherwise. Although children with ASD may be provided with ample opportunity to participate in surface level activities, opportunity alone may not be sufficient to develop

friendship if children with ASD fail to engage in affective sharing with peers while exposed to surface level activities. Considering the important role of affective sharing in the friendships of typically developing children, a better understanding of the specific role of affective sharing in the friendships of children with ASD may lay the foundation for future interventions geared toward helping these children develop the skills they need to engage in reciprocal friendships, and fully derive the benefits thereof. Thus, an examination of the relation between affective sharing, reciprocal friendship, and outcomes commonly associated with reciprocal friendship represents a key step toward better understanding the processes and outcomes of friendship for children with ASD.

### **Statement of Purpose**

The purpose of this study was to examine the role of affective sharing in the friendships of boys aged 8–12 with ASD, as well as its role in commonly associated outcomes of friendship. This study is designed to build upon findings reported in Bauminger, Solomon, Aviezer, Heung, Brown, et al. (2008) and Bauminger, Solomon, Aviezer, Heung, Guzit, et al. (2008). Like Bauminger, Solomon, Aviezer, Heung, Brown, et al. (2008) and Bauminger, Solomon, Aviezer, Heung, Guzit, et al. (2008), this study included a comparison group of typically developing boys aged 8–12 and their friends. Additionally, to replicate findings from the typical literature indicating the centrality of affective sharing to the reciprocal nature of friendship (e.g., Newcomb & Bagwell, 1995), as well as associated outcomes (e.g., Baumeister & Leary, 1995; Furman & Robbins, 1985; Hartup, 1996; Weiss, 1974), this study also included a coded observation of the

participant and a nominated friend. Also like Bauminger, Solomon, Aviezer, Heung, Brown, et al. (2008), this study included a self-report measure of friendship quality.

However, this study also diverged from Bauminger, Solomon, Aviezer, Heung, Brown, et al. (2008) and Bauminger, Solomon, Aviezer, Heung, Guzit, et al. (2008) across several important domains. Instead of using maternal nomination to select child friends, this study directly asked child participants to select a best friend to complete the study with them. This study also included a friend nomination from the selected friend, to determine the reciprocal nature of the friendship. The aim of this friend nomination procedure is to better understand how friendship *as perceived by boys with ASD* differs in self-reported qualities and observed characteristics from the friendships of TD boys.

This study also included a measure of internal positive affect (as measured by child self-report on the PANAS-C). In this way, this study aimed to examine the possible disconnect between outward social displays and internal experiences in this population, so as to examine whether children with ASD truly share in a positive internal affective experience during interactions with friends. Moreover, this study included a parent-report measure (the BASC-2) of child internalizing symptoms and adaptive behavior, with the aim of better understanding the relation between affective sharing and commonly associated outcomes among boys with ASD.

Additionally, this study included a parent-report measure of the amount of time spent with other children in general, as well as the nominated friend. The aim of this measure was twofold: (a) to understand whether affective sharing contributes to friendship reciprocity and quality above and beyond time spent with the friend, and (b) to

understand if friendship impacts internalizing symptoms and adaptive behavior above and beyond time spent with other children/the nominated friend. Although it would have been ideal to obtain a measure of actual child *participation* in activities, as opposed to opportunity, to do so would require observational measures at both home and school that were beyond the scope of this project, or completion of lengthy self-report measures with questionable construct validity. However, findings from this project can be used as a jumping off point for future projects geared toward assessing child participation more specifically.

Although Bauminger, Solomon, Aviezer, Heung, Brown, et al. (2008) and Bauminger, Solomon, Aviezer, Heung, Guzit, et al. (2008) included a behavioral observation, this study focused more specifically on affective sharing. For the purpose of this study, affective sharing was conceptualized primarily as behaviors associated with positive affect (including facial expressions, verbal exchanges, and overt shared affect) as well as prosocial behavior (e.g., gestures, eye contact, and sharing objects). For the purpose of this study, these *behaviors* are referred to as positive social engagement. Additionally, to capture the *sharing* component of affective sharing, this study aimed to measure synchrony in these behaviors in two ways. First, behavioral observations of friend dyads were coded for the frequency with which both members of the dyad engaged in a prosocial behavior within a 1-minute period (this is referred to as the “time spent in synchronous interaction” code, and is described in greater detail in the methods section). As an additional measure of synchrony, friend dyads were also coded for the frequency with which each child provided an affective or verbal response to the other child within a

3-second period (this is referred to as the “responsiveness” code, and is described in greater detail in the methods section). In sum, this study measured the broader construct of affective sharing through defining and directly measuring two sub-constructs: positive social engagement (the *behaviors* associated with affective sharing, described above) and synchrony (so as to capture the *sharing* aspect of affective sharing; defined as two further sub-constructs: time spent in synchronous interaction and responsiveness during the interaction).

This study examined whether reciprocated friendships are higher in affective sharing and internal positive affect than unilateral friendships, as is commonly found among typically developing children in the 8–12 age range (Newcomb & Bagwell, 1995), as well as whether friendships that are higher in affective sharing are also higher in overall quality. This study also examined the relation between the reciprocal status of friendship and friendship quality with outcomes including internalizing symptoms, adaptive functioning, and social skills, in comparison to a control group of typically developing boys aged 8–12.

### **Hypotheses**

1. Friendship Characteristics Overview. A substantial proportion (approximately 50%) of friend nominations from children with ASD was expected to be unilateral. This percentage was expected to be higher among the ASD sample than within the typical control group. Unilateral friendships were expected to be associated with lower rates of overall friendship quality among both children with ASD and typical controls, such that the ASD group was



expected to have lower average friendship quality overall, largely due to the higher prevalence of unilateral friendships. Unilateral friendships were also predicted to be characterized by lower rates of synchronous social behavior overall and lower ratings of internal positive affect on the PANAS-C by the friend, but not by the participant. Greater discrepancies in PANAS-C ratings were expected in unilateral friendships than in reciprocated friendships. As a result, due to the predicted higher prevalence of unilateral friendships in the ASD group, the ASD group was expected to have lower average synchronous social behavior and greater participant-friend discrepancies in PANAS-C ratings than typically developing controls.

2. Do positive social engagement/synchrony/positive internal affect mediate the relation between time spent with the nominated friend/children in general and friendship reciprocity/quality? Positive social engagement (as measured by coded behavioral observations) and synchrony (as measured by time spent in synchronous interaction and responsiveness) and internal affect (as measured by child self-report on the PANAS-C) were expected to predict friendship status and quality over and above opportunity to participate in surface level activities (as measured by parent report on the Activities Questionnaire–General) among both children with ASD and typical controls.
3. What is the relation between friendship status/quality and outcomes commonly associated with friendship among boys with and without ASD? Friendship status and quality, as measured by child nominations and child

report on the FQQ, were expected to predict improved psychosocial functioning, as measured by parent report on the BASC-2 internalizing and adaptive functioning subscales among children with ASD and typical controls.

4. Do positive social engagement and synchrony mediate the relation between time spent with the nominated friend/children in general and outcomes commonly associated with friendship? Positive social engagement (as measured by behavioral observations) and synchrony (as measured by time spent in synchronous interaction and responsiveness) and internal affect (as measured by child self-report on the PANAS-C) were expected to predict improved psychosocial functioning, as measured by parent report on the BASC-2 internalizing and adaptive functioning subscales among children with ASD and typical controls.

## **CHAPTER II**

### **METHODS**

#### **Participants**

Eighteen boys aged 8–12 years with Autism Spectrum Disorder (ASD) were recruited to participate in this study, along with one caregiver each. Of these, 13 returned to participate in the second visit with a friend nominated by the target child. Additionally, 21 typically developing boys in the 8- to 12-year age range were recruited to participate as the control group, with one caregiver each. Of these, 17 returned to participate in the second visit with a friend nominated by the target child. To minimize variance in friend characteristics, all participants were asked to select a friend who was also a boy in the 8- to 12-year age range, and disability status of the friend was noted. One child in the ASD group reported having only one friend, who was female. This child was permitted to participate with the female friend. All analyses were run with and without this participant to determine that differences from participants with male friends were not significant, and data from this participant were retained when differences were not significant to increase statistical power. Recruitment of boys with ASD focused on local agencies and private schools in Greensboro, North Carolina, as well as the surrounding areas. Research visits were completed primarily in the participant's home or at the UNCG Psychology Clinic. Additionally, two participants opted to participate in a local after school agency for children with ASD, the Independence Place. During study visits, these children were

provided with a private room and comparable surroundings to children who participated in their homes or at the UNCG Psychology Clinic. All 21 children in the TD sample were recruited through the UNCG D.U.C.K. Lab database with the permission of Dr. Janet Boseovski.

To meet study criteria for an ASD diagnosis, all participant caregivers reported a previous clinical diagnosis of Autism, High Functioning Autism, or Asperger's Disorder. To confirm diagnosis, all participants in the ASD group participated in the Autism Diagnostic Observation Schedule-Generalized (ADOS-G) as part of study procedures. All ASD participants met the Autism Spectrum cut-off on Module 3 of the ADOS-G (Lord et al., 2000) prior to participation in study measures. Additionally, to rule out the impact of comorbid mental retardation on social functioning, all participants in both groups completed the Kaufman Brief Intelligence Test-2 (KBIT-2). With the exception of one child, all achieved a score of 70 or above on the verbal or nonverbal subscales of the KBIT-2, or an overall IQ of 70 or above on the KBIT-2. One child with ASD achieved scores slightly below the cut off across all three domains (VIQ=67, Nonverbal IQ=66, Total IQ=62); however, this child did not return for a second study visit and so his data are not included in the main study analyses. To assess for comorbidity, all parents were asked to report additional diagnoses on the demographics questionnaire (Appendix D). In the TD group, one participant reported a diagnosis of AD/HD. This child also did not return for a second study visit, and so his data are not included in main study analyses. For a flow chart of study procedures, please see Figure 3 (located in Appendix A).

## Measures

### Demographic and Background Characteristics

Demographic information was collected via a questionnaire relating to ethnicity, age, grade level, and special education status of each child (see Appendix D and Table 1; all tables are located in Appendix B). Comparable demographic data were also collected for each friend (see Tables 2 and 3). Ethnic breakdown was comparable across groups. Of the sample, 66.7% was Caucasian, 16.7% was African American, 6.7% was Latino, and 10% listed “other” as their ethnicity. TD participants and their friends were comparable to ASD participants and their friends in terms of chronological age, number of siblings, and grade level. However, TD participants received significantly higher overall IQ scores than participants with ASD ( $t(28)=2.64, p=.013$ ). TD participants were also found to have a significantly higher VIQ than participants in the ASD group (VIQ;  $t(28)=2.25, p=.033$ ).

All boys in the TD sample were in fulltime mainstream classroom placements and not receiving special education services. In the TD group, all children nominated a fellow TD boy to participate in the second visit. In the ASD group, 76.9% ( $n=10$ ) completed the second visit with a TD friend (one of whom was female), whereas the remaining three selected another child with ASD. Of children with ASD who completed a second visit, 18% were in a mainstream classroom fulltime with no special education services, 64.7% received part-time special education services and were otherwise in a mainstream classroom, and 17.6% were in fulltime special education classrooms. The demographics questionnaire is included in Appendix D. Additionally, for a table listing all measures used in this study, please see Appendix C.

## **Autism Symptomatology**

**Autism Diagnostic Observation Schedule–Generalized (ADOS–G; Lord et al., 2000).** The ADOS–G is a semi-structured, standardized observational system designed to press for symptoms consistent with an autism spectrum diagnosis. The ADOS–G consists of three modules designed for administration to individuals across a range of expressive language abilities, the activities of which vary in developmental level and language ability required to participate. Examinees are coded for behaviors that are often lacking among individuals with ASD, such as social use of speech, demonstrative use of gestures, and communicative use of eye contact. Module 3 of the ADOS–G was used for the purpose of this study, as it is designed for children aged 4–16 with fluent speech who have an interest in playing with toys, as was expected of participants in this study (Lord et al., 2000). The ADOS–G was used to confirm diagnostic status among the ASD sample during the preliminary study visit. The ADOS–G was administered by the graduate student researcher, who has previously established research reliability as per standards maintained by Western Psychological Services (WPS) and attended an advanced level training in July of 2014 to reestablish reliability.

**Gilliam Aspergers Disorder Scale (GADS; Gilliam, 2001).** The GADS was used as a measure of ASD severity, and was completed by caregivers of participants from both groups during the first study visit. The GADS is a 32-item, 4-point Likert-type rating scale designed to probe for symptoms of ASD across four main subscales. The GADS is designed to be completed by individuals who have had regular contact with the individual for at least two weeks (Gilliam, 2001). For the purpose of this study,

participant caregivers completed the GADS. The GADS has been found to have an interrater reliability quotient of .89, as well as a test-retest reliability quotient of .93. Additionally, the GADS has been found to identify individuals with ASD across the spectrum of symptom severity, as well as to distinguish individuals with ASD from those with a range of other disorders (Mayes et al., 2009).

### **Cognitive Functioning**

**Kaufman Brief Intelligence Test-Second Edition (KBIT-2; Kaufman & Kaufman, 2004).** The KBIT-2 is a broadly used and well-validated 20- to 30-minute assessment of verbal, nonverbal, and overall intellectual functioning. It is specifically intended to act as a screening measure for intellectual abilities, and has adequate psychometric properties that have been established across a range of demographic populations (Bain & Jaspers, 2010). The KBIT-2 provides a Verbal Composite score comprised of two subtests: a Verbal Knowledge subtest that requires examinees to select a picture that corresponds to the word or phrase, and a Riddles subtest that requires examinees to reply to short word problems. The KBIT-2 also provides a Nonverbal Composite score based on a single Matrix Reasoning subtest. A general composite score can also be calculated based on scores from the Verbal and Nonverbal composites. All participants completed the KBIT-2 with the examiner during the first study visit. For the purpose of this study, a score above 70 on the nonverbal, verbal, or general composite score was required to rule out Intellectual Disability.

## **Psychosocial Functioning**

**Behavior Assessment System for Children, Second Edition (BASC–2; Reynolds & Kamphaus, 2004).** The BASC–2, a broadband measure of child behavior, is commonly used in child assessments. Caregivers rate the frequency of behaviors described in each item on a 4-point scale ranging from “never” to “almost always.” The BASC–2 yields 14 subscale and five composite scores, and has been found to have internal consistency in the 0.8–0.89 range (Merenda, 1996). For the purpose of this study, the Internalizing subscale was used as a measure of overall internalizing symptomatology, while the Adaptive Functioning Composite score was used as a measure of adaptive psychosocial functioning. Caregivers of all participants completed the BASC–2 during the first study visit.

**Social Skills Rating Scale (SSRS; Gresham & Elliott, 1990).** The SSRS is a well-validated measure of social skills that has been used in over 120 published studies (Gresham, Elliott, Vance, & Cook, 2011). The Parent Rating Scale version of the SSRS is designed to be completed by caregivers of boys and girls aged 3–18, and has been normed on a sample of over 4,000, including specific norms for boys in the 8–12 age range. It consists of two main subscales; a Social Skills subscale aimed at measuring positive social behaviors across five domains of functioning (Cooperation, Empathy, Assertion, Self-Control, and Responsibility), as well as a Problem Behaviors subscale geared toward assessment of behaviors that can interfere with social skills across three domains of functioning (Externalizing Problems, Internalizing Problems, and Hyperactivity). For the purpose of this study, scores from the Social Skills subscale were



used in analyses of social skills. Caregivers of all participants completed the SSRS during the first study visit.

### **Internal Affect**

**Positive and Negative Affect Scale–Child Version (PANAS–C; Laurent et al., 1999).** The PANAS–C is a self-report measure designed to assess positive and negative affect in youth. The original PANAS–C consisted of 12 items geared toward assessment of positive affect, and 15 to assess negative affect, and has demonstrated favorable psychometric properties across both clinical and non-clinical samples (Ebesutani et al., 2012). Children rate whether they experienced a range of emotions (e.g., joyful, cheerful, scared, mad) using a 5-point Likert-type rating scale from “*Not much*” to “*A lot.*” A 10-item self-report version based off of the original 27-item measure has been found to have comparably desirable psychometric properties in the measurement of positive and negative affect (Ebesutani et al., 2012). For the purpose of this study, all participants and their friends completed the 10-item PANAS–C during the second study visit, immediately following the friend interaction as an assessment of internal affective state. This scale includes five items relating to positive affect and five items relating to negative affect.

### **Friendship**

**Friendship reciprocity.** Reciprocal child nomination is well-established and has been commonly used as a valid measure of reciprocal friendship across multiple studies (e.g., Bukowski et al., 2009; Erdley et al., 1998; Gifford-Smith et al., 2003), and has been found to be a stricter measure of friendship than Likert-style ratings (e.g., Bukowski et

al., 2009; Erdley et al., 1998), prompting Bukowski et al. (2009) to state that it “deserves to be the most widely used” measure of friendship reciprocity. In addition to friend nomination, this study also employed a detailed measure of friendship quality (see below) to assess the possibility of considerable variation in quality and liking even within reciprocated friendships (Erdley et al., 1998; Gifford-Smith et al., 2003). All target participants completed the friend nomination during the first study visits. Friends completed the friend nomination over the phone prior to the second study visit, or, when this was not possible, during the second study visit out of earshot of the target child.

To obtain the friendship nomination, interested participants in both the control and ASD samples were contacted via phone using a standardized Study Script (see Appendix E). The examiner provided an overview of the study and verbally reviewed consent forms. Once verbal consent had been obtained from the participant’s legal guardian, the examiner asked to speak with the participant. The examiner then introduced the study and verbally reviewed the child assent form, following the research study script. Paper consent and assent forms were completed during the first study visit. Once verbal assent was obtained, the participant was asked to disclose the names of five children who were not his siblings and did not live with him in order of friendship status (e.g., best friend, second best friend, third best friend, etc.), using specific language specified in the study script. Participants also had the option of completing the friendship nomination during the first study visit, once parents verified that they believed their child to have at least one friend. All children in this sample were able to report at least one friendship. Caregivers were then consulted as to which of these friends might be available to

participate. The examiner provided the caregiver with contact information and a flier describing the study to provide to the friend's parents, in accord with IRB regulations, and asked that the friend's parent please contact the examiner to complete the demographics questionnaire and friend nomination. However, only one parent of a nominated friend (in the ASD group) contacted the examiner to complete these questionnaires. Friends whose parents did not contact the examiner before the study visit were provided an opportunity to complete the friendship nomination form in a private room out of earshot of the target child during the second visit. Parents of friends who did not contact the examiner were provided the demographic form to complete during the second study visit, where they also completed all study consents.

**Friendship Quality Questionnaire (FQQ; Parker & Asher, 1993).** Children and their nominated friends each completed the Friendship Quality Questionnaire (FQQ, Parker & Asher, 1993) about their friendship during the second study visit. The FQQ consists of 40 items plus one "warm-up" item, and asks children to indicate on a 5-point scale how true a particular quality is of their relationship with a specific friend (e.g., "Jamie and I loan each other things all the time"). The scale ranges from (0) *Never* to (4) *Always*. The FQQ is commonly used to assess the perceived quality of child friendships (Parker & Asher, 1993). Items are divided into 6 subscales: validation and caring, conflict and betrayal, companionship and recreation, help and guidance, intimate exchange, and conflict resolution. For the purpose of this study, items relating to conflict and betrayal were reverse scored, to generate a total of ratings across all items as a score for overall friendship quality. Ratings from each friend dyad were then summed, providing a single,

overall rating of the quality of the friendship within that dyad. When warranted, additional analyses were run examining each of the six subscales of the FQQ, as well as participant and friend scores separately.

**Opportunity to participate in surface level activities: Activity Questionnaire.**

Parents were asked to report the activities the participant engages in with the nominated friend (e.g., shared classroom, recess, after school activities) during a typical week of the school year (see Appendix F). If the parent did not complete the form during a school week, they were asked to estimate the number of hours per week the children spent together during a typical week of the school year. This number (the Activity Questionnaire Specific Score) was calculated into minutes for statistical purposes.

Parents were also asked to estimate the total number of hours per week that their child spent with other children in general during a typical school week, as well as the nature of the activities (the Activity Questionnaire–General). If the parent did not complete the form during a school week, they were asked to estimate the number of hours per week their child spent with other children during a typical week of the school year. Activities included attending school and any other activity where the participant interacts closely with other children, including siblings and other relatives. Estimates were calculated into minutes before being entered into statistical analyses. Parents of target participants were provided with the Activities Questionnaire–General and Specific during the first study visit and, during the school year, asked to complete based on activities of that week. In situations where parents did not bring back the Activities Questionnaire to

the second visit, they were provided with the questionnaire to complete during the second visit.

### **Affective Sharing: Positive Social Engagement and Synchrony**

For the purpose of this project, the broader construct of affective sharing was broken down into two components: positive social engagement and synchrony. Synchrony was then further defined as time spent in synchronous interaction and responsiveness. Behavioral observation methods used to measure these two components of affective sharing are described in detail below.

#### **Behavioral observation coding procedure.**

*Interaction task.* Participants and friends were provided with the Discovery Toys Super Marbleworks Raceway Construction set, to work on as they chose while seated at a small table for 12 minutes. This task was selected based on its previous use in dyadic observations by Bauminger, Solomon, Aviezer, Heung, Brown, et al. (2008) and Bauminger, Solomon, Aviezer, Heung, Guzit, et al. (2008), as well as its established efficacy in distinguishing differences in friendship behaviors between children with and without learning disabilities (Bauminger, Solomon, Aviezer, Heung, Brown, et al., 2008; Bauminger, Solomon, Aviezer, Heung, Guzit, et al., 2008; Siperstein, Leffert, & Wenz-Gross, 1997).

*Positive social engagement: Social Interaction Observation System (SIOS; Bauminger, 2002).* The SIOS (see Appendix G) is a coding system geared toward capturing behaviors across three categories: positive social interaction, negative social interaction, and low-level social interaction. The positive social interaction scale is

geared toward capturing positive social engagement, including eye contact, affection, sharing, and expressions of interest in the other child. Conversely, the negative interaction scale is designed to capture instances of conflict and aggression, while the low-level social interaction scale is geared toward capturing more low-level social behaviors, such as standing in close proximity without directly socially engaging, repetitive behaviors, and approaches or responses to the other child for the sole purposes of fulfilling one's own needs. The SIOS is also specifically designed to capture social initiations and responses in the interactions of children with high-functioning autism, based on Hauck, Fein, Waterhouse, and Feinstein's (1995) behavior coding system for children with autism. For the purpose of this study, the positive social interaction scale of the SIOS was used to measure positive social engagement (the specific behaviors associated with affective sharing). The positive social interaction scale of the SIOS includes items such as eye contact (instances where the two children make eye contact), eye contact with smile, smile with no eye contact, social communication, and giving help, among other codes, all of which are considered key aspects of affective sharing. The positive social interaction scale of the SIOS is a composite score comprised by a total sum of 10 other scores. Only the positive social interaction composite, not the negative composite, was used in study analyses. To capture the possibility of subtler or indirect social behaviors in the ASD group (Bauminger, 2002), all dyads were also coded for behaviors on the Low Level Social Interaction scale of the SIOS. Items on the Low-Level interaction scale are geared toward capturing subtler social behaviors, such as looking in the direction of the other child, standing closely to the other child, imitating the other

child's activity, functional communication (communication aimed at fulfilling one's own needs, such as stating 'It's my turn now'), and repetitive behavior and idiosyncratic language. Codes from the Low Level Social Interaction Scale were included in the measure of time spent in synchronous interaction (described in detail below). However, only the positive interaction subscale of the SIOS was used to measure positive social engagement. Participants were observed in one-minute intervals, and coders then selected the three codes that best described the 1-minute period. Each child in each dyad was observed separately. To avoid coder bias, each child in each dyad was observed by a different coder for the 75% of tapes that were not used to calculate interrater reliability.

***Synchrony: Time spent in synchronous interaction.*** Once all data had been coded, scores from each dyad were analyzed such that each dyad received a score of 1 for every one-minute interval during the 12-minute observation wherein both children were coded as participating in the same coded behavior, and a score of 0 for the behavior if members of the dyad did not *both* engage in the behavior. For example, if both children in the dyad were coded to have been engaged in social communication during minute interval 5, the dyad received a score of 1 for social communication during minute interval 5 of the observation. If one or neither of the children was coded as having engaged in social communication during minute interval 5, the dyad received a score of 0 for social communication during minute interval 5. Total scores were then tallied for each dyad, including every coded behavior over the 12-minute interval, and the percent of minute intervals spent engaged in synchronous behavior was calculated. This resulted in a maximum possible score of 3 for each minute interval (if both children were coded as

having engaged in the same 3 behaviors during a one-minute interval) and a maximum dyad total score of 36 (if both children engaged in the same 3 behaviors for all 12 minutes). This measure of synchrony was intended to capture subtler aspects of synchronous interaction, such as to account for the observation that some friend dyads appeared to go periods of time without directly communicating, yet appeared attuned to each other's behavior and continued to interact cooperatively even during these periods. To capture the possibility of synchrony even in the lower-level behaviors anticipated from the ASD group, coding for time spent in synchronous interaction includes items from the both the Positive Interaction and Low Level interaction scales of the SIOS.

***Synchrony: Responsiveness.*** Additionally, to capture more directly the responsiveness of each participant in each dyad, coders also coded each time a child provided a clear vocal or affective response to a behavior of the other child in the dyad over the course of the observation period. Vocal and affective responses were specifically selected as being key aspects of affective sharing. Behavioral responses were not included in the responsiveness code, but were captured in the time spent in synchronous interaction and positive social engagement codes through items of the Positive Interaction scale of the SIOS that correspond to behavior (e.g., the Giving Help and Sharing codes). The responsiveness code is intended as a more fine-tuned and direct measure of synchrony, as it is limited to responses that took place within 3 seconds of a behavior and required either a vocalization or affective change that were clearly in response to the other child. The responsiveness code was not included in the calculation of the total Positive Interaction subscale score.



***Reliability training.*** The coding team consisted of four undergraduate and graduate level research assistants. Eight tapes (13% of the total number) were used for training, including four pilot observations, and were coded during a four-week training period from February to March of 2015. Coders were provided with a detailed coding manual, which they were instructed to bring to every meeting and have available during every coding session. During these meetings, coders watched training tapes minute-by-minute, recorded their codes independently, and then discussed their codes in order to arrive at a consensus. Coders were not permitted to ask questions or discuss their codes before recording them. They were also instructed not to change their codes if a different decision was reached through discussion, allowing for calculation of reliability. This period was also considered a calibration phase, during which time minor aspects of certain codes were more clearly defined to best characterize this specific set of observations. For example, the “giving help” code was further specified to include both children having their hands on the same piece of the toy in a cooperative manner, due to an initial lack of clarity for this particular code in the context of this particular observation setting. Coders were provided with updated manuals throughout the training period reflecting these minor clarifying details. Observations using pilot data were used for the beginning of the training period, and coders moved on to observations of actual participants by the end of the training period. Only codes agreed on by full consensus were used in statistical analyses from observations coded during the training phase.

Overall, coders met during a total of 23 2-hour meetings held over 14 weeks. To prevent burnout, coders were assigned a maximum of 5 observations to code per week,

advised to spend no more than one hour at a stretch coding, and encouraged to speak with the graduate student researcher if the number of observations assigned proved unwieldy. Coders were assigned only one member of each dyad to code from the 12-minute dyadic interaction so as to prevent undue influence of codes for one participant on codes for the other participant in the dyad. Of each coder's five assigned observations per week, 1–2 were shared with all other coders. This allowed for ongoing calculation of between-coder reliability on a total of 25% of all coded observations, spread evenly over the course of the coding period. Any differences in codes were discussed and adjudicated during coding meetings. Coders also generated consensus codes during these meetings, which allowed for ongoing discussion and clarification of coding definitions. Each member of the coding team was provided with a Reliability Tracking Form every two weeks throughout the coding period (Appendix H) with a record of their reliability using the intra-class coefficient (ICC, described below), which provided their ongoing reliability with consensus codes and allowed them to continually track their reliability across all coded domains. In addition to regular coding meetings and discussion of observations to be used in the calculation of reliability, coders were encouraged to discuss particularly challenging observations with the graduate student researcher, who then independently coded the observation and discussed any differences in codes independently with the coder until consensus was reached. For the 25% of observations that were consensus coded, consensus data were entered into analyses.

Reliability was calculated using the ICC. ICC was selected as an appropriate measure of inter-rater reliability for this project because it allows for calculation of

overall reliability for teams of larger than three coders with a fully crossed design (i.e., the same team of coders coded all tapes), and incorporates into reliability calculation the magnitude of disagreement (as opposed to an all-or-nothing agreement, such as is calculated by Cohen's kappa; Cohen, 1960, Hallgren, 2012). Because a subset of subjects was coded by multiple coders as a measure of overall reliability, the single-measures ICC is reported. Based on general guidelines delineated by Cicchetti (1994), reliability is considered fair when the ICC is between .40 and .59, good when the ICC falls between .60 and .74, and excellent when it is between .75 and 1.0. An ICC of 1.0 represents perfect inter-rater agreement. According to these guidelines, excellent reliability was established on the Positive composite of the SIOS during the training phase, and maintained throughout the coding period (final  $ICC_{(2,1)}=.94$ ). Excellent reliability was also established for the Responsiveness code and maintained throughout the coding period (final  $ICC_{(2,1)}=.88$ ), as well as for several subscales of the Positive composite, including Smiling without eye contact ( $ICC_{(2,1)}=.90$ ), Social Communication ( $ICC_{(2,1)}=.97$ ), and Giving Help ( $ICC_{(2,1)}=.93$ ). Reliability for the Eye Contact and Eye Contact with Smile subscales rose to the good range by the end of the coding period ( $ICC_{(2,1)}=.61$  and  $ICC_{(2,1)}=.72$ , respectively). Inter-rater reliability on the Low-Level composite of the SIOS was in the upper ranges of the good phase by the end of the training period ( $ICC_{(2,1)}=.72$ ), and rose into the excellent range over the course of the coding period (final  $ICC_{(2,1)}=.81$ ). Coders were able to establish excellent reliability on the Idiosyncratic Language subscale (final  $ICC_{(2,1)}=.99$ ), and good reliability on the Functional Communication subscale (final  $ICC_{(2,1)}=.64$ ). The slightly lower, but still good

to excellent interrater reliability on the Low-Level composite and its subscales is likely due to the subtler nature of behaviors included in this category. To account for coder drift, reliability was calculated every 2–3 weeks. Drift was calculated to be minimal, with reliability actually increasing over time across several subscales (Appendix H).

### CHAPTER III

#### RESULTS

Normality of the data was assessed, consistent with guidelines provided by George and Mallery (2010). To examine group differences in greater detail, participants were divided into three groups: Dyad Group 1 which consisted of TD children with TD friends ( $n=17$  dyads); Dyad Group 2 which consisted of children with ASD with TD friends ( $n=10$  dyads), and Dyad Group 3, which consisted of children with ASD whose nominated friends also had a diagnosis of ASD ( $n=3$  dyads) (comparable with procedures used in Bauminger, Solomon, Aviezer, Heung, Brown, et al., 2008). Of note, since Dyad Group 3 consisted of only three dyads, findings by Dyad Group can only be considered in an exploratory fashion. Data presented are from dyads (as opposed to individuals or diagnostic groups) unless otherwise specified.

Scores for all scales were found to be normally distributed. To account for the possibility of Type 1 error, an initial multivariate analysis comparing ASD participants to TD participants and including every study measure was run to examine the relative significance of each  $t$ -test (Hummel & Sligo, 1971; see Table 4). The MANOVA comparing all study variables for ASD vs. TD participants was not significant overall ( $F(27,1)=2.5, p=.46, \text{Wilks's } \Lambda=.014$ ); however, significant differences were found for several variables within the MANOVA (see Table 4). An additional MANOVA was run including every study measure and examining participants by Dyad Group (see Table 5).

Findings similarly indicated no overall significant difference ( $F(26,1)=.69, p=.76$ , Wilks's  $\Lambda=.003$ ), but several significant differences were found for variables included in the MANOVA. Given the exploratory nature of this study, significant differences at the individual variable level were interpreted; however, only those differences that were significant in the respective MANOVAs were further investigated and reported.

Descriptive statistics for all measures are reported in Tables 6–9.

### **Attrition Data**

Attrition rates were higher in the ASD group, with 28% of participants in the ASD sample and 19% of children in the TD sample failing to attend a second visit. Of these, all children were able to identify a friend during the first visit, but were unable to attend the second visit due to difficulty arranging for the friend to join them. To examine for attrition bias, data collected during the first visit were compared between children who attended a second visit and those who did not. In the ASD group, attrition analyses were run with and without the participant who did not meet IQ cut-offs. Findings were not found to differ significantly; thus, data from this participant were retained to increase statistical power. In the ASD group only, those participants who were able to complete a second visit achieved significantly higher Verbal Comprehension ( $t(16)=4.36, p<.01$ ) and Total IQ ( $t(16)=3.82, p<.01$ ; see Table 1) scores on the KBIT–2 than those who did not. Children in the ASD group who did not return for a second visit also demonstrated higher scores on the Depression subscale of the BASC–2 than children in the ASD group who returned for a second visit at a rate that fell just below significance ( $t(16)=1.96, p=.07$ ; see Table 6).

In contrast, children in the TD group who did not return for a second visit demonstrated significantly lower Social Skills scores on the SSRS ( $t(18)=-4.59, p<.01$ ; see Table 6), including lower scores on the responsibility ( $t(18)=-3.75, p=.035$ ) and cooperation ( $t(18)=-4.90, p<.01$ ) subscales, than those who returned for a second visit. TD children who did not complete a second visit demonstrated higher levels of anxiety ( $t(19)=3.13, p<.01$ ) than those who returned; as well as higher levels of internalizing symptoms that approached significance ( $t(19)=1.95, p=.065$ ) on the BASC-2 and on the depression subscale ( $t(19)=1.89, p=.075$ ). These children also received significantly lower scores than TD children who completed a second visit on the Adaptive Composite of the BASC-2 ( $t(19)=-2.32, p=.031$ ), including significantly lower scores on the Activities of Daily Living subscale ( $t(19)=-2.92, p=.02$ ).

### **Mixed vs. Non-mixed Dyads**

Overall, 10 children with ASD participated in the second visit with a TD friend (mixed dyads, Dyad Group 2), whereas three participated with a friend who also had an ASD diagnosis (non-mixed dyads, Dyad Group 3). Children in mixed dyads did not differ significantly from children in non-mixed dyads by family income, age, or number of siblings. They also did not differ significantly in terms of IQ, across BASC-2 composites, in terms of social skills as rated on the SSRS, or in terms of ASD severity as rated on the GADS (see Table 7).

### **Sample Characteristics**

Independent samples  $t$ -tests revealed that Dyad groups did not differ in terms of chronological age or number of siblings (see Table 2). Children with ASD received

significantly higher scores on the GADS than those in the TD group ( $t(29.51)=7.53$ ,  $p<.01$ ), as expected. Children in Dyad Group 1 received significantly lower scores on the GADS than children in Dyad Groups 2 or 3 ( $t(9.75)=-5.67$ ,  $p<.01$ ;  $t(18)=-8.44$ ,  $p<.01$ ; see Table 7), but children in Dyad Groups 2 and 3 did not differ significantly by ASD severity.  $t$ -tests were also run to examine differences in social skills across diagnostic and dyad groups. Caregivers of children in the TD group reported significantly higher scores on the SSRS than did caregivers of children in the ASD group ( $t(36)=2.98$ ,  $p<.01$ ). Children in Dyad Group 1 received higher ratings of social skills than children in either Dyad Group 2 ( $t(24)=2.62$ ,  $p=.01$ ) or Dyad Group 3 ( $t(18)=4.28$ ,  $p<.01$ ). Dyad Groups 2 and 3 did not differ significantly in their social skills as rated on the SSRS. Lastly,  $t$ -tests were run examining adaptive and internalizing composite scores on the BASC–2. Notably, boys in the ASD group who returned for a second visit demonstrated significantly higher  $t$ -scores for internalizing symptoms than boys in the TD group who returned (ASD  $M(SD)=59.5(10.67)$ , TD  $M(SD)=44.4(7.58)$ ) regardless of dyad status ( $t(28)=4.52$ ,  $p<.01$ ). Boys in the ASD group who returned for a second visit also demonstrated significantly higher mean  $T$ -scores for depression (ASD  $M(SD)=60.4(14.12)$ , TD  $M(SD)=45(5.48)$ ;  $t(28)=3.72$ ,  $p<.01$ ), anxiety (ASD  $M(SD)=59.77(10.70)$ , TD  $M(SD)=47.29(9.12)$ ;  $t(28)=3.45$ ,  $p<.01$ ), and somatization (ASD  $M(SD)=53.31$ , TD  $M(SD)=44.24(8.35)$ ;  $t(28)=2.30$ ,  $p=.03$ ) than boys in the TD group who returned for a second visit. However, within the ASD group, Dyad Groups 2 and 3 did not differ significantly across any of these BASC–2 scales. Nominated friends did not differ significantly across any of the measured demographic variables by either



diagnostic or Dyad Group. For friend demographic characteristics, please see Tables 2 and 3.

### **Hypothesis 1: Friendship Characteristics Overview**

*A substantial portion (approximately 50%) of friend nominations of children with ASD will be unilateral.*

In all, six boys' nominated friends did not spontaneously reciprocate their friendship nomination by listing the participant among their top five best friends. Of these six boys, five reciprocated the friendship when the examiner asked, "What about \_\_\_\_? Is he your friend?" Two children in Dyad Group 1 (11.8% of total dyads), two in Dyad Group 2 (20% of total dyads), and two in Dyad Group 3 (67% of total dyads) did not spontaneously reciprocate the friendship nomination. Combined, a total of four children in the ASD sample did not spontaneously reciprocate the friendship (30.77%). Only one child, in Dyad Group 3, responded "no" to the examiner's prompt. Dyad Group 3 also had a significantly higher rate of unreciprocated friendships based on the friend nomination procedure than did Dyad Group 1 ( $t(18)=2.39, p=.03$ ). The six dyads in which the friendship nomination was not spontaneously reciprocated will be referred to as "unilateral" for the remainder of this document.

*Unilateral friendships will be associated with lower overall friendship quality across groups.*

The six children in unilateral friendships received significantly lower overall dyad FQQ ratings ( $t(28)=-2.37, p=.03$ ). However, upon further investigation, only the target child in each of these friendships rated the relationship as lower in quality ( $t(28)=-2.92,$

$p < .01$ ). The six target children in unilateral friendships rated their relationships as lower in conflict resolution ( $t(28) = -2.36, p = .03$ ), higher in conflict and betrayal ( $t(28) = -3.67, p < .01$ ) and lower in help and guidance ( $t(28) = -2.54, p = .02$ ). Notably, these children's friends did not rate the friendship more poorly ( $t(28) = -1.32, p = .20$ ), despite not having reciprocated the friendship.

*Unilateral friendships will be characterized by lower rates of synchronous social behavior and lower rates of positive social engagement from the friend, but not the participant.*

Behavioral observations of unilateral friendships were comparable to those of reciprocated friendships in terms of time spent in synchronous behavior ( $t(28) = -.106, p = .30$ ) and responsiveness ( $t(28) = -.10, p = .33$ ). However, boys in unilateral friendships were observed to demonstrate lower levels of positive social engagement as measured by the positive interaction subscale of the SIOS ( $t(28) = -2.05, p = .05$ ). Upon further investigation, friends who did not spontaneously reciprocate the friendship nomination demonstrated significantly lower levels of positive social engagement during the observed interaction ( $t(28) = -2.27, p = .03$ ), whereas target children did not ( $t(28) = -1.66, p = .11$ ).

*Greater discrepancies in PANAS-C ratings are expected in unilateral friendships than in reciprocated friendships.*

Boys in unilateral friendships did not report significantly lower internal positive affect on the PANAS-C following the structured play interaction than boys in reciprocated friendships ( $t(28) = .56, p = .58$ ), nor did their friends ( $t(28) = -.36, p = .72$ ). Boys

in unilateral friendships also did not report higher levels of negative affect following the interaction ( $t(28)=.304, p=.76$ ), nor did their friends ( $t(28)=.21, p=.83$ ). Additionally, dyads in unilateral friendships also did not demonstrate significant discrepancies across either negative or positive scales of the PANAS–C ( $t(28)=.18, p=.86$ ); ( $t(28)=.86, p=.40$ ). *The ASD group will have lower average friendship quality, levels of synchrony, and positive social engagement overall, largely due to the higher prevalence of unilateral friendships.*

Overall, children in the ASD group did not differ significantly from children in the TD group in terms of synchrony (as measured by responsiveness:  $t(28)=.27, p=.79$  or total percent of time engaged in synchronous behavior:  $t(28)=1.39, p=.08$ ) or positive social engagement ( $t(28)=1.77, p=.10$ ; see Table 8). Boys with ASD spent comparable amounts of time with their nominated friend and with children in general as did TD boys (with the nominated friend:  $t(28)=.67, p=.51$ ; with children in general:  $t(28)=1.4, p=.17$ ). However, they demonstrated significantly lower scores on the Friendship Quality Questionnaire (FQQ) than children in the TD group ( $t(28)=3.43, p=.00$ ; see Table 8). The significant overall difference in dyad FQQ total scores between the ASD and TD groups was also further examined by dyad. Both Dyad Groups 2 and 3 reported significantly lower total scores on the FQQ than did Dyad Group 1, respectively ( $t(24)=3.26, p<.01$ ;  $t(18)=-3.21, p<.01$ ; see Table 9). TD dyads reported significantly higher friendship quality across five of the six FQQ subscales, including Companionship ( $t(28)=3.86, p<.01$ ), Validation and Caring ( $t(28)=2.24, p=.033$ ), and Help and Guidance ( $t(28)=2.83, p<.01$ ). To account for a possible reporting difference among the ASD sample that may

account for overall lower scores (Lickel, MacLean, Blakeley-Smith, & Hepburn, 2012; Ozsivadjian, Hibberd, & Hollocks, 2014), friend scores on the FQQ were then examined separately from target child scores and overall dyad scores. As all friends completed questionnaires in a private room out of earshot of the other child in the dyad, these scores can be considered an independent representation of the friend's perception of the quality of the friendship. Friend FQQ total scores were significantly correlated with target scores across all dyad groups ( $r=.47, p<.05$ ). Friends of children with ASD reported significantly lower total scores on the FQQ than did friends of TD children ( $t(28)=-2.67, p=.013$ ). TD friends of TD target children (Dyad Group 1) reported significantly higher friendship quality than TD friends of children with ASD (Dyad Group 2;  $t(24)=2.12, p=.044$ ) and friends with ASD of target children with ASD (Dyad Group 3;  $t(18)=3.01, p<.01$ ). Findings indicate that friendships involving a child with ASD were consistently rated as lower in quality than those involving only TD children. Both TD friends and friends with ASD, as well as target children, experienced friendships involving a child with ASD as being lower in quality. This finding cannot be attributed to differences in reporting among children with ASD.

*The ASD group will demonstrate lower overall average synchronous social behavior and greater participant-friend discrepancies in PANAS-C ratings than typically developing controls.*

Friendships of boys with ASD demonstrated lower mean levels of time spent in synchronous behavior, responsiveness, and positive social engagement than did those of TD boys (see Table 8, Figure 4). However, these differences were not statistically

significant (time spent in synchronous behavior ( $t(28)=1.39, p=.14$ ); responsiveness ( $t(28)=.27, p=.79$ ); positive social engagement ( $t(28)=1.77, p=.088$ ); see Table 8).

Friendships of boys with ASD did not differ from those of boys with TD in terms of discrepancies in PANAS–C ratings (positive subscale:  $t(28)=-.93, p=.36$ ; negative subscale:  $t(28)=-.95, p=.35$ ).

## **Hypothesis 2**

*Does positive social engagement/synchrony mediate the relation between time spent with the nominated friend/children in general and friendship reciprocity/quality?*

Positive social engagement and synchrony (defined as time spent in synchronous interactions and responsiveness) and internal affect (as measured by child self-report on the PANAS–C) were expected to predict friendship status and quality over and above opportunity to participate in surface level activities (as measured by the Activities Questionnaire—General) among both children with ASD and typical controls.

Joint significance tests of mediation were run to examine whether synchrony and positive social engagement (respectively) would mediate the relation between opportunities to engage in surface level activities with the friend selected for the study or children in general (respectively) and friendship status and quality (respectively). A joint significance test involves testing the null hypothesis that the indirect effect is statistically comparable to zero (as opposed to calculating the magnitude of the indirect effect compared to its standard error, as in a Sobel test). Joint significance tests have been found to be more powerful than other methods of testing for mediation, and as a result have been deemed to be a more appropriate test for smaller sample sizes (Fritz & MacKinnon,

2007; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Joint significance tests consist of fitting two consecutive regression models. The first is to test path A: a regression of the mediator variable on the predictor variable. If path A is significant, a second analysis is run with a model including both the predictor variable and the mediator variable as predictors. If the mediator variable significantly predicts the dependent variable even with the predictor variable in the model, mediation is determined to be present.

Data were entered by dyad into each mediation analysis (as opposed to separating target vs. friend data); thus, all data reported pertains to friend dyads, rather than individuals. To control for dyad group status, two dummy coded variables were created to represent Dyad Groups 1 and 2. Output for the continuous variable could then be interpreted as pertaining to Dyad Group 3. To assess and account for any possible interactions between predictor variables and group status, interaction terms were calculated by multiplying the dummy coded variables for Dyad Groups 1 and 2 by each predictor variable included in the analysis. Results for Dyad Group 3 could then be interpreted as having accounted for a possible interaction between Dyad Group 3 and the predictor variables. When a significant interaction was found, analyses were re-run with Dyad Groups 1 and 2 as the reference variable to examine the slope and significance of the regression analysis by group without losing statistical power. This procedure was employed for all mediation analyses (Hypotheses 2 and 4). Results reported from all mediation analyses pertain to all three dyad groups unless otherwise reported.

The first step of this joint significance test assessed whether scores on the Activity Questionnaire General and Specific would predict levels of positive social engagement and synchrony (with separate analyses run to account for time spent in synchronous interaction and the rate of responsiveness). Six regression analyses were run to evaluate this question. The first three included the Activity Questionnaire–Specific, dummy coded group variables, and interaction terms as predictors, with scores from the positive interaction scale of the SIOS, time spent in synchronous behavior, and responsiveness as the dependent variables, respectively. Analyses were then re-run with the Activity Questionnaire–General as the predictor variable, controlling for dyad group and interactions. Scores on the Activity Questionnaire–Specific were not found to significantly predict time spent in synchronous behavior ( $\beta = -.25, p = .18$ ), responsiveness ( $\beta = -.28, p = .15$ ), or target child report of internal affect as measured by the PANAS-C ( $\beta = -.16, p = .41$ ). However, opportunities to participate in surface level activities with the friend nominated for the study were *negatively* associated with positive social engagement ( $\beta = -.36, p = .05$ ; please see Figures 5–7, Table 10). No interactions were found, and no significant relations were found with scores on the Activity Questionnaire–General and positive social engagement ( $\beta = .04, p = .85$ ), time spent in synchronous behavior ( $\beta = .06, p = .76$ ), responsiveness ( $\beta = .19, p = .34$ ) or positive internal affect ( $\beta = -.14, p = .47$ ).

Because this joint significance test was significant at the first step for positive social engagement, the second model of the joint significance test was fitted, with Activity Questionnaire Scores and scores from the Positive Interaction Scale of the SIOS

(positive social engagement) entered together as predictors into a regression analysis to examine whether positive social engagement would mediate the relation between Friendship Quality and Opportunities to Participate in Activities with the nominated friend. This regression analysis was not significant ( $\beta=.27, p=.14$ ; see Figure 7). Additionally, a binary logistic regression was run to examine whether positive social engagement and opportunities to participate in activities with the nominated friend would predict friendship status, but the Wald test indicates that this relation was not quite statistically significant ( $\beta=.10, p=.06$ , see Figure 6, Table 11).

### **Hypothesis 3**

*What is the relation between friendship status/quality and outcomes commonly associated with friendship among boys with and without ASD?*

Friendship status and quality, as measured by child nominations and child report on the FQQ, were expected to predict improved psychosocial functioning, as measured by parent report on the BASC–2 internalizing and adaptive functioning subscales among both children with ASD and typical controls.

An additional series of regression analyses were run to examine whether friendship status and quality would predict adaptive behavior and internalizing symptoms as rated on the BASC–2. Friendship status was found to significantly and negatively predict internalizing symptoms, controlling for group, indicating that target participants whose friends spontaneously reciprocated their nomination were also rated as demonstrating lower levels of internalizing symptoms by their caregivers ( $\beta=-.33, p=.04$ ; please see Figure 8). Consistent with hypotheses, this was true for children with and



without ASD, as well as across Dyad Group. Additionally, friendship status was negatively associated with anxiety in Dyad Group 2 only (children with ASD who nominated a TD friend;  $\beta = -.85, p < .01$ ), such that children in Dyad Group 2 in a reciprocal friendship were reported to have lower levels of anxiety than those in unilateral friendships. However, no significant relation was found between friendship quality and internalizing symptoms or adaptive behavior for either the ASD or TD group.

Additional exploratory analyses were run examining the possible relation between social skills, internalizing symptoms, and adaptive behavior, with the hypothesis that stronger social skills would predict lower internalizing symptoms and stronger adaptive behavior. A unique relation between social skills and anxiety as measured by the BASC-2 emerged in the ASD group who completed second visits, such that anxiety was positively and significantly correlated with social skills ( $r = .70, p < .01$ ; see Figure 9, Table 12). This relation was not significant among TD children who completed second visits ( $r = -.08, p = .75$ , see Table 13). This relation held across Dyad Group 2 ( $r = .70, p = .03$ ) and fell just below significance in Dyad Group 3 ( $r = .10, p = .05$ ). Thus, children with ASD who had higher social skills were also reported to demonstrate higher levels of anxiety, whereas the relation was not significant but trended in the opposite direction among their TD peers. Additional exploratory joint significance tests were run to examine whether anxiety might mediate the relation between social skills and reciprocated friendship across dyad groups. No significant results emerged.

#### Hypothesis 4

*Does positive social engagement/synchrony mediate the relation between time spent with the nominated friend/children in general and outcomes commonly associated with friendship?*

Positive social engagement (measured by the positive social interaction scale of the SIOS) and synchrony (defined as percent of time spent in synchronous interaction and responsiveness) and internal affect (as measured by child self-report on the PANAS–C) were expected to predict improved psychosocial functioning, as measured by parent report on the BASC internalizing and adaptive functioning subscales among children with ASD and typical controls.

A series of joint significance tests were run to examine whether overall positive social engagement, time spent in synchronous behavior, responsiveness, and internal affect would predict psychosocial functioning overall and above opportunities to participate in surface level activities. The first step of this joint significance test was to assess whether the Activity Questionnaire (general and specific) would predict positive social engagement, time spent in synchronous behavior, responsiveness, and PANAS–C scores. As with Hypothesis 1, scores on the Activity Questionnaire-Specific were not found to significantly predict percent of time spent in synchronous behavior ( $\beta = -.25$ ,  $p = .18$ ), responsiveness ( $\beta = -.28$ ,  $p = .15$ ), or target child ratings of internal affect as measured by the PANAS–C ( $\beta = -.16$ ,  $p = .41$ ). However, opportunities to participate in surface level activities with the friend nominated for the study were *negatively* associated with positive social engagement as coded on the SIOS ( $\beta = -.36$ ,  $p = .05$ ; see Table 10). No

interactions were found, and no significant relations were found with scores on the Activity Questionnaire–General, positive social engagement ( $\beta=.04, p=.85$ ), time spent engaged in synchronous behavior ( $\beta=.06, p=.76$ ), responsiveness ( $\beta=.19, p=.34$ ), or target child self-reported affect on the PANAS–C ( $\beta=-.14, p=.47$ ).

Three regression analyses were run to examine pathway b of the mediation analysis; whether positive social engagement would positively predict psychosocial functioning (defined as internalizing symptoms as measured by the BASC–2, adaptive skills on the BASC–2, and social skills on the SSRS) with Activity Questionnaire–Specific scores included in the model. To fit this model, scores from the Activity Questionnaire–Specific and from the positive interaction scale of the SIOS were entered as predictors, along with dummy codes for dyad group. Three regression analyses was then run with internalizing scores from the BASC–2, adaptive skills scores from the BASC–2, and social skills scores from the SSRS as dependent variables, respectively. No significant relations were found (internalizing:  $\beta=-.08, p=.63$ ; adaptive:  $\beta=.03, p=.86$ ; social skills:  $\beta=.09, p=.64$ ; see Figures 10–12). Thus, the hypothesis that affective sharing would predict psychosocial functioning over and above opportunities to participate in surface level activities was ultimately not supported.

## **Exploratory Analyses**

### **Exploratory Analysis 1**

*IQ will positively predict friendship status and quality.*

Regression analyses with total IQ scores from the KBIT–2 as the predictor and total friendship quality scores on the FQQ per dyad as the dependent variable were run,

with dummy coded group status included as a predictor to control for group, as well as the interaction term for group status and total IQ. No interactions were found, and overall IQ did not significantly predict self-reported friendship quality as measured by dyad FQQ scores ( $\beta=-.26, p=.14$ ). However, VIQ predicted low self-reported dyad friendship quality to a degree that was not quite significant ( $\beta=-.34, p=.06$ ; see Figure 13). Overall, findings may suggest a negative relation between VIQ and perceived friendship quality.

### **Exploratory Analysis 2**

*Symptom severity will be negatively associated with friendship status and quality.*

To examine whether symptom severity would negatively predict friendship status and quality, regression analyses were run with autism quotient scores on the GADS as the predictor variable, and friendship status and quality as the outcome variables. Without controlling for group, Asperger's Quotient scores significantly and negatively predicted total dyad FQQ scores ( $\beta=-.42, p=.02$ ; see Figure 14). Since parents of all children in the study completed the GADS (regardless of child diagnostic status), this may indicate the relation between subtler manifestations of ASD symptomatology and friendship quality. However, this effect did not remain when group was controlled for, and no relation was found in Dyad Group 1, supporting the finding that the presence of a child with ASD in a friend dyad was associated with lower FQQ dyad scores, regardless of overall ASD severity or diagnostic status of friend.

### **Exploratory Analysis 3**

*Social skills will predict friendship status and quality, as well as overall synchrony, but not positive internal affect.*

A series of regression analyses were then run to examine whether Social Skills, as measured by the total Social Skills score on the SSRS, would predict friendship status, quality, overall synchrony, and ratings of positive internal affect. As hypothesized, social skills did not predict positive internal affect as measured by the PANAS-C ( $\beta=.04$ ,  $p=.87$ ). However, no significant relations were found between friendship status ( $\beta=-.09$ ,  $p=.11$ ), friendship quality ( $\beta=-.26$ ,  $p=.19$ ), time spent engaged in synchronous behavior ( $\beta=.23$ ,  $p=.32$ ), responsiveness ( $\beta=.09$ ,  $p=.69$ ), or positive social engagement ( $\beta=.02$ ,  $p=.92$ ) and social skills. Overall, findings suggest no significant relation between social skills, friendship quality, friendship status, or internal affect following the coded observation.

## CHAPTER IV

### DISCUSSION

#### Summary of Findings

The purpose of this project was to examine the role of affective sharing, defined as positive social engagement and synchrony (responsiveness and time spent in synchronous social interaction), in the friendships of boys aged 8–12 with and without ASD. An equally important purpose of this project was to explore how these processes might associate with outcomes typically associated with friendship among TD boys in the 8–12 age range. This project differed from the previous work upon which it was based by using child friend nominations, rather than maternal nominations, and including measures of outcomes commonly associated with friendships among TD boys.

Hypothesis 1 was that roughly 50% of the friendships of boys in the ASD group would prove to be unilateral, and that children in unilateral friendships would report less positive affect and lower overall quality of the friendship. Overall, findings relating to Hypothesis 1 highlight not only some key differences in friendships between boys with and without ASD, but, perhaps more importantly, some key similarities. Notably, while the majority of boys in unilateral friendships were in the ASD group (4/6), the overall percentage of children with ASD in reciprocated friendships was 69.23%; well above the projected 50%. This is consistent with findings from a large-scale meta-analysis ( $n=1,768$ ) indicating that, while children with ASD do have fewer reciprocated

friendships, most *do* have at least one friend (Mendelson et al., 2016). Notably, dyad scores for friendship quality as rated on the FQQ were significantly lower among dyads in unilateral friendships. Additionally, consistent with prior research indicating that affective sharing distinguishes reciprocal from unilateral friendships among TD children (Newcomb & Bagwell, 1995), boys in unilateral friendships demonstrated significantly lower levels of positive social engagement than boys in spontaneously reciprocated friendships. Further investigation revealed this finding to be driven by lower levels of positive social engagement among the friends, but not the target children, in these dyads than among reciprocated dyads. However, when target child scores were investigated separately from friend scores on the FQQ, target children in unilateral friendships reported significantly lower scores than target children in spontaneously reciprocated friendships, whereas friend scores did not differ significantly between groups. This indicates that target children in unilateral friendships, although unaware that their friend did not reciprocate their nomination, may perceive the lower levels of affective sharing provided by the friend and experience the friendship as lower in quality as a result. Since the majority of boys in unilateral friendships were in the ASD group, this is consistent with research suggesting that children with ASD may actually have more insight into their friendship quality than previously imagined (Mendelson et al., 2016). However, boys in unilateral friendships did not report lower levels of positive affect or higher levels of negative affect immediately following the interaction, suggesting that while differences in affective sharing negatively impacted their perceptions of friendship

quality, reduced affective sharing did not have an immediate impact on their own affective state.

Boys with ASD rated their friendships as being significantly lower in quality than did TD boys. These findings also mirror those from the meta-analysis conducted by Mendelson and colleagues indicating that while most boys with ASD do succeed in forming reciprocal friendships, these friendships tend to be lower in quality than those of their TD peers (Mendelson et al., 2016). Moreover, friends of children with ASD also reported their friendships to be significantly lower in quality than friends of TD children, even though children completed questionnaires separately. Thus, this finding cannot be attributed to possible reporting differences among the boys with ASD, and suggests that friendships of boys with ASD are consistently perceived as lower in quality by both children involved.

Boys with ASD did demonstrate lower mean levels of positive social engagement, time spent in synchronous interaction, and responsiveness in a pattern comparable to what has been previously found in the literature (Bauminger, Solomon, Aviezer, Heung, Guzit, et al., 2008; Bauminger-Zviely & Agam Ben-Artzi, 2014; see Figure 4). However, differences in positive social engagement and synchrony behavior (responsiveness and time spent in synchronous interaction) fell below significance, suggesting that although these behaviors occurred at a lower mean rate, boys with ASD *were* able to engage in them to a sufficient degree to maintain reciprocal friendships. Additionally, among the four boys with ASD who were in unilateral friendships, lower rates of positive social engagement were found among their *friends* than what was found among friends in



reciprocated friendships, not the target boys themselves, suggesting that the lower rates of affective sharing in unilateral friendships were driven at least as much by the friend's lack of engagement in the friendship as by lower levels of affective sharing on the part of the boy with ASD. Taken together, these findings suggest that affective sharing plays a central role in the friendships of boys with ASD, much as it does in TD friendships.

The first part of Hypothesis 2, that synchrony (time spent in synchronous interaction and responsiveness) would mediate the relation between opportunities to participate in surface level activities and friendship status and quality was not supported. Regression analyses to examine the second part of Hypothesis 2 indicated a counter-intuitively *negative* relation between opportunities to participate in surface level activities with the nominated friend and positive social engagement, such that those children who had spent more time in the last two weeks with their nominated friend demonstrated *lower* levels of positive social engagement during their observed interaction. Notably, boys in both diagnostic groups and all dyad groups spent comparable amounts of time with the nominated friend (see Table 7). It may be that children who spent more time with the nominated friend felt less self-conscious around their friend and more comfortable engaging in the activity with a greater degree of independence. Alternatively, and perhaps the more likely explanation, it may be that measures of affective sharing used in this study were not sufficiently sophisticated to capture the potentially fleeting and subtler forms these exchanges may take on among friends who spend more time together (e.g., Berscheid, 1983). The joint significance test of whether positive social engagement would mediate the relation between opportunities to

participate in surface level activities and friendship status/quality was not significant at the second step, indicating that Hypothesis 2 was not supported overall. Thus, while boys with ASD did engage in lower levels of affective sharing in their friendships, this was not at a statistically significant level and did not negatively predict the quality of their friendships or the likelihood that their friendships would be reciprocated, much as it did not among TD boys. Findings again suggest that affective sharing plays a comparable role in the friendships of boys with ASD and those of TD boys.

As predicted, children in reciprocated friendships were reported to have lower levels of internalizing symptoms by their caregivers, and this finding held across groups, suggesting a comparably beneficial role of reciprocal friendship for children with and without ASD. Additionally, higher friendship quality was associated with lower levels of internalizing symptoms across both groups, further suggesting a comparable relation to psychosocial outcomes among both TD and ASD samples. However, children with ASD who participated with a TD friend (Dyad Group 2) that reciprocated their friendship nomination were reported by their caregivers to demonstrate *higher* levels of anxiety than those in a unilateral friendship. This is consistent with the finding that children in the ASD group who were rated as having stronger social skills by their caregivers were also reported to have higher levels of anxiety. This is also consistent with findings from previous research suggesting that friendship may relate differently to psychosocial functioning, and anxiety specifically, among children with ASD than among their TD peers (e.g., Mazurek & Kanne, 2010). Children with ASD who have higher social anxiety may also be more vigilant to subtle social cues, making them stronger friend candidates

for their TD peers. Conversely, those children with ASD who are sufficiently perceptive of social cues to form friendships may also be more aware of their differences from peers and develop anxiety as a result. Notably, this relation was in the opposite direction among children in the TD group. Considered in light of the finding that children in the TD group who did not complete a second visit were reported to have significantly poorer social skills than those who did return, it may be that, among TD peers, social skills contribute to friendship formation and the subsequent benefit of reduced anxiety. Among children with ASD, anxiety that may accompany stronger social skills may interfere with the reduction in anxiety seen among TD children who have at least one reciprocated friendship (e.g., Bukowski et al., 2010).

Hypothesis 4, that positive social engagement and synchrony (defined as time spent in reciprocal interaction and responsiveness) would mediate the relation between opportunities to participate in surface level activities and psychosocial functioning, was largely unsupported. As with Hypothesis 2, among TD boys, this may relate to subtler and more fleeting interactions between close friends that were not captured by this coding system (e.g., Berscheid, 1983). Positive social engagement and synchrony were also not found to mediate the relation between time spent with other children/the nominated friend and commonly associated benefits of friendship. Taken into consideration with the finding that boys in unilateral friendships did demonstrate significantly lower levels of affective sharing than boys in reciprocated friendships, boys may need to demonstrate a threshold level of affective sharing in order to engage in a truly reciprocal friendship, but subsequently reap the benefits regardless of the relative amounts of affective sharing that

take place during interactions with their friend. Alternatively, measures used to assess positive social engagement and synchrony (time spent in synchronous interaction/responsiveness) in this study may not have been sufficiently sensitive to capture potentially subtle variations that may impact outcome factors. Once again, findings were comparable between boys with ASD and TD boys, suggesting a similar role of affective sharing in the friendships of both groups.

Regardless of the diagnostic status of the target child or friend, target children with higher VIQ reported their friendships to be lower in quality at a level that fell just below significance. This finding may suggest that boys with a higher VIQ may have been more critical in thinking about their friendships. Alternatively, boys with a higher VIQ may be more sensitive to subtle differences in friend behaviors, or maintain higher expectations of their friendships. While boys with ASD may rely more heavily on VIQ in their social interactions (Bauminger, Solomon, Aviezer, Heung, Brown, et al., 2008; Bauminger et al., 2010), this finding suggests that VIQ relates to perceived friendship quality comparably between boys with ASD and TD boys.

Consistent with hypotheses, higher ASD severity was associated with lower overall friendship quality scores. This is also consistent with the finding that friendships involving boys with ASD were rated as lower in quality by both the target child and the friend. This finding is consistent with findings from a large-scale meta-analysis (Mendelson et al., 2016) in suggesting that the friendships of boys with ASD are experienced as lower in quality by all parties involved in the friendship. While this finding may relate to the lower mean levels of positive social engagement, time spent in

synchronous interaction, and responsiveness in the friendships of boys with ASD, these differences were not statistically significant between groups and observational measures in this project were not significantly related to ratings of friendship quality.

Lastly, several notable differences emerged in attrition patterns between the ASD and TD group. In the ASD group, children who were able to arrange for a friend to attend the second visit had significantly higher IQs than those who did not, and lower depression ratings that fell just below significance. The finding that boys with ASD who returned for a second visit achieved significantly higher VIQs than those who did not (whereas this was not the case among TD boys) mirrors findings from previous research indicating that VIQ relates more strongly to social functioning among individuals with ASD than TD individuals (Hughes & Leekam, 2004; Kasari et al., 2001; Yirmiya et al., 1989). Additionally, this finding may map onto theories that children with ASD rely on alternative processing strategies to achieve success in social relationships (Bauminger, Solomon, Aviezer, Heung, Brown, et al., 2008; Bauminger et al., 2010).

Conversely, children in the TD group who were able to arrange for a friend to attend the second visit were found to have significantly higher social and adaptive skills, coupled with lower rates of depression and anxiety, than those who did not, with no significant differences in IQ. Thus, patterns of internalizing symptoms, adaptive skills, and social skills among TD boys who completed a second visit as compared to those who did not mirrored those commonly found in the literature among TD children with and without friends (e.g., Demir & Urberg, 2004). This was not the case in the ASD group. A speculative hypothesis based on these data may be that boys with ASD experience the

*lack* of a reciprocated friendship differently than do their TD peers. Boys in this study demonstrated high rates of friendship reciprocity in the sample of boys who did return for a second visit (across both TD and ASD groups), and five of six nominated peers in unilateral friendships *did* reciprocate the friendship when prompted. Thus, it may be that the boys who were not able to arrange for a friend to return are more accurately representative of boys who truly lack a reciprocal friendship. If this were the case, findings from these attrition data suggest that boys with ASD who could not arrange for a friend to attend the second visit did not demonstrate a comparable pattern of higher levels of internalizing symptoms (specifically, anxiety) coupled with poorer social and adaptive skills found among TD boys without a reciprocated friendship, and may point to a distinct relation between friendship and commonly associated outcomes among boys with ASD. Additionally, this hypothesis may also explain why no significant relation was found between social skills and any of the measured friendship variables (behavioral observations, friendship quality, friendship reciprocity, or internal affect following the friend interaction). It may be that, among TD boys, social skills play a key role in *establishing* a reciprocal friendship, but that once a child has achieved a reciprocated friendship (as did the majority of children in this study), the role of social skills is reduced. The lack of statistically different social skills between boys with ASD who did and did not attend a second session suggests that social skills may play a distinct role in these processes among boys with ASD. Moreover, boys in the ASD sample demonstrated a significantly higher level of depression than boys in the TD sample of this study, even though the majority of these boys were participating in reciprocated friendships. This

finding suggests that friendship may be less effective in mitigating the symptoms of depression among boys with ASD than among TD boys, and warrants further investigation.

### **Conclusions**

This study hypothesized that affective sharing would mediate the relation between surface level activities and friendship status/quality for boys with and without ASD. This study also hypothesized that affective sharing would mediate the relation between surface level activities and outcomes commonly associated with friendship for boys with and without ASD. While neither of these mediations was supported in either group, affective sharing was found to play a largely comparable role in the friendships of boys with ASD and TD boys. Although boys with ASD did demonstrate lower mean levels of positive social engagement, time spent in synchronous interaction, and responsiveness than did their TD peers, these differences were not statistically significant and did not significantly relate to either measures of friendship quality or internalizing symptoms and adaptive skills of the target child. Moreover, affective sharing *was* significantly lower among boys engaged in unilateral friendships. Thus, boys with ASD may need to meet a certain threshold level of affective sharing in order to engage in a reciprocal friendship, but do not appear to experience reduced levels of the benefits of friendship as a direct result of lower levels of affective sharing after meeting the threshold. Nonetheless, ASD severity was significantly associated with poorer friendship quality, suggesting that the social difficulty boys with ASD experience as a result of their diagnosis negatively

impacts the quality of their friendships, even when they are able to engage in sufficient affective sharing to establish and maintain the friendship.

As predicted, unilateral friendships across both groups were characterized by lower levels of affective sharing and rated as being lower in quality. Also consistent with hypotheses, boys in unilateral friendships demonstrated significantly higher levels of internalizing symptoms regardless of diagnostic status. This finding again suggests a comparable experience of friendship among boys with ASD and TD boys.

However, despite the fact that the majority of boys with ASD in this study were engaged in reciprocal friendships and able to participate in a degree of affective sharing that was statistically comparable to their peers, findings from attrition data point to the potential for a more complex relation between friendship and its benefits among boys with ASD than among TD boys. Specifically, TD boys who were not able to arrange for a friend to join them at the second visit demonstrated a pattern of higher levels of internalizing symptoms and poorer social and adaptive skills, consistent with what has been commonly found among children who lack a reciprocated friendship (Bukowski et al., 2010; Demir & Urberg, 2004). However, this was not the case among boys with ASD who were not able to return for a second visit. Moreover, boys with ASD who did return for a second visit and *were* engaged in reciprocal friendship demonstrated significantly higher rates of internalizing symptoms than TD boys engaged in reciprocal friendships. Thus, key differences from TD boys may lie less in the specific processes of friendships of boys with ASD than in the efficacy of these friendships in promoting psychological well-being and overall psychosocial functioning. Friendship has been repeatedly



established to serve a key buffering role against a range of life stressors among boys in the 8–12 age range (e.g., Laursen, Bukowski, Aunola, & Nurmi, 2007; Nangle et al., 2003, Renshaw & Brown, 1993). These findings suggest that friendship may be a less effective buffer against stress among boys with ASD than it is among TD boys. This may be due to the significant level of stress associated with carrying an ASD diagnosis (Mayes et al., 2013; Strang et al., 2012), or to differences in processing of social information among boys with ASD (Mendelson et al., 2016).

### **Limitations**

This study has several limitations that must be taken into consideration when interpreting findings. Primary among them is small sample size. Despite a wide range of recruitment efforts that included applying for and receiving two grants with a community partner, completing a full application to distribute study information in local public schools, applying to recruit participants through a regional research registry, and contacting over a dozen local agencies, ultimately only 18 children with ASD enrolled in the study. Of these, only 13 were able to arrange for a friend to attend the second visit. Attrition rates were only slightly lower in the TD group, recruitment of which was greatly facilitated by access to a university database of families of TD children interested in participating in research studies. Most notably, data specific to Dyad Group 3 (ASD-ASD) must be interpreted with *extreme caution* considering the very low sample size in this group ( $n=3$ ). Potential future iterations of this project would benefit from access to larger populations of individuals with ASD, be it through participation in multi-site recruitment (as has been done in several of the more prominent studies in this field; e.g.,

Bauminger, Solomon, Aviezer, Heung, Brown, et al., 2008; Bauminger, Solomon, Aviezer, Heung, Guzit, et al., 2008), access to a database of families of children with ASD interested in participating in research, or conducting recruitment through a school system. Nonetheless, findings from this project represent a novel contribution to the literature that could easily be incorporated into a meta-analysis to examine whether they are, in fact, representative of the larger population.

Notably, the boys in the ASD group who returned for a second visit had significantly higher mean BASC–2 Internalizing scores across all three subscales, and the mean score for the anxiety and depression subscales in the ASD group closely approached the “at-risk” range. While this study is predicated on the hypothesis that participation in a reciprocal friendship contributes to lower levels of internalizing symptoms, it bears consideration that this relation may actually be bidirectional. Additionally, as this was not a longitudinal study, it may be that participation in a reciprocal friendship *does* significantly contribute to lower levels of internalizing symptoms over time in a manner that could not be captured in this one-time snapshot of participant functioning. Longitudinal studies that include consideration of the potential for a bidirectional relation between internalizing symptoms and friendship outcomes will be able to better shed light on the relation between friendship outcomes and internalizing symptoms.

Also bearing consideration are aspects of the friendship nomination procedure used in this study that may have contaminated nominations. While the initial intent of this project was for the researcher to obtain the contact information for the friend and contact

them *prior* to the second study visit to complete the nomination (so as to avoid priming or biasing the friend toward reciprocal nomination), this was not permitted under the “Word of Mouth Rule” of the university IRB. Thus, nomination procedures may have contributed to the relatively high rate of reciprocated friendships across both study groups. One potential means of mitigating this issue in future studies may be to ask participants to numerically rank their top 5 best friends in order (e.g., #1 = Best Friend, #2 = Second Best, etc.), so as to better account for subtler nuances in friendship reciprocity. Similarly, inclusion of a measure of within-dyad attachment may also be a means of shedding greater light on the potential for subtle nuances even within reciprocal and unilateral friendship groups. Inclusion of an adaptation of the Inventory for Parent and Peer Attachment (Gullone & Robinson, 2005) to children in the 8–12 age range may be a means of gathering this information. Moreover, further consideration of the potential for unique benefits to each participant in mixed vs. non-mixed dyads is warranted in the context of a longitudinal study that accounts for potential bi-directionality between friendship outcomes and internalizing symptoms. Further, parents have been found to play a critical role in the friendships of children in this age range (e.g., Allès-Jardel, Fourdrinier, Roux, & Schneider, 2002) and this was observed anecdotally in the key role parents played in organizing the second visit of this study. Future research that includes consideration of the role of parents in the friendships of boys with ASD will help to shed further light on factors promoting friendship-formation in this population.

Additionally, the PANAS–C, a 10-item Likert-type rating scale, was used as a measure of internal affect in this study, and no significant relations were found between

the PANAS–C and any other study variable. It may be that the PANAS–C, while demonstrated to have adequate psychometric properties (Ebesutani et al., 2012) and chosen for the ease with which it could be administered with this population, was not a sufficiently nuanced measure to capture the likely subtle variations in affect following the standardized behavioral observation. Future studies may benefit from incorporation of more sensitive measures of internal affect, including more detailed questionnaires and biophysiological measures of affective experience.

Lastly, despite lower mean levels of affective sharing in the ASD group than in the TD group, differences were not statistically significant. Moreover, contrary to hypotheses, affective sharing was not significantly related to friendship quality, internalizing symptoms, social skills, or adaptive functioning in either group. While this may represent an actual finding, it bears consideration that differences across these variables may have been too subtle to be captured using a traditional coding approach. Future research of this nature may benefit from incorporation of more advanced technology so as to capture subtler nuances in social behavior. While this project used a detailed coding scheme and rigorous training strategy, inclusion of more advanced technology may allow future projects to capture subtleties that are not readily apparent to the human eye. Use of more advanced technology that is able to capture subtler differences may also help to identify differences in the likely context of a low sample size, as is often the case in this line of research.

### **Implications and Future Directions**

Findings from this study are consistent with those of a large meta-analysis (Mendelson et al., 2016) in suggesting that the majority of boys with ASD are engaged in at least one reciprocal friendship. This finding stands in contradiction to commonly suggested hypothesis that boys with ASD may not be able to engage in truly reciprocal friendships given the social impairments associated with the diagnosis (Calder et al., 2013; Hobson, 1993; Mitchell & Locke, 2015). However, the friendships of boys with ASD in this study were experienced as significantly poorer in quality by both children, again consistent with meta-analysis findings (Mendelson et al., 2016). This project may represent an important step toward research aimed at better understanding the means whereby boys with ASD are able to overcome their social difficulties in order to form reciprocal friendships, with the aim of capitalizing on these skills to provide support to boys with ASD who struggle to form even one reciprocal friendship. A better understanding of the means whereby boys with ASD form friendships may also help to inform interventions geared at using these skills to promote higher quality friendships among boys with ASD.

While the majority of boys with ASD are able to engage in reciprocal friendship, findings from this study are consistent with findings from previous research in suggesting that these friendships may be less effective in buffering against life stressors than those of their TD peers (e.g., Mazurek & Kanne, 2010). Considering the significant life stress faced by many children with ASD (e.g., Mayes et al., 2013), further research aimed at understanding factors that promote well-being among individuals with ASD is warranted.

Promisingly, children with ASD in reciprocated friendships did demonstrate significantly lower levels of internalizing than those in unreciprocated friendships who returned for a second visit, suggesting that friendship is able to serve a buffering role among boys with ASD, albeit to a lesser degree. Along these lines, findings from this project suggest that affective sharing plays a comparable role in the formation and maintenance of reciprocal friendship among boys with and without ASD, but that friendship may be less effective in buffering against negative psychosocial outcomes among boys with ASD than among TD boys. This finding suggests that extant friendship-based interventions aimed at assisting boys with ASD in engaging in TD friendship processes are likely well-founded. In other words, yes, promoting typical friendship processes among boys with ASD is likely to help them form and maintain reciprocal friendships, but this alone may *not* necessarily help them to reap the key psychosocial benefits of friendship at a comparable level to their TD peers. Further research geared toward understanding how specific friendship processes may best promote well-being among individuals with ASD can be used to more specifically hone friendship-based interventions so as to more directly improve well-being among individuals with ASD. Research of this nature will be essential to developing interventions geared toward helping children with ASD develop the tools they need to experience increased well-being and lead lives they find fulfilling and meaningful.

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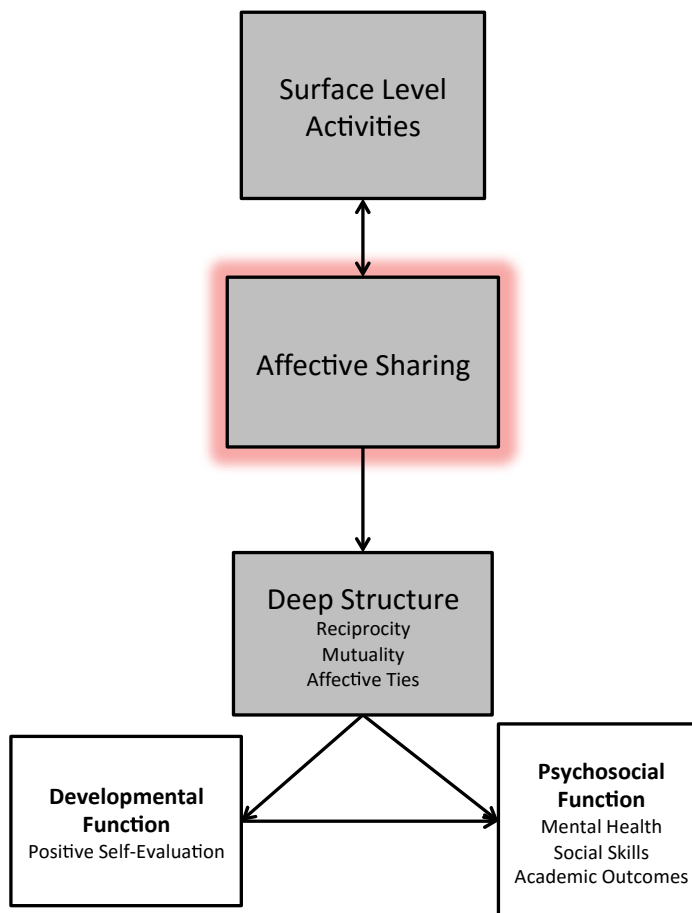
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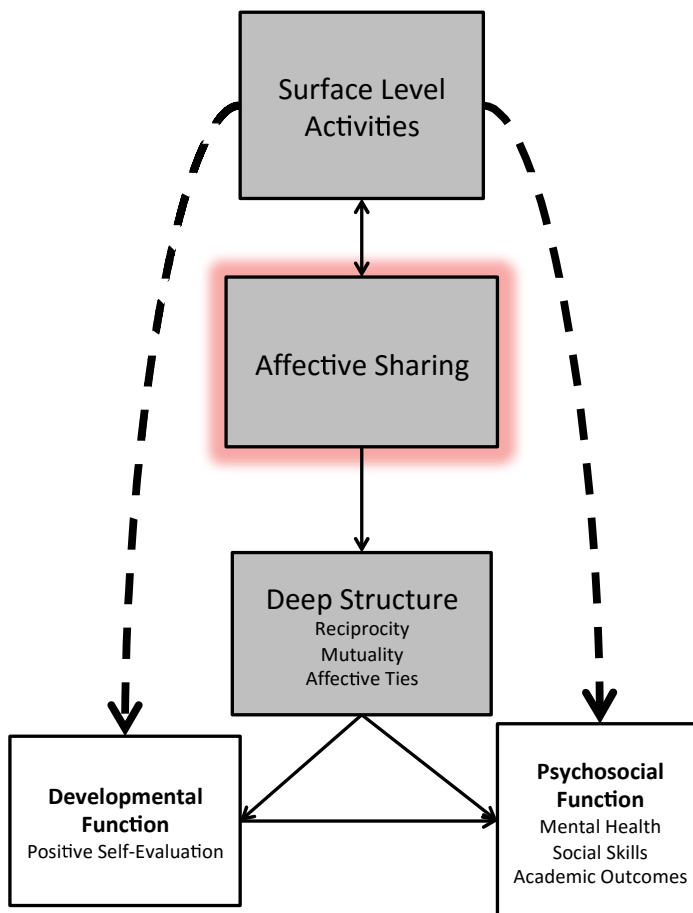
## APPENDIX A

## FIGURES



*Note.* TD boys rely on the affective sharing that takes place during participation in surface level activities to establish the deep structure of friendship. This deep structure serves important developmental and psychosocial functions.

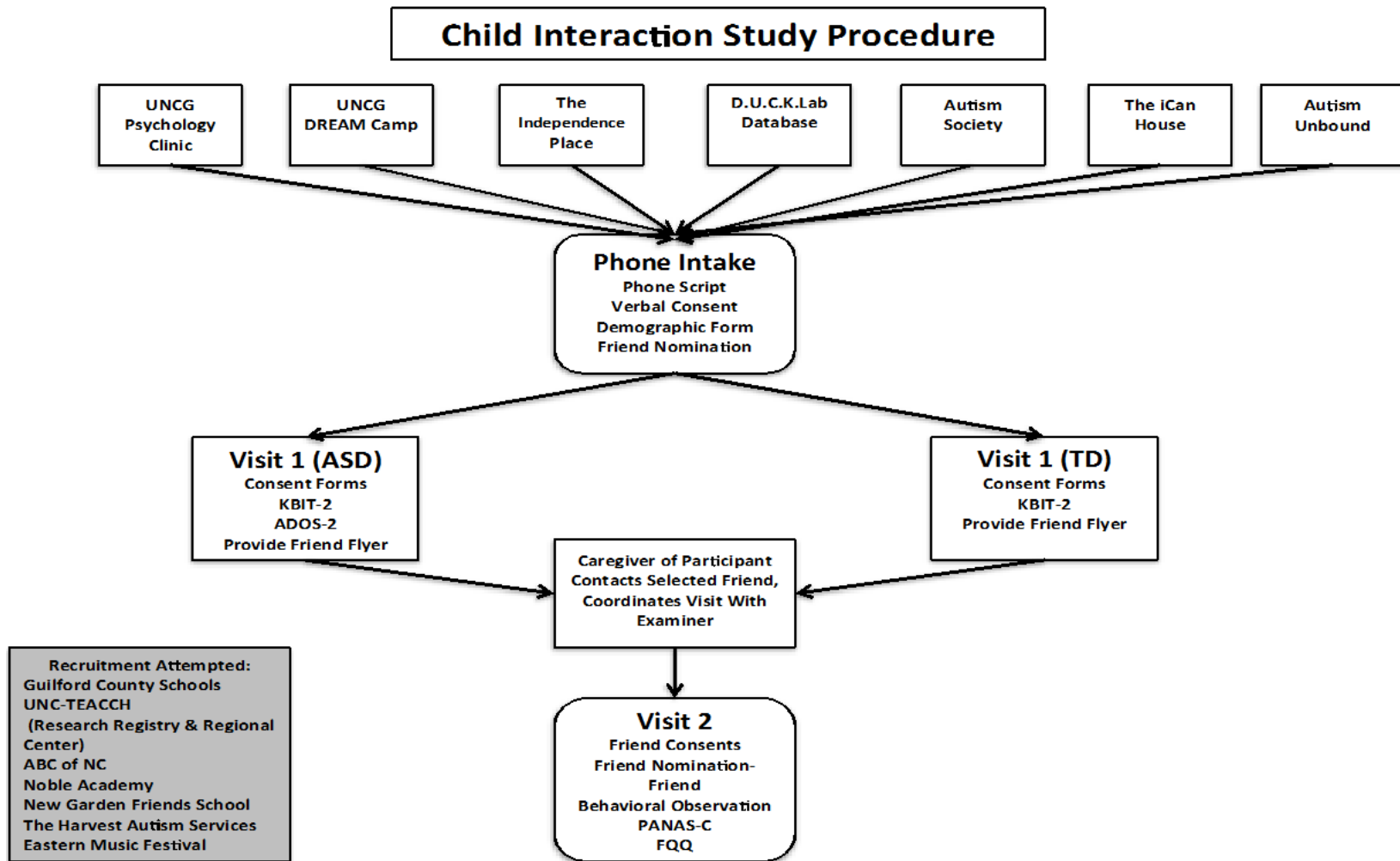
Figure 1. Friendship Among TD Boys Aged 8-12 (Adapted from Hartup & Stevens, 1997).



*Note.* Boys with ASD may have difficulty engaging in affective sharing, leaving them dependent on surface level activities for benefits of friendship, denoted by direct line between Surface Level Activities, Developmental Function, and Psychosocial Function

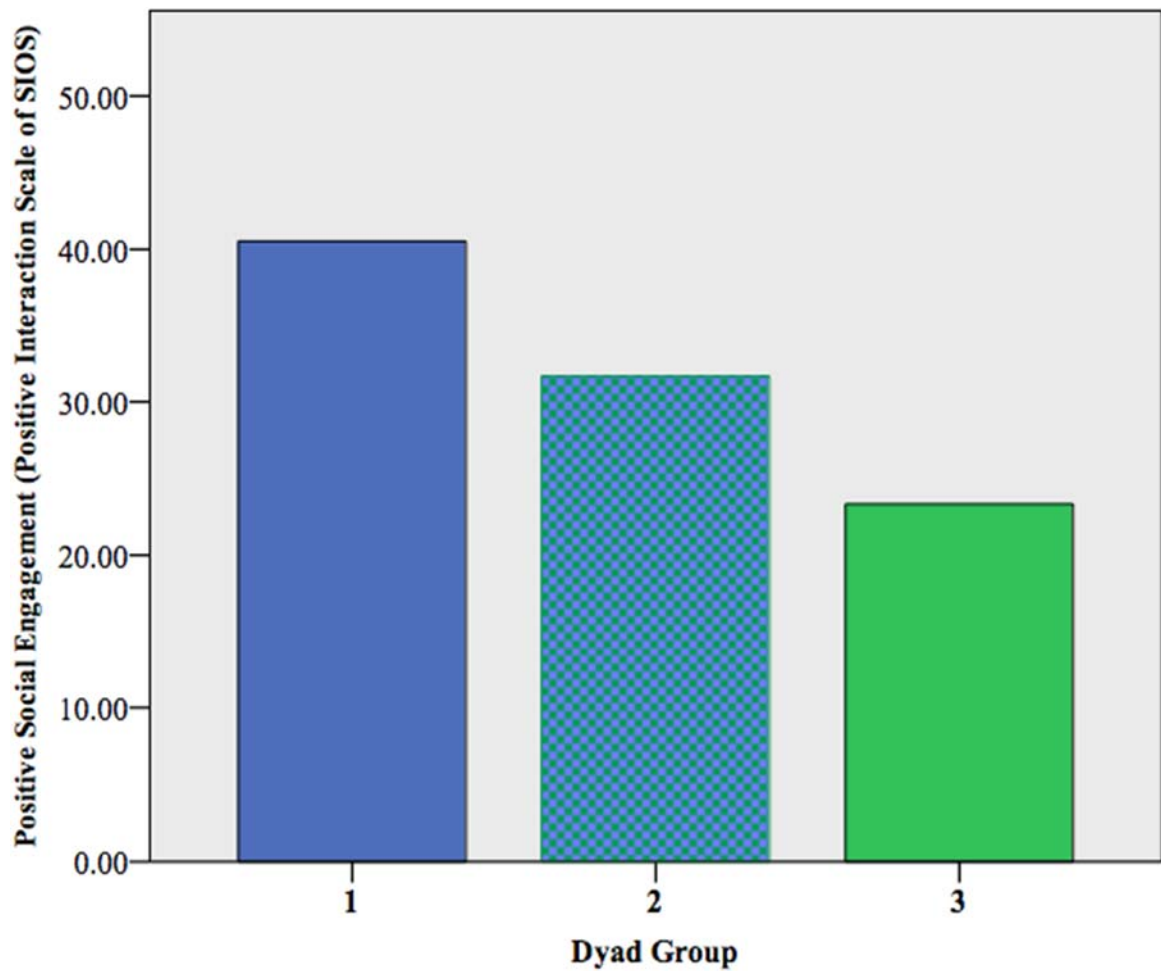
Figure 2. Friendship among Boys Aged 8-12 with ASD.





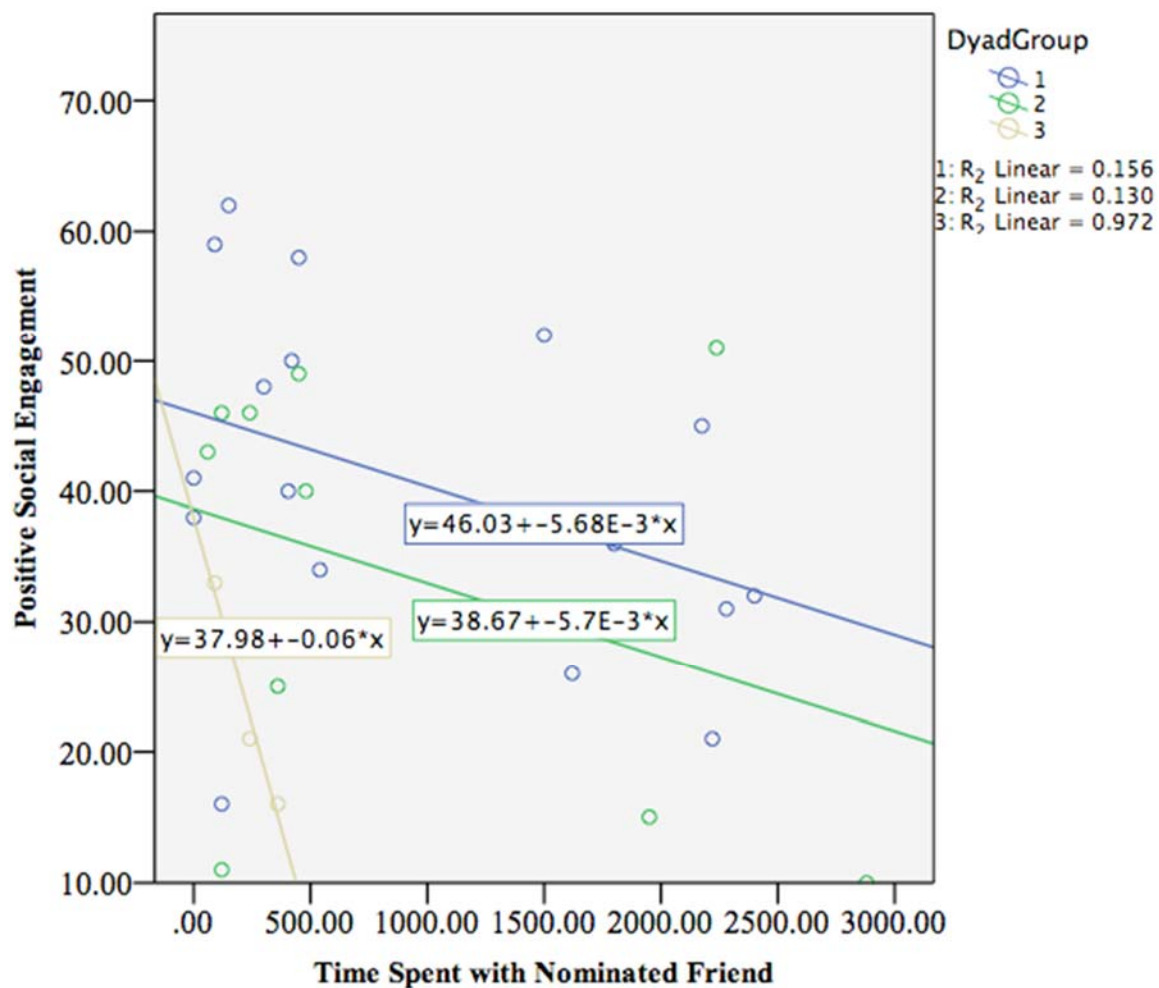
Note. Flow chart depicting steps involved in study participation, from initial recruitment to the second (final) visit.

Figure 3. Study Methods: Flow Chart.



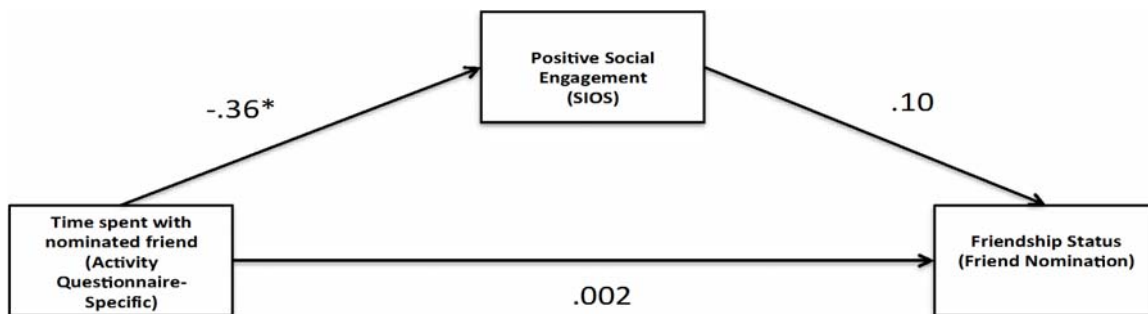
*Note.* Figure depicts rates of positive social engagement by dyad group, with Dyad Group 1 (TD-TD) demonstrated the highest level, Dyad Group 2 (TD-ASD) demonstrating slightly less, and Dyad Group 3 (ASD-ASD) demonstrating the lowest rates of positive social engagement. Differences were only significant between Dyad Group 1 and Dyad Group 3.

Figure 4. Positive Social Engagement by Dyad Group.



*Note.* Figure depicts the relation between time spent with the nominated friend and positive social engagement by Dyad Group. While groups 1 (TD-TD, depicted in blue) and 2 (TD-ASD, depicted in green) appear to show a comparable, negative relation (greater amounts of time with the nominated friend were associated with lower levels of positive social engagement), Dyad Group 3 (ASD-ASD, depicted in yellow) appears to show a more steeply negative relation. However, this relation must be interpreted with caution given the especially low sample size in Dyad Group 3.

Figure 5. Positive Social Engagement and Activity Questionnaire Specific, by Dyad Group.

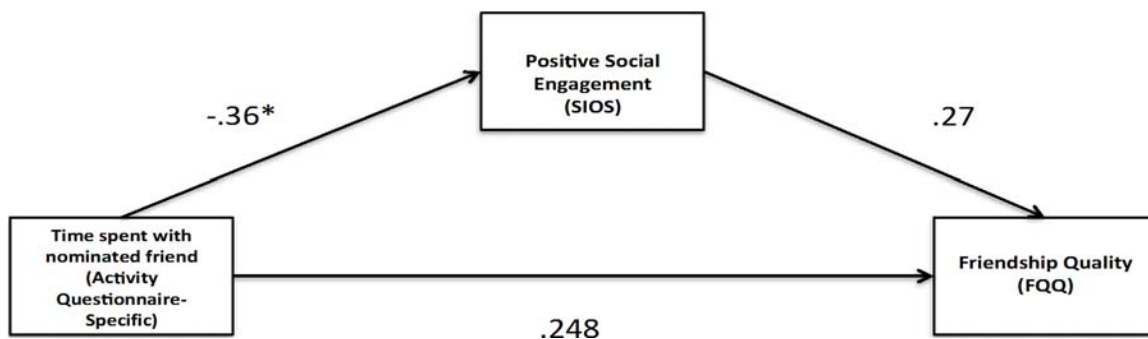


*Note.* Results from hypothesis 2, while significant at the first step, ultimately did not support the hypothesized mediation of the relation between time spent with the nominated friend and friendship status (as assessed by Friend Nomination). Figure depicts findings for all three dyad groups.

\*\*=value is significant at the  $p < .01$  level

\*=value is significant at the  $p < .05$  level

Figure 6. Hypothesis 2: Positive Social Engagement Will Mediate the Relation between Time Spent with Friend and Friendship Status.

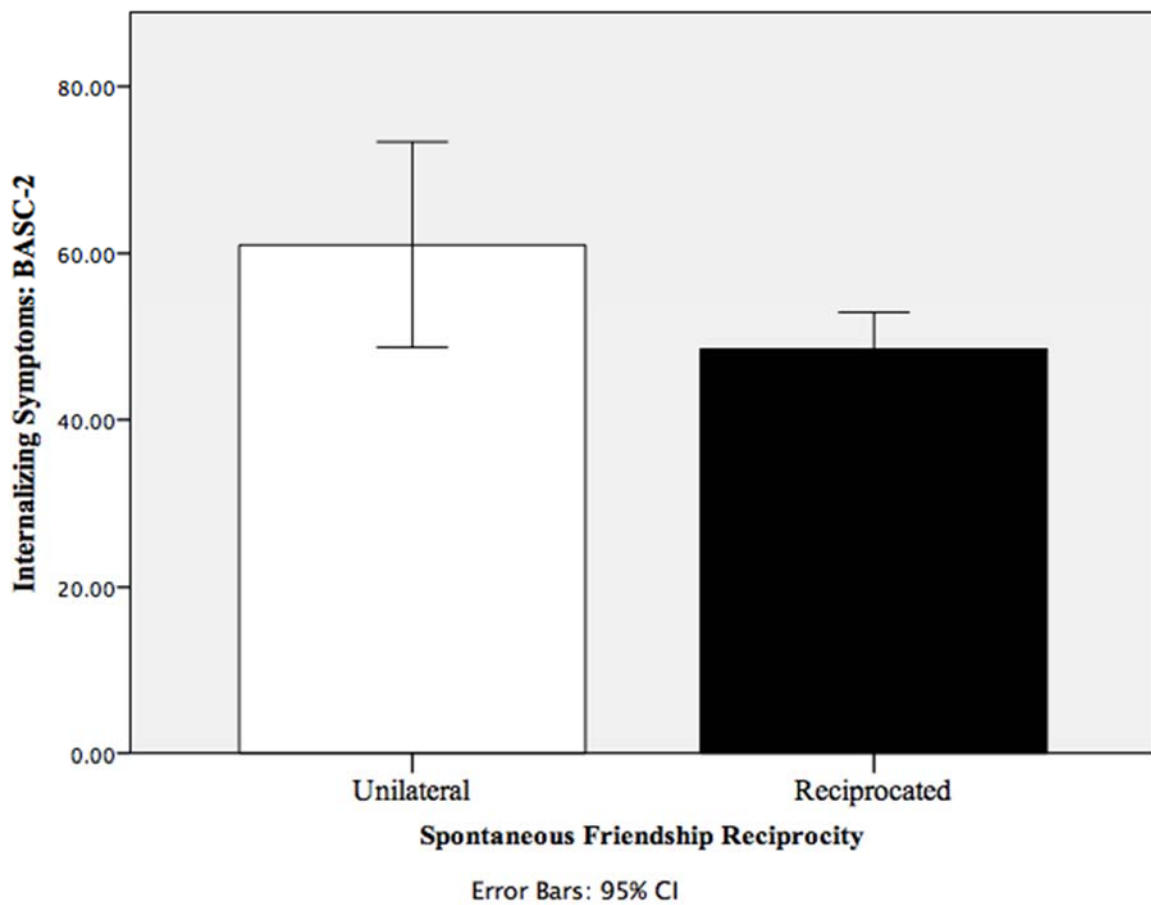


*Note.* Results from hypothesis 2, while significant at the first step, ultimately did not support the hypothesized mediation of the relation between time spent with the nominated friend and friendship quality (as assessed by the Friendship Quality Questionnaire). Figure depicts findings for all three dyad groups.

\*\*=value is significant at the  $p < .01$  level

\*=value is significant at the  $p < .05$  level

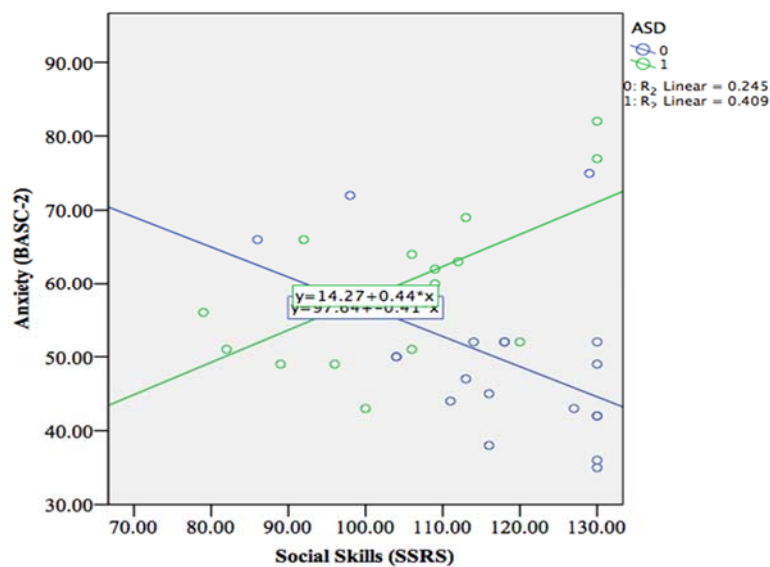
Figure 7. Hypothesis 2: Positive Social Engagement Will Mediate the Relation between Time Spent with Selected Friend and Friendship Quality.



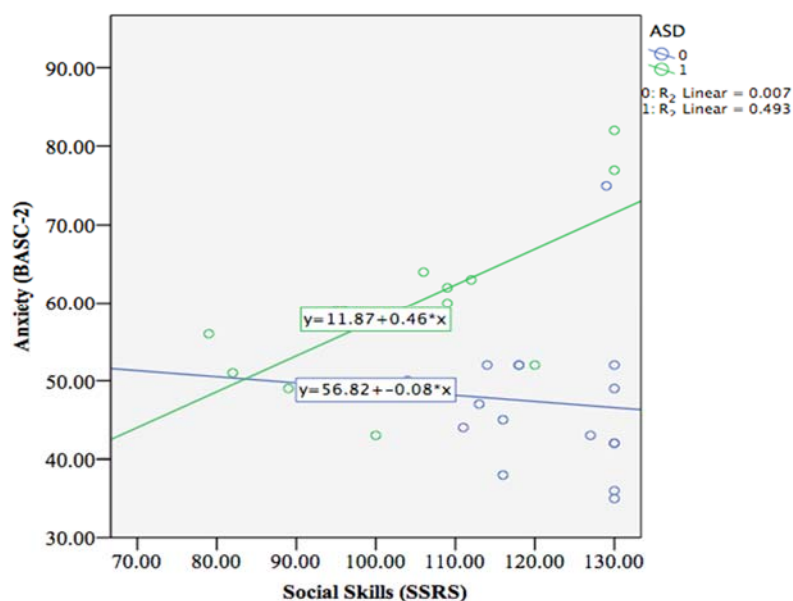
*Note.* Boys in unilateral friendships demonstrated significantly higher levels of internalizing symptoms than boys in reciprocated friendships, regardless of diagnostic status. Notably, the majority of boys in unilateral friendships (4/6) were in the ASD group.

Figure 8. Hypothesis 3: Friendship Reciprocity and Internalizing Symptoms.

### All Participants



### Participants who Completed 2<sup>nd</sup> Visit



*Note.* Figures depict the relation between social skills and anxiety among all boys with ASD vs. TD boys as compared to just those who completed a second visit. Findings suggest an interaction by diagnostic group. Findings including all participants suggest that boys with ASD and stronger social skills demonstrated higher levels of anxiety, whereas TD boys who were reported to have stronger social skills demonstrated lower levels of anxiety. Blue is used to indicate TD participants, whereas green denotes participants with ASD.

Figure 9. Anxiety and Social Skills.



*Note.* Results from hypothesis 4, while significant at the first step, ultimately did not support the hypothesized mediation of the relation between time spent with the nominated friend and internalizing symptoms. Figure depicts findings for all three dyad groups.

\*\*=value is significant at the  $p < .01$  level

\*=value is significant at the  $p < .05$  level

Figure 10. Hypothesis 4: Positive Social Engagement Will Mediate the Relation between Time Spent with the Friend and Internalizing Symptoms.

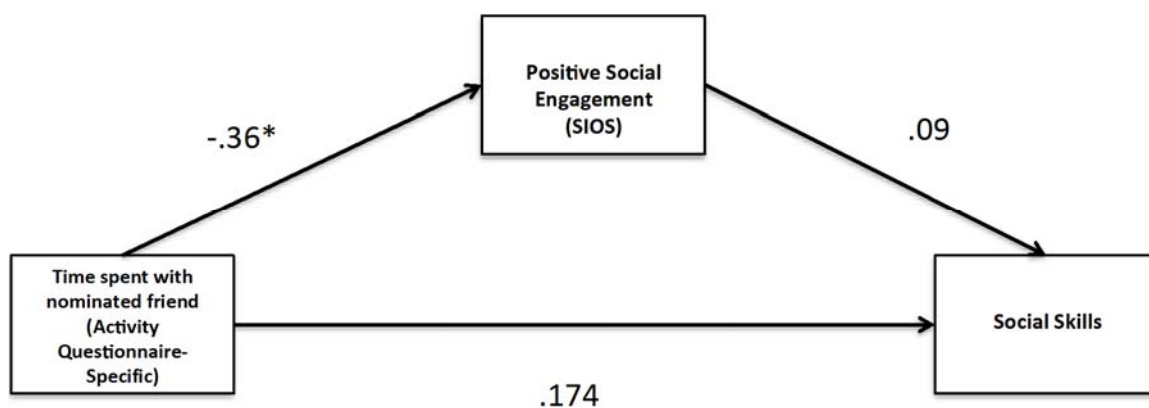


*Note.* Results from hypothesis 4, while significant at the first step, ultimately did not support the hypothesized mediation of the relation between time spent with the nominated friend and adaptive skills. Figure depicts findings for all three dyad groups.

\*\*=value is significant at the  $p < .01$  level

\*=value is significant at the  $p < .05$  level

Figure 11. Hypothesis 4: Positive Social Engagement Will Mediate the Relation between Time Spent with the Friend and Adaptive Functioning.



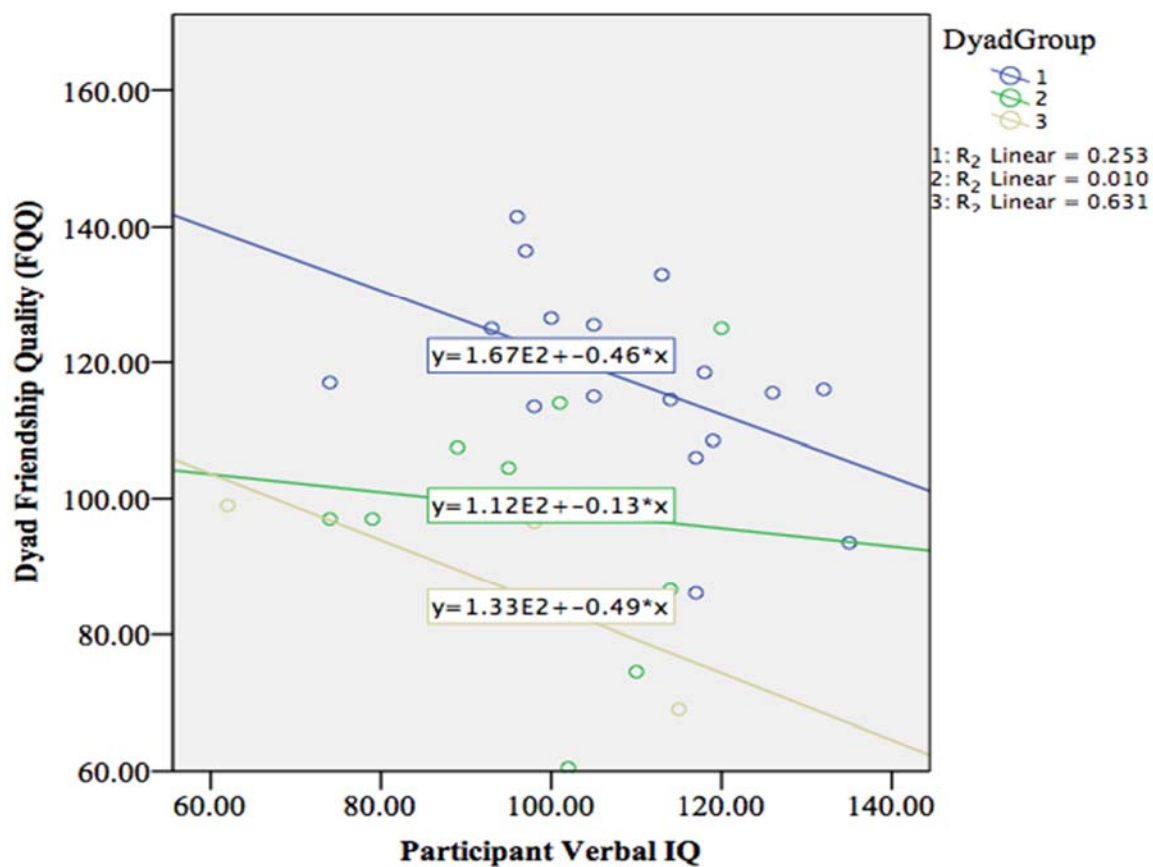
*Note.* Results from hypothesis 2, while significant at the first step, ultimately did not support the hypothesized mediation of the relation between time spent with the nominated friend and social skills. Figure depicts findings for all three dyad groups.

\*\*=value is significant at the  $p < .01$  level

\*=value is significant at the  $p < .05$  level

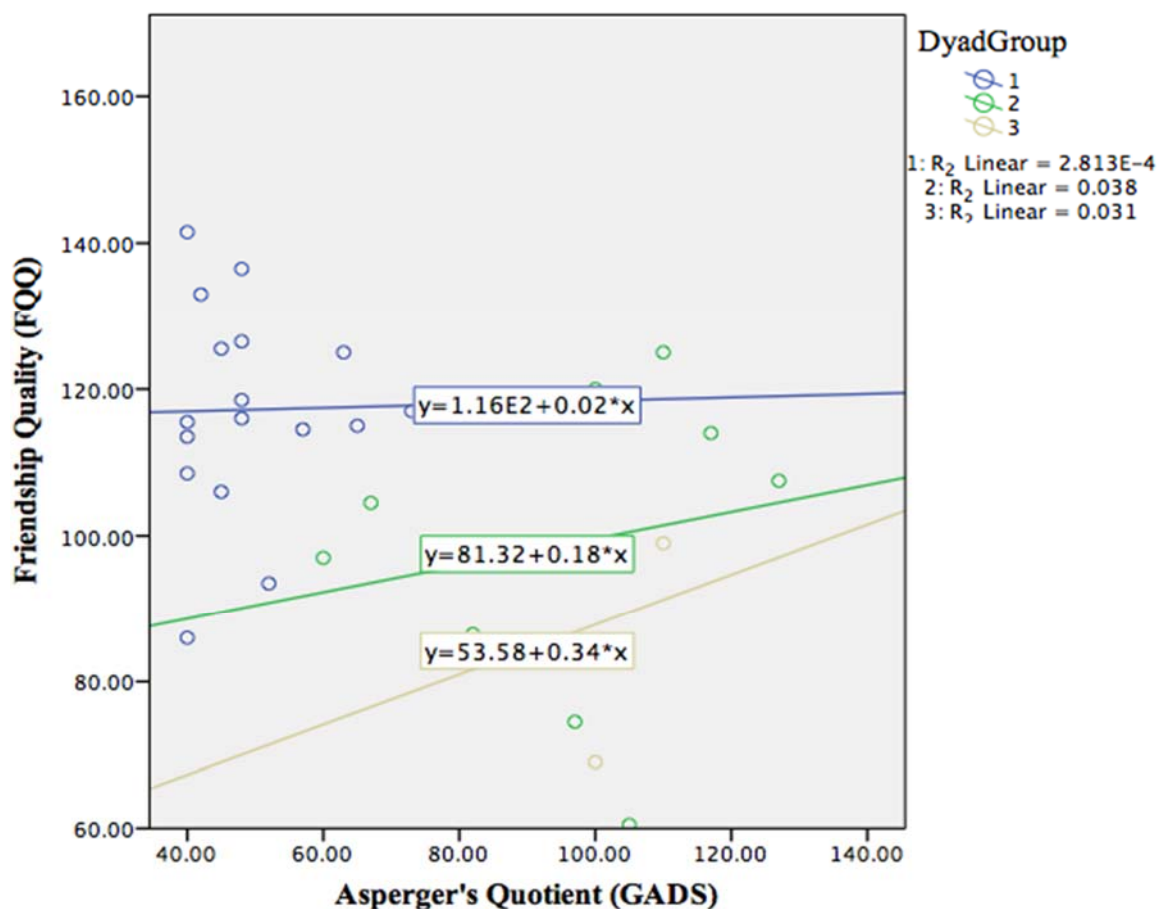
Figure 12. Hypothesis 4: Positive Social Engagement Will Mediate the Relation between Time Spent with the Friend and Social Skills.





*Note.* This figure depicts the relation between friendship quality and verbal IQ for each dyad group (Dyad Group 1: TD-TD, depicted in blue, Dyad Group 2: TD-ASD, depicted in green, and Dyad Group 3: ASD-ASD, depicted in yellow). Findings suggest a comparably negative relation across dyad groups, with higher verbal IQ predicting lower ratings of friendship quality. Data is color-coded by group, with blue indicating participants in Dyad Group 1, green indicating participants in Dyad Group 2, and yellow indicating participants in Dyad Group 3.

Figure 13. Exploratory Analysis 1: Friendship Quality and Verbal IQ.



*Note.* Figure depicts the relation between the Asperger's Quotient and ratings for friendship quality for each dyad group. Dyad groups with a child with ASD (groups 2: ASD-TD and 3: ASD-ASD) both demonstrate a positive relation between Asperger's Quotient and friendship quality ratings, whereas Dyad Group 1 (TD-TD) demonstrates no such relation. Data are color-coded by group, with blue indicating participants in Dyad Group 1, green indicating participants in Dyad Group 2, and yellow indicating participants in Dyad Group 3.

Figure 14. Exploratory Analysis 2: Friendship Quality and ASD Severity.

## APPENDIX B

### TABLES

Table 1

Demographic Information: Participants with and without Second Visits

	ASD		<i>t</i> -test	TD		<i>t</i> -test
	1st Visit Only ( <i>n</i> =5) <i>M</i> ( <i>SD</i> )	2nd Visit ( <i>n</i> =13) <i>M</i> ( <i>SD</i> )		1st Visit Only ( <i>n</i> =4) <i>M</i> ( <i>SD</i> )	2nd Visit ( <i>n</i> =17) <i>M</i> ( <i>SD</i> )	
Age (months)	115.6 (13.85)	123.77 (16.50)	0.98	129.5(17.5)	116.12 (12.45)	-1.80
IQ	75.8 (9.86)	100.54 (17.03)	3.02**	103.5 (19.64)	114.76 (12.52)	1.46
Verbal IQ	68.2 (9.26)	95.85 (17.28)	3.35**	108.5 (18.98)	109.35 (15.55)	0.10
Nonverbal IQ	89.8 (14.92)	104.46 (15.14)	1.85	97.25 (16.88)	115.53 (11.61)	2.61*
Grade	3.6 (1.14)	4.15 (1.35)	0.81	5.00 (1.41)	3.88 (1.17)	-1.66
# Siblings	0.8 (0.84)	1.69 (0.95)	1.84	1.25 (0.50)	1.29 (.77)	0.11

Note. # Siblings=Number of Siblings

<sup>a</sup>=approached significance; .08 > *p* < .05

\*=value is significant at the *p* < .05 level

\*\*=value is significant at the *p* < .01 level

Table 2

## Friend Characteristics by Dyad Group

	Dyad Group 1 ( <i>n</i> =17) <i>M</i> ( <i>SD</i> )	Dyad Group 2 ( <i>n</i> =10) <i>M</i> ( <i>SD</i> )	Dyad Group 3 ( <i>n</i> =3) <i>M</i> ( <i>SD</i> )	Dyad 2 vs Dyad 3 <i>t</i> <sup>***</sup>	Overall <i>F</i>
Age	9.35 (1.06)	10.10 (1.37)	9.33 (1.53)	.93	1.28
Grade	3.94 (1.14)	4.50 (1.35)	3.33 (1.53)	1.23	1.21
# Siblings	1.69 (1.14)	1.50 (0.84)	0.00 (0)	-.63	2.32

Note. \*\*\*=no *t* scores were significant

<sup>a</sup>= value approached significance,  $.05 < p < .075$

\*=value is significant at the  $p < .05$  level

\*\*=value is significant at the  $p < .01$  level

Table 3

## Friend Characteristics: TD vs. ASD

	ASD ( <i>n</i> =13) <i>M</i> ( <i>SD</i> )	TD ( <i>n</i> =17) <i>M</i> ( <i>SD</i> )	<i>t</i> -test
Age	9.92 (1.38)	9.35 (1.06)	-1.28
Grade	4.23 (1.42)	3.94 (1.14)	-.62
# Siblings	1.13 (0.99)	1.69 (1.14)	1.19

Note. <sup>a</sup>= value approached significance,  $.05 < p < .075$

\*=value is significant at the  $p < .05$  level

\*\*=value is significant at the  $p < .01$  level

Table 4

Multivariate Analysis of All Variables in *t*-tests (ASD vs. TD)

Dependent Variable	<i>df</i>	<i>F</i>
Internalizing (BASC-2)	1	17.76**
Depression (BASC-2)	1	14.90**
Anxiety (BASC-2)	1	9.72**
Somatization (BASC-2)	1	5.42*
Adaptive (BASC-2)	1	41.12**
Verbal IQ (KBIT-2)	1	5.04*
Nonverbal IQ (KBIT-2)	1	4.17 <sup>a</sup>
Full Scale IQ (KBIT-2)	1	6.31*
Friendship Nomination Spontaneously Reciprocated	1	0.83
Friendship Nomination Reciprocated Following Prompt	1	0.13
Asperger's Quotient (GADS)	1	69.13**
Social Skills (SSRS)	1	16.17**
Cooperation (SSRS)	1	23.29**
Assertiveness (SSRS)	1	23.22**
Responsibility (SSRS)	1	20.30**
Self-Confidence (SSRS)	1	4.70*
Activity Questionnaire-Specific (Minutes)	1	0.25
Activity Questionnaire-General (Minutes)	1	1.25
Target Positive Affect (PANAS-C)	1	0.99
Target Negative Affect (PANAS-C)	1	0.05
Friend Positive Affect (PANAS_C)	1	0.05
Friend Negative Affect (PANAS-C)	1	0.14
Discrepancy in Positive Affective (Target vs. Friend, PANAS-C)	1	1.20
Dyad Total Friendship Quality (FQQ)	1	9.72**
Dyad Companionship (FQQ)	1	12.60**
Dyad Validation and Caring (FQQ)	1	4.35*
Dyad Conflict Resolution (FQQ)	1	2.20
Dyad Conflict and Betrayal (FQQ)	1	3.545 <sup>a</sup>
Dyad Help and Guidance (FQQ)	1	6.25*
Dyad Intimate Exchange (FQQ)	1	3.59 <sup>a</sup>
Dyad Number of Friends (FQQ)	1	1.26
Target Total Friendship Quality (FQQ)	1	6.93*
Target Companionship (FQQ)	1	3.85 <sup>a</sup>
Target Validation and Caring (FQQ)	1	4.47*
Target Conflict Resolution (FQQ)	1	3.11
Target Conflict and Betrayal (FQQ)	1	5.05*
Target Help and Guidance (FQQ)	1	2.53

Table 4

(Cont.)

Dependent Variable	<i>df</i>	<i>F</i>
Target Intimate Exchange (FQQ)	1	1.27
Target Number of Friends (FQQ)	1	0.09
Friend Total Friendship Quality (FQQ)	1	5.58*
Friend Companionship (FQQ)	1	11.11**
Friend Validation and Caring (FQQ)	1	1.65
Friend Conflict Resolution (FQQ)	1	0.05
Friend Conflict and Betrayal (FQQ)	1	1.01
Friend Help and Guidance (FQQ)	1	4.98*
Friend Intimate Exchange (FQQ)	1	3.65 <sup>a</sup>
Friend Number of Friends (FQQ)	1	1.26
Dyad Positive Social Engagement (SIOS)	1	2.10
Target Positive Social Engagement (SIOS)	1	3.78 <sup>a</sup>
Friend Positive Social Engagement (SIOS)	1	.71
Dyad Total Responsiveness (SIOS)	1	0.00
Target Total Responsiveness (SIOS)	1	0.03
Friend Total Responsiveness (SIOS)	1	0.01
Dyad Time Spent in Synchronous Interaction (SIOS)	1	1.46

Note. <sup>a</sup>=approached significance; .08 > p < .05

\*=value is significant at p < .05 value

\*\*=value is significant at p < .01 value

Table 5

Multivariate Analysis of All Variables in *t*-tests (Dyad Group)

Dependent Variable	<i>df</i>	<i>F</i>
Internalizing (BASC-2)	1	8.64**
Depression (BASC-2)	1	7.26**
Anxiety (BASC-2)	1	4.68*
Somatization (BASC-2)	1	2.71
Adaptive (BASC-2)	1	21.58**
Verbal IQ (KBIT-2)	1	2.54
Nonverbal IQ (KBIT-2)	1	2.14
Full Scale IQ (KBIT-2)	1	3.24a
Friendship Nomination Spontaneously Reciprocated	1	3.20a
Friendship Nomination Reciprocated Following Prompt	1	0.50
Asperger's Quotient (GADS)	1	34.25**
Social Skills (SSRS)	1	9.19**
Cooperation (SSRS)	1	12.14**
Assertiveness (SSRS)	1	16.01**
Responsibility (SSRS)	1	14.16**
Self-Confidence (SSRS)	1	2.37
Activity Questionnaire-Specific (Minutes)	1	0.84
Activity Questionnaire-General (Minutes)	1	0.61
Target Positive Affect (PANAS-C)	1	0.77
Target Negative Affect (PANAS-C)	1	0.45
Friend Positive Affect (PANAS_C)	1	0.04
Friend Negative Affect (PANAS-C)	1	0.51
Discrepancy in Positive Affective (Target vs. Friend, PANAS-C)	1	0.70
Dyad Total Friendship Quality (FQQ)	1	6.16**
Dyad Companionship (FQQ)	1	8.72**
Dyad Validation and Caring (FQQ)	1	4.90*
Dyad Conflict Resolution (FQQ)	1	1.15
Dyad Conflict and Betrayal (FQQ)	1	2.82
Dyad Help and Guidance (FQQ)	1	3.65*
Dyad Intimate Exchange (FQQ)	1	1.80
Dyad Number of Friends (FQQ)	1	1.07
Target Total Friendship Quality (FQQ)	1	3.42*
Target Companionship (FQQ)	1	1.91
Target Validation and Caring (FQQ)	1	2.21
Target Conflict Resolution (FQQ)	1	1.81
Target Conflict and Betrayal (FQQ)	1	4.13*
Target Help and Guidance (FQQ)	1	1.23

Table 5

(Cont.)

Dependent Variable	<i>df</i>	<i>F</i>
Target Intimate Exchange (FQQ)	1	1.20
Target Number of Friends (FQQ)	1	0.08
Friend Total Friendship Quality (FQQ)	1	4.59*
Friend Companionship (FQQ)	1	9.93**
Friend Validation and Caring (FQQ)	1	5.76**
Friend Conflict Resolution (FQQ)	1	0.87
Friend Conflict and Betrayal (FQQ)	1	0.76
Friend Help and Guidance (FQQ)	1	3.33 <sup>a</sup>
Friend Intimate Exchange (FQQ)	1	1.80
Friend Number of Friends (FQQ)	1	1.25
Dyad Positive Social Engagement (SIOS)	1	2.06
Target Positive Social Engagement (SIOS)	1	2.61
Friend Positive Social Engagement (SIOS)	1	1.47
Dyad Total Responsiveness (SIOS)	1	1.24
Target Total Responsiveness (SIOS)	1	0.55
Friend Total Responsiveness (SIOS)	1	2.23
Dyad Time Spent in Synchronous Interaction (SIOS)	1	1.48

Note. <sup>a</sup>=approached significance; .08 > p < .05

\*=value is significant at p < .05 value

\*\*=value is significant at p < .01 value



Table 6

## Participant Characteristics: TD vs. ASD

	ASD			TD		
	1st Visit Only ( <i>n</i> =5)	2nd Visit ( <i>n</i> =13)	<i>t</i> -test	1st Visit Only ( <i>n</i> =4)	2nd Visit ( <i>n</i> =17)	<i>t</i> -test
	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )		<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	
Internalizing (BASC-2)	59.60 (5.22)	59.46 (10.67)	0.04	52.75 (8.06)	44.41 (7.58)	1.95 <sup>a</sup>
Depression (BASC-2)	51.80 (4.38)	60.38 (14.12)	-1.96 <sup>a</sup>	51.50 (9.15)	45 (5.48)	1.89 <sup>a</sup>
Anxiety (BASC-2)	58.20 (8.92)	59.77 (10.70)	-0.29	62.75 (7.89)	47.29 (9.12)	3.13 <sup>**</sup>
Adaptive (BASC-2)	37.00 (7.10)	35.31 (7.88)	0.42	43.25 (11.12)	54.64 (8.31)	-2.32 <sup>*</sup>
Asperger's Quotient (GADS)	80.40 (17.17)	96.23 (19.19)	-1.61	57.50 (24.58)	49.06 (9.97)	0.67
Social Skills (SSRS)	99.80 (9.34)	104.38 (16.38)	-0.58	94 (6.93)	120.59 (9.49)	-4.59 <sup>**</sup>
Time Spent with Selected Friend	N/A	737.54 (952.27)	N/A	N/A	968.82 (926.85)	N/A
Time Spent with Other Children	N/A	2487.69 (2065.95)	N/A	N/A	3408.18 (1535.36)	N/A

Note. <sup>a</sup>= value approached significance,  $.05 < p < .075$

<sup>\*</sup>= value is significant at  $p < .05$  level

<sup>\*\*</sup>= value is significant at  $p < .01$  level

Table 7

## Participant Characteristics by Dyad Group

	Dyad 1 ( <i>n</i> =17) <i>M</i> ( <i>SD</i> )	Dyad 2 ( <i>n</i> =10) <i>M</i> ( <i>SD</i> )	Dyad 3 ( <i>n</i> =3) <i>M</i> ( <i>SD</i> )	Dyad 2 vs. Dyad 3 <i>t</i> <sup>***</sup>	Overall <i>F</i>
Internalizing (BASC-2)	44.41 (7.58)	59.20 (11.14)	60.33 (11.06)	-.16	9.89 <sup>**</sup>
Depression (BASC-2)	45.00 (5.48)	60.00 (13.72)	61.67 (18.58)	-.17	8.24 <sup>**</sup>
Anxiety (BASC-2)	47.29 (9.12)	60.30 (11.91)	58.00 (6.56)	.31	5.81 <sup>**</sup>
Adaptive (BASC-2)	54.65 (8.31)	36.90 (8.12)	30.00 (4.58)	1.38	22.24 <sup>**</sup>
Asperger's Quotient (GADS)	49.06 (9.97)	94.80 (21.56)	101.00 (8.54)	-.48	37.58 <sup>**</sup>
Social Skills (SSRS)	120.59 (9.49)	107.40 (16.79)	94.33 (12.01)	1.24	7.37 <sup>**</sup>
Time Spent with Selected Friend	968.82 (926.85)	889.80 (1045.66)	230.00 (135.28)	1.06	0.80
Time Spent with Other Children	3408.18 (1535.36)	2394.00 (1919.73)	2800.00 (2972.32)	-.29	1.01

Note. \*\*\*=no *t* values were significant

<sup>a</sup>= value approached significance,  $.05 < p < .075$

<sup>\*\*</sup>=value is significant at the  $p < .01$  level

<sup>\*</sup>=value is significant at the  $p < .05$

Table 8

Means and Standard Deviations of Friendship Variables: ASD vs. TD

	TD Group ( <i>n</i> =17) <i>M</i> ( <i>SD</i> )	ASD Group ( <i>n</i> =13) <i>M</i> ( <i>SD</i> )	<i>t</i> -test
PANAS-C Positive Subscale	19.35 (5.01)	21.08 (3.15)	-1.09
Dyad FQQ Total	117.18 (14.14)	96.23 (19.36)	3.43**
Dyad SIOS Total	40.53 (13.30)	31.23 (15.44)	1.77
Dyad Responsiveness Total	41.65 (30.58)	38.23 (13.93)	0.27
Dyad Percent Synchrony	0.59 (.16)	0.47 (.29)	1.39

Note. <sup>a</sup>= value approached significance,  $.05 < p < .075$

\*=value is significant at the  $p < .05$  level

\*\*=value is significant at the  $p < .01$  level

Table 9

## Means and Standard Deviations of Friendship Variables: Dyad Group

	Dyad Group 1 ( <i>n</i> =17) <i>M</i> ( <i>SD</i> )	Dyad Group 2 ( <i>n</i> =10) <i>M</i> ( <i>SD</i> )	Dyad Group 3 ( <i>n</i> =3) <i>M</i> ( <i>SD</i> )	<i>F</i>
PANAS-C Positive Subscale	19.35 (5.01)	21.60 (3.37)	19.33 (1.53)	0.89
Dyad FQQ Total	117.18 (14.14)	98.65 (20.25)	88.17 (16.65)	6.32**
Dyad SIOS Total	40.53 (13.30)	33.60 (16.55)	23.33 (8.74)	2.18
Dyad Responsiveness Total	41.65 (30.58)	45.20 (39.73)	15.00 (21.79)	0.98
Time Spent in Synchronous Interaction	0.59 (.16)	0.50 (.31)	0.36 (.17)	1.59

*Note.* <sup>a</sup>= value approached significance,  $.05 < p < .075$

\*=value is significant at the  $p < .05$  level

\*\*=value is significant at the  $p < .01$  level

Table 10

## Hypothesis 2 &amp; 4: Joint Significance Test Step 1

Model	Unstandardized Coefficients		Standardized Coefficients		
	$\beta$	Std. Error	$\beta$	$t$	Sig.
(Constant)	46.13	4.20		10.97	.00
Dyad Group 2	-7.39	5.34	-0.24	-1.38	.18
Dyad Group 3	-21.46	8.63	-0.44	-2.49	.02
Time Spent with Selected Friend	-0.01	0.00	-0.36	-2.1	.05

Table 11

## Hypothesis 2: Joint Significance Test Step 2

Variables in the Equation		$\beta$	S.E.	Wald	df	Sig.	Exp ( $\beta$ )
Step 1a	Dyad Group 2	-0.00	1.4	0.00	1	1.00	1.00
	Dyad Group 3	-0.47	1.74	0.07	1	0.79	0.63
	Time Spent with Selected Friend	0.00	0.00	2.37	1	0.12	1.00
	Positive Interaction Scale (SIOS)	0.10	0.06	3.45	1	0.06	1.11
	Constant	-3.18	2.4	1.75	1	0.19	0.04

Note. S.E.= Standard Error of  $\beta$

Wald=Result of Wald chi-square test

df=Degrees of freedom for Wald chi-square test

g=Significance

Exp (B)= Exponentiation of the  $\beta$  Coefficient

Table 12

Correlation Matrix among Participants with ASD Who Completed a Second Visit

ASD	1	2	3	4	5	6	7	8	9	10
1 Internalizing	1.00									
2 Depression (BASC-2)	.84**									
3 Anxiety (BASC-2)	.56*	.38								
4 Adaptive (BASC-2)	-.26	-.36	.39							
5 Social Skills (SSRS)	.25	.34	.70**	.48						
6 Asperger's Quotient (GADS)	.42	.64*	-.18	-.75**	-.04					
7 Dyad Total Friendship Quality (FQQ)	-.38	-.18	-.31	-.16	.00	.15				
8 Target Number of Friends	.05 <sup>n</sup>	.10 <sup>n</sup>	-.12 <sup>n</sup>	.00 <sup>n</sup>	-.21	.10	-.04			
9 Positive Social Engagement (SIOS)	.17	.29	.12	-.19	.12	.00	.43	-.10		
10 Responsiveness (SIOS)	.19	.26	.28	.06	.40	-.09	.44	-.19	.91**	
11 Time Spent in Synchronous Interaction (SIOS)	.26	.34	.17	-.17	.30	.06	.40	-.09	.92**	.96**

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

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

*n*: *n*=12 for Number of Friends (one child declined to report)

Table 13

## Correlation Matrix Among TD Participants Who Completed a Second Visit

ASD	1	2	3	4	5	6	7	8	9	10
1 Internalizing	1.00									
2 Depression (BASC-2)	.85**									
3 Anxiety (BASC-2)	.71**	.34								
4 Adaptive (BASC-2)	-.35	-.53*	-.04							
5 Social Skills (SSRS)	-.18	-.20	-.08	.52*						
6 Asperger's Quotient (GADS)	-.14	-.03	-.15	-.43	-.01					
7 Dyad Total Friendship Quality (FQQ)	.02	-.15	.14	-.22	-.53*	.02				
8 Target Number of Friends	-.12	-.27	-.12	.54*	.45*	-.21	-.12			
9 Positive Social Engagement (SIOS)	-.16	-.26	.03	.18	.02	-.05	-.01	.40		
10 Responsiveness (SIOS)	-.14	-.28	.03	.13	-.25	-.13	.17	.17	.88**	
11 Time Spent in Synchronous Interaction (SIOS)	-.25	-.25	-.11	.29	.18	-.07	-.01	.41	.90**	.76**

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

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

## APPENDIX C

## SUMMARY OF PARTICIPANT MEASURES

Completed by	Measure
Caregiver	<p style="text-align: center;"><i>Phone</i></p> <p>Demographic Questionnaire</p> <p style="text-align: center;"><i>1st Study Visit</i></p> <p><b>ASD Severity:</b> Gilliam Asperger's Disorder Scale (GADS)  <b>Surface Level Activities:</b> Activity Questionnaire (to bring back)  <b>Social Skills:</b> Social Skills Rating System (SSRS)  <b>Psychosocial Functioning:</b> Behavior Assessment System for Children, 2<sup>nd</sup> Edition (BASC-2)</p> <p style="text-align: center;"><i>2nd Study Visit</i></p> <p>Activity Questionnaire (if not yet completed)</p>
Participant	<p style="text-align: center;"><i>1st Study Visit</i></p> <p><b>Cognitive Functioning:</b> Kaufman Brief Intelligence Test-2 (KBIT-2) Autism  <b>Diagnostic Confirmation:</b> Diagnostic Observation Scale*  <b>Friendship Status:</b> Friend Nomination</p> <p style="text-align: center;"><i>2nd Study Visit</i></p> <p><b>Affective Sharing:</b> Interaction Task  <b>Internal Affect:</b> Positive and Negative Affect Scale-Child Version  <b>Friendship Quality:</b> Friendship Quality Questionnaire (FQQ)</p>
Nominated Friend	<p style="text-align: center;"><i>1st (Only) Study Visit</i></p> <p><b>Friendship Status:</b> Friend Nomination (if not completed over phone)  <b>Affective Sharing:</b> Interaction Task  <b>Friendship Quality:</b> Friendship Quality Questionnaire (FQQ)  <b>Internal Affect:</b> Positive and Negative Affect Scale-Child Version</p>



**APPENDIX D**  
**DEMOGRAPHICS QUESTIONNAIRE**

1. Who lives in the participant's home?
  
  
  
  
  
  
  
  
  
  
2. How many siblings does the participant have? Please list number, age, and gender below:
  
  
  
  
  
  
  
  
  
  
3. Please list the participant's primary caregivers, and how they are related to the participant below.
  
  
  
  
  
  
  
  
  
  
4. What is the marital status of the participant's caregiver (married, divorced, single, unmarried but in a relationship, etc.)? Please list below:
  
  
  
  
  
  
  
  
  
  
5. What do the participant's caregivers do for employment? Please list below.
  
  
  
  
  
  
  
  
  
  
6. What is the estimated annual income of the participant's family?
  
  
  
  
  
  
  
  
  
  
7. What is the highest level of education of the participant's caregivers?
  
  
  
  
  
  
  
  
  
  
8. What is the participant's ethnicity?

9. What is the participant's current grade level?
  
10. Has the participant ever repeated a grade? If so, which grade?
  
11. Is the participant in a special education classroom? (If part-time, please list the amount of time in a special education classroom below)
  
12. Does the participant receive any special education services at school? Please list in detail below.
  
13. Please list the gender, age, and grade level of the friend selected to participate in this study.

## APPENDIX E

### STUDY SCRIPT

Initial Phone Contact: “Hello, my name is Jenna Mendelson and I am calling from the UNCG Psychology Department [because you had expressed an interest in participating in research]/[In response to your message]/[Because you provided your information to be contacted]. If it is ok, I would like to provide you with some more information about a study I am conducting on how children interact with each other, so you can decide if you might be interested in participating.”

If no: “Thank you for your time. Would it be ok to keep you on our list to contact for future research projects?”

If yes: “Great, thank you. This study is geared toward examining the processes of friendship among children with autism spectrum disorders, as compared to typically developing children. The study involves two visits, one with just you and your child and the other with you, your child, and another boy aged 8-12 selected by your child. If possible, I would come to your house [Suggest the Independence Place or the child’s private school if recruited through either of the above]. You could also choose to come to the UNCG Psychology Clinic. I will just need two separate rooms, one where you could complete questionnaires, and one with minimal distractions where the two children could interact. During the second visit, your child will interact with the friend he selected with an examiner in the room to supervise the interaction.”

Review consent form, detailing any possible risks for participating. Once parent has provided verbal consent over the phone, ask to please speak with their child.

To participant: “Hi, \_\_\_\_\_. My name is Jenna Mendelson and I am calling from the UNCG Psychology Clinic. I am talking to you because your parent thinks you might be a good fit for a study I am doing on how kids interact.”

Review consent forms, detailing any possible risks for participating. Indicate that participation is complete optional and child can stop at any time, with no repercussions.

“Does this sound ok?”

If no: “Thank you for letting me know. That is alright-make I please speak with your caregiver?”

If yes: “Thank you. If it is ok, I would like to learn a little more about you. What is your favorite food? What is your favorite color? What are your favorite things to do? Do you have kids you like to play with? Who are your five best friends? “

If child is unable to list any friends: “Is there anyone that you can think of that might be a friend?”

If no: “Thank you for your help! May I please speak with your caregiver?” (This child is not eligible).

If yes: Record all listed best friends, in order. Ask the child, “Do you know if any of these friends are boys aged 8-12 who might be able to do this study with you?” Ask to please speak with caregiver, and ask if they are able to arrange for any of the other children on the list to participate in the study. Schedule a lab visit to complete the ADOS, and ask that they please contact the friend in the meantime.

**At the ADOS/KBIT-2 visit:**

At the lab visit to complete the ADOS, provide authorization forms so that you have permission to contact the friend. Also provide the caregiver with consent forms to give to the friend’s parent, as well as the study flier. Ask that the parent of the participant have the parent of the friend call the PI within the next week if they are interested in participating. Additionally, tell the participant: “I will see you again in one-two weeks for another visit, during which you will play a game with \_\_\_\_\_” and answer some questions.

**Phone Conversation with Nominated Friend’s Caregiver:**

“Thank you for calling! Your child has been nominated to participate in the Child Interaction Study. [Go through consent forms, detailing all risks and benefits of the study. Let them know that the PI or the research assistant will be present to supervise both children at all times, and that the child will receive a \$10 gift card for participating].

“What I will need to do next is speak to your child to describe the study and ask him some questions about who he considers his friends. May I speak to him on the phone?”

*To child:*

“Hello, my name is Jenna Mendelson and I am calling from the UNCG Psychology Clinic. I am conducting a study on how kids interact, and I was wondering if you might be willing to participate. The study would involve one visit during which you would play a marble game with [name of participant], then answer some questions. [Review child assent, detailing all risks to the study and emphasizing that participation is completely voluntary.] Does this sound like something you would be interested in doing?”

If no: “Thank you for your time!”

If yes: “If it is ok, I would like to learn a little more about you. What is your favorite food? What is your favorite color? What are your favorite things to do? Do you have kids you like to play with? Who are your five best friends? “Record child’s responses, noting if the participant is on the list. If participant is not on the list, ask “Is [participant] a friend of yours? “Thank you! May I speak with your caregiver?”

Speak with the caregiver and establish a time and date for the visit already determined with the participant, or let them know the participant will do so shortly.

**At the Study Visit:**

“I am so glad you both could make it today. This is a game called the Super Marbleworks Raceway. I would like for you to please have a seat at this table and play with this toy however you like, while staying seated, for the next 12 minutes. Please do not touch this camera during the 12 minutes. I (or the research assistant, if present) will be here with you to make sure everything is ok, but please pretend like we are not here. “

Once they have finished playing: “Thank you! Now I have some questions for you both to answer. I would like you [Friend] to come with me.” Lead to room with caregiver and have him complete the PANAS-C.

Complete the FQQ with the participant. Retrieve the friend and complete the FQQ with the friend.

Once the interaction and all questionnaires have been completed, bring the friend out to the participant and the caregiver.

“Thank you so much for participating in my study of how kids interact. This information will help us to better understand the ways kids interact with each other, and you have both helped the study very much by participating. [Provide gift cards]





## APPENDIX G

### POSITIVE SOCIAL INTERACTION SCALE

Social Interaction Observation System (Bauminger, 2002)  
Positive Social Interaction Scale

#### Positive social interaction Scale

1. Eye contact: The child looks into the eyes of another child.
2. Eye contact combined with smile: The child looks at and smiles toward another child.
3. Smile with no eye contact: The child smiles at another child but does not look into the peer's eyes.
4. Affection: The child expresses affection toward another child either verbally (e.g., "You're nice," "I like you") or nonverbally (e.g., hugs, touches).
5. Sharing objects: The child offers his/her objects to another child or shares an object with another child.
6. Sharing experience: The child tells about an experience to peers or asks them about their experiences (e.g., "What did you do over the weekend?").
7. Social communication: The child approaches another child with a social (rather than functional) intention (e.g., "Let's play").
8. Talk that reflects an interest in another child: The child expresses an interest in another child's hobbies (e.g., "What's your favorite game/object?"), mood (e.g., "Are you sad?"), etc.



9. Greeting: The child says hello to another child or replies appropriately to such a greeting.
10. Giving help: The child offers help to another child.\*\*

Low-level interaction Scale: The child exhibits behaviors that indicate social intention, but with minimal social enactment. This includes behaviors such as close proximity to children without initiating a positive social interaction. It also includes behaviors typical of the autistic syndrome (e.g., echolalia, idiosyncratic language).

1. Looking—The child looks at the other child’s face or body, or child’s action, without establishing eye contact.
2. Close proximity—The child stands in close proximity to another child (3 feet or less) but does not approach the peer.
3. “Yes” and “no”—The child only nods his/her head for yes or shakes it for no.
4. Imitation—The child imitates another child’s talk or activity.
5. Idiosyncratic language—The child uses utterances with no clear meaning.
6. Repetitive behavior—The child behaves in a repetitive manner with no clear communication intent, but with close proximity to another child.
7. Functional communication—The child approaches or responds to another child with an intention to fulfill his/her own needs, and with no social intention (e.g., “It’s my turn on the computer now”).

\*\*The Giving Help code was modified to apply whenever both children had their hands on the same object at the same time.

## APPENDIX H

### SOCIAL INTERACTION OBSERVATION SCALE RELIABILITY AND DRIFT TRACKING

MICROANALYTIC ITEMS (# of tapes)	T1	T2	T3	T5
	3 Training Tapes, First 5 Data Tapes	First 9 Data Tapes	12 data tapes	Final 15 Data tapes
Eye	.478	.725	.667	.613
Eye Contact with Smile	.603	.764	.732	.716
Smile Alone	.877	.839	.870	.900
Affection	N/A	N/A	N/A	N/A
Sharing Objects	.398	.436	.152	.267
Sharing Experiences	N/A	N/A	N/A	N/A
Social Communication	.975	.949	.960	.970
Talk that shows Interest	N/A	N/A	N/A	N/A
Greeting	N/A	N/A	N/A	N/A
Giving Help	.952	.978	.898	.927
<b>POSITIVE SUBSCALE</b>	.974	.955	.941	.942
Looking	.145	.194	.227	.309
Close Proximity	N/A	-.032	-.023	-.018
Yes/No Response	N/A	N/A	N/A	N/A
Imitation	N/A	N/A	N/A	N/A
Idiosyncratic Behavior	.267	.992	.992	.992
Repetitive Behavior	N/A	N/A	N/A	N/A
Functional Communication	N/A	.667	.667	.639
<b>LOW-LEVEL SUBSCALE</b>	.718	.874	.825	.807
<b>RESPONSIVENESS</b>	.897	.975	.891	.876

\*N/A=behavior occurred too rarely for reliability to be calculated