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**Let's Have a Playdate! Comparing Autistic Children's Social Behavior During Play  
Sessions with Siblings Versus Peers**

Senior Thesis

Submitted to Dr. Marjorie Charlop & Dr. Tessa Solomon-Lane

W. M. Keck Science Department

Claremont Autism Center

By: Clare Boldt

April 25th, 2022

## Table of Contents

Abstract.....	4
Introduction.....	5
Autism Spectrum Disorder.....	5
Play and Social Skills.....	6
Nature of Sibling Relationships.....	8
Sibling vs. Peer Play of Autistic Children.....	9
Sibling- and Peer-Mediated Intervention.....	10
Ethics of Peer Inclusion in Interventions.....	12
Social Behaviors of Interest.....	14
Current Study.....	18
Methods.....	19
Participants.....	19
Recruitment.....	20
IRB Approval.....	21
Research Design.....	22
Data Collection.....	22
Data Analysis.....	28
Results.....	29
Discussion.....	45
Conclusion.....	53
Acknowledgements.....	54
Works Cited.....	55

Appendices.....	61
Appendix A: Coding Form Template.....	61
Appendix B: Operational Definitions.....	62
Appendix C: Parental Consent Forms .....	64
Appendix D: Participant Assent Forms.....	69
Appendix E: Recruitment Form.....	72
Appendix F: Debriefing Form.....	73

## **Abstract**

Autistic individuals can struggle with social interactions and forming friendships. As a result, improving social skills is often a focus of interventions. While siblings and peers are commonly used for social skills intervention, there is a paucity of research analyzing the differences in autistic children's play with siblings versus peers. Investigating behavior differences between siblings and peers during play sessions can help clinicians learn how to best support social skill development, improve sibling relationships, and determine ideal peer mediators for interventions. In this study, I compare social behaviors of autistic children during play sessions with their sibling versus a non-sibling peer. The behaviors measured were prosocial behaviors, cooperative and parallel play, verbalizations (appropriate and inappropriate), aggressive behaviors, eloping, and stereotypy. Based on previous literature, I first hypothesize that the type of dyad, sibling or peer, affects the social play of an autistic child. Second, I hypothesized that positive social behaviors would covary (prosocial behaviors, appropriate verbalizations, and cooperative play) and non-social or negative behaviors would covary (parallel play, eloping, stereotypy, and aggression/fighting). Third, I hypothesized that the children's behavioral profiles would differ from each other. All six autistic children played one-on-one with their sibling and with a peer (5 sessions each). Upon coding behaviors, the mean frequency of behaviors were compared between sibling and peer sessions. A principal component analysis was performed to analyze covariance patterns. There are three major takeaways from this study: 1) the individual child drives the variation in behavior not the peer type; 2) there are significant differences in how some autistic participants played with their sibling vs. peer; 3) there are relationships between certain play behaviors (appropriate verbalizations, cooperative play, and prosocial behavior). Some autistic children may benefit

greatly from sibling peer mediated intervention; other autistic children may improve their social skills more with a non-sibling peer, especially when their siblings are less well suited to participate in therapy. Together, this work is important because it highlights areas of support for some autistic children, the relationships between certain behaviors, common areas of support in sibling relationships, and emphasizes the importance of improving social skills for both sibling and peer interactions.

## **Introduction**

Autistic children generally struggle with social interactions, including but not limited to delays and difficulties in their social play (Jordan, 2003). Due to these social challenges, autistic individuals can struggle with social interactions and friendships. Physical health and mental/emotional wellbeing are directly benefited by social interactions and friendships. As a result, improving social skills is an important aspect of autism research and intervention. Often, siblings or peers are utilized for social skills intervention. There is a paucity of research analyzing the differences in play between siblings and peers. By analyzing behavior differences between siblings and peers during play, we can learn more about how to support social skill development for autistic individuals, improve sibling relationships, and determine ideal peer mediators for interventions. This type of research can inform clinicians of common areas of support needed for autistic children and their family members. In addition, behavioral measures can provide context for further research into underlying neural mechanisms and pathology.

## **Autism Spectrum Disorder**

Autism spectrum disorder (ASD) is a developmental disorder characterized by a range of difficulties including deficits in social communication and interactions as well as restricted or repetitive behaviors or interests (5th ed.; DSM–5; American Psychiatric Association, 2013). The diagnostic criteria for the medical definition of autism spectrum involves two main areas: 1) symptoms in social communication and social interactions, and 2) highly focused patterns of behavior, interest, or activities (American Psychiatric Association [APA], 2013; Tomchek & Koenig, 2016). Autistic individuals struggle to initiate interactions, stay engaged in conversations, and participate fully in social interactions. In addition, those with ASD may have difficulty with sensory regulation or sensory hypersensitivity (APA, 2013; Tomchek & Koenig, 2016). Autism is classified as a spectrum in part because the symptoms and severity of symptoms varies significantly among individuals. However, the perception of autism as a linear spectrum from mild or high functioning to severe or low-functioning has received recent criticism. Rather than viewing ASD as a linear spectrum, autistic individuals have different sets of strengths and challenges, such as ease with maintaining eye-contact but struggling to continue a conversation.

### **Play and Social Skills**

Several different scholars have stated that “a child’s job is to play.” Although frequently stated, this message remains extremely relevant. Play provides a large context for social learning and is vital for healthy development (Dunn, 1989). Play development typically mirrors other aspects of development including cognitive, social, linguistic, and emotional development (Jordan, 2003). Social play is any play with children interacting together with each other for enjoyment; it can include imaginative play as well as rough and tumble play. This type of play in

early childhood is vital for developing social skills and communication (Kenney, 2012). Social play involves emotional regulation (the ability to exert control over one's emotional state), social competence (knowledge or skills needed for functioning peacefully and meaningfully in one's social community), as well as the cognitive development of play (one's ability to think, problem-solve, communicate, or imagine what might happen next while playing) (Jordan, 2003). These aspects of play can be affected by ASD. Autistic individuals often have difficulties initiating spontaneous play and imitating play behaviors (Jordan, 2003), (Rogers & Pennington, 1991). They can struggle with back-and-forth conversation, responding to social interactions, adjusting their behavior based on the social context, and insistence on sameness/inflexibility (Charlop et al., 2018). Teaching play to autistic children has been shown to facilitate language and improve joint attention, their prognosis, and long term follow up after treatment (Charlop et al., 2018). Moreover, children with ASD have been found to spend less time engaged in pretend or symbolic play, defined as when children use objects to symbolize or represent other objects, specifically with deficits in "doll as agent" symbolic play, compared to peers with other developmental delays (Wong & Kasari, 2012). Many autistic children also struggle to sustain cooperative play, specifically with turn taking, engaging in reciprocal conversation, and maintaining the attention of their partner while playing. Cooperative play is the highest level of social play between children that involves both children combining their efforts, feelings, and ideas towards a common goal while playing. Autistic children may instead play alone, line up toys or objects, and perform repetitive actions such as opening and closing a toy box (Charlop et al., 2018). By improving social play, autistic children will be better equipped to make friends, interact socially with others (including verbally), and grow up to be successful in their personal life.



## **Nature of Sibling Relationships**

Because around 80% of individuals have at least one sibling, sibling relationships are of particular importance in many people's lives, including autistic individuals (Dirks et al., 2015). Developmental disabilities, including ASD, impact sibling, family, and friend relationships. Some studies have shown that children who have a sibling with autism have lower social functioning (the ability of an individual to engage effectively in their social environment) and higher rates of depression and anxiety compared to controls, namely people who have typically developing (TD) siblings who have not been diagnosed with ASD or any neurodevelopmental disorder (Shivers et al. 2018). However, other studies show there are no differences in social functioning between children that have a sibling with ASD compared to those who do not (Angell et al. 2012). Research has shown that 20-30% of children who have an autistic sibling have the symptoms of a diagnosis themselves. Of the siblings who do not develop ASD, 20% of siblings will have an autism-like phenotype (referring to traits and symptoms of ASD) (Georgiades et al, 2013). The nature of sibling relationships that include an autistic child are somewhat mixed. While some children report that they have a warm relationship and minimal conflict with their autistic sibling, several studies have found that sibling dyads that include an autistic child are characterized by less warmth and intimacy, as well as less conflict compared to control TD siblings (Kaminsky & Dewey, 2001, Angell et al., 2012). Another study found that sibling relationships were particularly negative in nature when the autistic child was the older sibling (Ben-Itzhak et al., 2019). TD siblings often struggle with differential treatment/attention from parents towards their autistic child, their sibling's behavioral problems, and negative reactions from unrelated peers about their autistic sibling (Haukeland et al., 2015; Tudor et al.,

2018). Furthermore, some children report embarrassment of their sibling's socially inappropriate behaviors, especially if they occurred in public (Angell et al., 2012). However, it should be noted that siblings self-report more positive interactions with their autistic sibling compared to negative interactions (Braconnier et al. 2017). According to Angell et al. (2012), the TD children in their study spoke about pride, love, fear, and a heightened sense of responsibility towards their autistic sibling.

Siblings and family members can help autistic children improve their social skills both at home and through research interventions at clinical centers. Due to the frequency of familial interaction, autistic children who have a sibling can practice and improve their social skills more readily than autistic children without siblings. Having multiple siblings offers an autistic child more chances to play and model positive social behaviors. Researchers have found that autistic children who have an older TD sibling had better social functioning and less social impairment deficits (Ben-Itzhak et al., 2019). Older siblings may serve as a social role model for appropriate social behaviors. Younger siblings may not function in the same role model capacity for an autistic child. In addition, having more siblings was associated with better social functioning and fewer social deficits (Ben-Itzhak et al., 2019). It should be noted that only autistic children who had higher cognitive ability and younger TD siblings were found to have significantly better social functioning compared to autistic children who did not have any siblings (Ben-Itzhak et al., 2016).

### **Sibling vs. Peer Play of Autistic Children**

While sibling play offers opportunities for practicing social skills, siblings may not play as positively in comparison to peers. A study by Kent et al. (2020) found that playfulness scores

were higher in peer dyads compared to sibling dyads (Kent et al., 2020). This would indicate that dyads that include an autistic child and an unrelated TD peer may play better than siblings. This may be due to a strained sibling relationship, sibling fatigue towards their autistic sibling, and/or challenging social behaviors of the autistic child. As a result, some siblings may be less appropriate for ASD-related interventions in certain situations. However, one study found that there were no significant differences in social pragmatics (including joint attention, turn taking, initiation, and imitation) of autistic children whether playing with their sibling or a peer (Welsh, 2011). This study by Welsh is one of the only recent studies to specifically observe behavior differences between these dyad types. While specific behaviors may not differ for some autistic children with a sibling or a peer, overall playfulness could be lower in sibling dyads compared to peer dyads.

### **Sibling- and Peer-Mediated Intervention**

Typically developing siblings and peers have been utilized in autism research, both as intervention implementers and for observational research. TD children serve as a model to teach play, including social and symbolic play, to autistic children (Ferraioli et al., 2012). The goal of many peer interventions, both sibling and non-sibling mediated, is to increase the autistic individual's social initiations, (e.g., starting a conversation, offering or asking for help, and suggesting play activities), social interactions with the autistic child, creation of peer social networks, and facilitation of peer tutoring, which is when peers act as one on one teachers to give instruction, repetition, and clarification (Zhang, 2021). Peer-mediated interventions include peer modeling, peer training, peer monitoring, peer networking, and peer tutoring (Zhang, 2021). An example of peer intervention includes autistic children learning social skills with the help of their

preschool peers, and then practicing those skills at home (Ferraioli et al., 2012). Based on a meta-analysis, peer-mediated interventions for autistic children are highly effective for improving target behaviors (Zhang, 2021).

### *Sibling-Mediated Intervention*

Many studies have taught siblings various intervention techniques, often planned to be transferred into the home, effectively having them serve as mini-at-home therapists. There are multiple benefits to sibling mediated intervention. For example, utilizing family members for intervention mediation can help provide consistency for the autistic child since the interventions are occurring both at therapy centers and at home. As discussed earlier, siblings are often used in autism intervention due to the theory that siblings act as social role models. The related prevalence of social behaviors in sibling dyads supports this theory; specifically, that social behaviors of an autistic child will increase or decrease based on the frequency of their sibling's social behavior (Abramovitch et al., 2021). Rum et. al (2021) found that younger children with ASD imitated their older TD sibling's prosocial behavior. Sibling dyads with a younger autistic child were found to have the highest level of imitation (Rum et al., 2021).

### *Non-Sibling Peer vs Sibling-Mediated Intervention*

Comparison of sibling and peer play including an autistic child is not only uncommon but insufficient for deep understanding of autistic children's play behavior and sibling dynamics. By understanding more about sibling and peer play, researchers can be better informed about the benefits and drawbacks of using siblings or non-sibling peers to improve social behaviors through peer-mediated interventions. Some research shows that siblings and TD peers are both

beneficial interventionists for autistic children and adolescents (Ferraioli et al., 2012). In one study, TD children, including siblings and unrelated peers, were both effective at teaching an autistic child to label pictures (Jones & Schwartz, 2004). Likewise, two other studies have found that TD unrelated peers and siblings are both successful at implementing stay-play-talk (Ledford & Pustejovsky, 2021) or improving social engagement (Tsao & Odom, 2006) with autistic children. However, a recent meta-analysis of peer intervention found that interventions were more effective if the intervention implementers are siblings compared to TD peers (Zhang, 2021); specifically, they found a significant difference between the effect sizes for research that included siblings and unrelated peers. Moreover, the most successful interventions were those that involved at-home interventions, peer modeling, and when older male siblings were interventionists for younger boys (Zhang, 2021). Although it should be noted their review included fewer sibling studies (only 5) than peer studies (39 peer). More research should investigate potential differences in effectiveness between sibling and peer mediated interventions.

### **Ethics of Peer Inclusion in Interventions**

While integrating peers (whether sibling or non-sibling) into research may help elucidate new findings or be useful for autism interventions, serving as a peer model has its challenges. Typically developing children may feel a heightened sense of pressure that proves stressful (Locke et al., 2012). In addition, acting as a peer model for an extended period of time may lead to burnout. Field researchers Reiter and Vitani (2007) found that TD children who were initially willing and excited to participate in an intervention program became less willing to engage in the intervention and expressed detachment and negative attitudes towards the autistic children

(Locke et al., 2012). While peer models can be useful in research, burnout and participation willingness should be consistently addressed during intervention programs and research. In addition to these concerns, there are additional ethical considerations for the integration of siblings into interventions and research. Serving as a role model or acting as a mini at home therapist may alter the sibling dynamic dramatically, potentially giving the TD child too much responsibility or authority over their autistic sibling. In addition, there is minimal research investigating how sibling mediated interventions during childhood impact the relationship of adult siblings.

However, while sibling mediated interventions can be negative for some siblings, other siblings benefit greatly. Sibling integration in research has been shown to improve a TD child's satisfaction with their sibling relationship, increase engagement for both children, and heighten the responsiveness of the autistic child (Ferraioli et al., 2012). Such intervention may foster closeness and love between the siblings as well. Parents can benefit from sibling integration in interventions because they are afforded more free time and less stress when siblings are playing well together and communicating effectively. Based on findings from a parent perception study, parents reported that their TD children liked being included in therapy and intervention strategies (Grindle et al., 2009). They may like learning more about autism and what goes on behind the closed therapy door as well as learning ways to connect better with their siblings.

Whether integrated in therapy or not, TD siblings need to be well supported. There is plentiful evidence that siblings can benefit from bonding with other peers who have an autistic sibling, which can be through organized support groups (Angell et al., 2012, Braconnier et al., 2018, Jones et al., 2019). These types of programs can help siblings discover new coping strategies, create friendships with individuals who have a similar home life, and feel less alone in

their experience. Involvement in sibling support groups must be voluntary and not burdensome, so that the individual does not feel resentment towards their autistic sibling.

### **Social Behaviors of Interest**

The overarching goal of my study was to compare social behaviors of autistic children during play sessions with their sibling versus a peer. In this study, I analyze social behaviors of children with autism while free-playing, which is unstructured play that allows a child to play in any manner they wish, with their familial sibling compared to a TD peer. If particular play behaviors and social skills are more frequent in one dyad (sibling or peer) across the different participants, therapy programs may be more motivated to integrate neurotypical peers or siblings into their social skill programming or interventions. In addition, this study can highlight areas of support for autistic children and sibling/peer dyads. I will investigate behaviors related to social play interactions including prosocial behaviors, aggression/fighting, cooperative play, parallel play, verbalizations (appropriate and inappropriate), and eloping.

#### *Prosocial Behavior and Aggressive/Fighting Behaviors*

Prosocial behavior is defined as any social behavior intended to benefit others or society as a whole, including but not limited to helping, sharing, praising, comforting, cooperating, and volunteering. There is a strong relationship between prosocial behavior and ASD severity: lower prosocial skills are correlated with higher ASD symptom severity (Oerlemans et al., 2018).

Prosocial behavior has been shown to follow a reciprocal pattern among siblings, concurrently increasing and decreasing in frequency dependent on the TD child's behavior (Rum et al., 2021). Children with ASD were found to imitate prosocial behavior initiated by their TD siblings.

Specifically, in one study, older TD siblings were found to conduct more prosocial behaviors while younger siblings with ASD imitated prosocial behaviors. This may be one of the factors in how having an older TD sibling improves the social skills of younger children with ASD (Ben-Itzhak et al., 2016). Long standing evidence shows that prosocial skills are correlated with ASD symptom severity. However, improving prosocial skills has not been shown to reduce ASD symptoms and reducing ASD symptoms has also not been shown to improve prosocial skills (Oerlemans et al., 2018). More research needs to be done to determine the generalized effects of having autistic adolescents practice prosocial skills. While some research has shown that siblings of children with ASD have higher rates of autistic symptoms compared to TD peers, other research shows that siblings of autistic individuals do not struggle with prosocial skills more than individuals without an autistic relative (Orm et al. 2021). In fact, siblings of autistic children were found to have significantly higher prosocial behavior (as reported by their mother) than children who did not have an autistic sibling (Orm et al. 2021). Perhaps, siblings are encouraged more to engage prosocially with their autistic sibling; more research should investigate this initial finding.

Negative behaviors including aggression, threats, and fighting also follow a reciprocal pattern among siblings, namely the agonistic behaviors in the dyad increase and decrease if one of the children fights more or less (Rum et. al., 2021, Knott et. al., 2007). However, the frequency of agonistic behaviors in the sibling dyad appears to be stage managed by the TD sibling. Meaning that the autistic child's agonistic behaviors will increase or decrease in an imitative nature based on their TD sibling (Knott et. al, 2007). The incidence of each autistic child's aggressive behaviors will be observed to determine if there is a difference when playing with a sibling or a peer.



### *Parallel Play and Cooperative Play*

The types of play which will be assessed in this research will be parallel and cooperative play. Parallel play, which is a less advanced form of play that typically presents early in development (around 18 months to 2+ years), refers to children engaging in play adjacent to each other but not interacting with each other (Brigano, 2011). Autistic individuals often continue engaging in parallel play for longer into their development than TD peers. Although autistic children may want to interact with their peers, they can find it particularly challenging to initiate social interaction so they will instead conduct parallel play (Preissler, 2006). Cooperative play refers to children playing together with shared goals. Cooperative play, which is a more advanced form of play, requires a host of skills including: sharing, communication, self-regulation, establishing rules or games, and spontaneity. As a result, autistic children often do not engage or maintain spontaneous, collaborative play (Jordan, 2003). Additionally, autistic children often engage in repetitive behavior which can discourage cooperative play as stereotypy often isolates them from peers. Cooperative play is a key target for interventions as it teaches important social skills, communication skills, and problem solving. For the purpose of this study, I will be observing whether the autistic child engages in different levels of cooperative play and parallel play in their peer dyad or sibling dyad.

### *Appropriate Verbalizations*

Autistic individuals often struggle with appropriate speaking and conversation, meaning that they typically speak only when directly spoken to and they seldom initiate conversation. Research has found that 40-50% of autistic children never fully develop functional speech (Zager

et al., 2012). In addition, many autistic individuals engage in verbal stereotypy and/or echolalia, which is the repetition of another person's spoken words, rather than unprompted spontaneous speech. However, verbal communication promotes peer interactions, personal independence from one's parents or caregivers, financial independence, and making friends. Naturalistic interventions for increasing spontaneous speech, especially play-based interventions, are particularly effective (Lane et al., 2015, Charlop-Christy et al., 1999). In this study, I will observe if each autistic child converses or engages in appropriate speech more while playing with their sibling or an unrelated peer.

### *Mechanisms Underlying Social Behaviors*

While I will be examining the environmental effects of playmate type (sibling vs non-sibling dyads), mechanisms across levels of biological organization underlie social play behavior and are important to consider in play research, including biological, hormonal, neurological, and environmental mechanisms. I will focus on one neurobiological mechanism specific to prosocial behavior that is particularly interesting. Prosocial behaviors are regulated in part by hormones. One important hormone in the complex pathway for prosocial behavior is oxytocin (OT); oxytocin is a hormone produced by the hypothalamus and secreted into the bloodstream by the posterior pituitary gland (Yamasue et al., 2012). Autistic adolescents often exhibit fewer prosocial skills than their typically developing peers. A recent meta-analysis found that blood levels of OT in autistic children tend to be lower than their neurotypical peers; however, no such differences existed for adults with ASD (John & Jaeggi, 2021). Moreover, research has found an association between the gene OXTR and individuals with ASD; the OXTR gene is responsible for oxytocin receptor coding (Parker et al., 2014; Yamasue et al., 2012). In

addition, small clinical trials proposed intranasal OT administration as a treatment for autistic individuals to improve various behaviors, including: repetitive behaviors, emotional recognition, and improved social interactions (Yamasue et al., 2012). However, recently, the largest clinical trial to date found no significant difference in social or cognitive functioning of autistic children/adolescents who received intranasal OT for 24 weeks or a placebo (Sikich et al., 2021). Thus, while OT may play a major mechanistic role, including hormonally (by OT) and genetically (by the OXTR gene), in modulating many different social behaviors, including prosocial behavior, its application as a treatment for behavior improvement is unlikely. While I am exploring the behavioral outcomes of manipulating playmate type, there are many underlying mechanisms regulating play behaviors for the participants.

## **Current Study**

The purpose of this study is to compare a variety of social play of autistic children during play sessions with their sibling and a peer because it can inform how clinicians and parents can best support social skill development for autistic individuals, improve sibling relationships, and determine ideal peer mediators for interventions. The behaviors included are: prosocial behaviors, cooperative and parallel play, verbalizations (appropriate and inappropriate), aggressive behaviors, eloping, and stereotypy. Based on previous literature, I first hypothesize that the type of dyad, sibling or peer, affects the social play of an autistic child. Second, I hypothesized that positive social behaviors would covary (prosocial behaviors, appropriate verbalizations, and cooperative play) and non-social or negative behaviors would covary (parallel play, eloping, stereotypy, and aggression/fighting). Third, I hypothesized that the children's behavioral profiles would differ from each other.

## Method

### Participants

14 children between the ages of 5 and 15 participated in the study. Six of the children have a diagnosis of ASD based on the criteria of *The Diagnostic and Statistical Manual of Mental Disorders* and the other eight participants are typically developing children. All participants were selected from an after-school applied behavioral analysis (ABA) treatment program (5th ed; DSM-5, American Psychiatric Association, 2013). Children with ASD eligible to participate in this study must have a TD sibling. The TD peers were all children who regularly attended the clinic for a social skills group alongside their autistic sibling. All children were able to communicate verbally with their partner and play with toys. The clinic director made recommendations for participants based on their knowledge of each child's diagnosis and familial status. Initial recruitment yielded 6 sibling dyads and 2 additional TD peers (Table 1). One of the additional TD peers (Henry) for several participants was the younger brother of another participant (Sam); Sam completed all of his sibling sessions with his twin sister (Nancy). The autistic participants were previously assessed using the Childhood Autism Rating Scale-2 (CARS-2; Schopler et al., 2010) to determine the severity of each child's support needs. Brandon, Simon, and Zane are characterized as having low verbal communication. Sam, Annie, and Wesley are characterized as having high verbal communication. The participants' ages, genders, ethnicity, and CARS-2 scores are reported in Table 1.

*Table 1: Participants and Dyad Characteristics*

Dyad	Age (Y)	CARS-2 Rating	Ethnicity
Dyad 1 Brandon Kassidy	15 7	Severe N/A	Asian Asian
Dyad 2 Sam Nancy	10 10	Mod/Severe N/A	Middle Eastern Middle Eastern
Dyad 3 Annie Sally	13 9	Mod/Severe N/A	Asian Asian
Dyad 4 Wesley Amanda	10 8	Mod/Severe N/A	Asian Asian
Dyad 5 Simon Abigail	8 5	Severe N/A	Asian Asian
Dyad 6 Zane Lucy	8 5	Severe N/A	White White
Additional Peers: Henry Karen	9 13	N/A N/A	Middle Eastern Hispanic

## Recruitment

Parents/guardians of potential participants were given a recruitment form and/or verbal explanation of the study with the lead researcher and clinic director (see *Appendix C* for consent form and *Appendix E* for recruitment form). Parents/guardians were given an informed consent document which explained the study so they could determine if they wanted their children to participate. In the recruitment form and informed consent document, parents were informed that if they chose for their child to not participate they could reject the informed consent document without any consequences for their child's participation at the clinic center. Parents who wished

to have their children participate were instructed that their signature confirmed that they were voluntarily agreeing for their children to participate in this study. The potential participants were provided with a developmentally appropriate assent form which explained the study (see *Appendix D* for assent form). Those children who expressed assent, and whose parents agreed, were included in the study. The assent form was provided in a written form and read aloud to any children who struggle to read. Assent was obtained as well through active participation in the research. The researcher informed the children that she wished to see them playing as they normally play and explained that they could stop playing or being filmed at any point during the 10 minute observation. Participants did not receive monetary compensation for participation in this study. All participants were debriefed following the study (see *Appendix F*).

### **IRB Approval and Ethics Training**

Full IRB approval from Scripps College was obtained prior to data collection. Two additional research assistants completed training and provided relevant forms to Scripps College. Research assistants were undergraduate students of the Claremont Colleges who are taking a psychology course at the Claremont Autism Center. All undergraduate research assistants obtained ethics training prior to this research study. All research assistants obtained a CITI ethics certificate, approved by Scripps College IRB. The play sessions were supervised by either a CGU masters student or a CGU Ph.D student (who also holds a board certified behavioral analysis certification).

### **Materials**

A selection of toys was presented to the children prior to the start of each play session. I asked the children which toys they would like to play with. Some toys included in this selection were balls, blocks, dolls, cars, stuffed animals, and kitchen sets. Toys were selected to prompt spontaneity, imaginative play, and communication among the partners.

## **Research Design**

A multi-element comparison design was used, involving the variation of the presentation of playmate condition (sibling or peer). The order of the sibling and peer sessions alternated for each participant. Behaviors of each autistic child were tracked in their different groups, sibling dyad or peer dyad, for comparison. Sibling dyad groups were created based on sibling relationship; a sibling was defined as their biological brother/sister whom the target child lives with at home. Peer dyad groups were created based on age proximity, co-occurring time of a social skills group, and diagnostic criteria. Each peer dyad involved one child who had been previously diagnosed with ASD and a neurotypical child. Peers were changed for peer dyads depending on the schedule and availability of the participants so as to prevent peer effect. All typically developing children were a sibling of an autistic child who regularly attends clinic. Participant and dyad descriptions are provided in Table 1.

## **Data Collection**

Data collection was done via direct observations, videotaped on an iPad for later behavior scoring, of autistic children playing one-on-one with their sibling and one-on-one with a non-sibling peer during an after-school ABA treatment program. Due to Covid-19 protocols, an outdoor space, away from any other people but still in relative proximity to the social skills

group, was used for observation. Two dyads played indoors for one session each due to rain. The participants were not isolated from the social skills group completely as that would artificially decrease eloping. Children wore face masks during all play sessions, some wore clear masks or face shields. Each dyad (both peer and sibling) was presented with a variety of toys they could play with. Toys were selected that would prompt imagination and conversation (such as dinosaur figurines). At the beginning of the play session, the researcher informed the children that she wished to see them playing as they normally play. The participants were told they could stop playing and/or videotaping at any time. They were also informed to play only with each other and not with the head researcher or any research assistants. At the end of 5 minutes, the dyads were informed that the playtime was over and that they could return to the main group. Each child completed 10 separate 5 minute play sessions: 5 with a sibling and 5 with a peer. The order of sibling and peer dyad play sessions alternated so as to prevent order effect of the observations. Different peers were utilized for the peer dyad if possible to avoid peer effect; this depended on which TD peers were present during regular clinic sessions. All sessions were recorded with an iPad for later coding analysis.

### *Coding*

Video recordings were coded utilizing a partial interval scoring format using latest Excel software (version 16.0. 13901 .20400). Partial-interval scoring is an observational measurement procedure that involves dividing up the length of an observation session into small, equal length intervals. The first instance of a behavior was measured for each interval (i.e. Yes or No). For the 5 minute observations, 10 second intervals were used (see *Appendix A* for coding form template).



The number of intervals that a dependent variable occurred was divided by the total number of intervals observed during the session (e.g., 30 intervals for a 5-minute observation) and multiplied by 100 to yield a percentage of occurrence for the session. Only spontaneous behaviors were recorded. The behaviors measured were verbalizations, prosocial behavior, cooperative and parallel play, eloping, stereotypy, and fighting/aggression (*see Table 2* for operational definitions and examples). Specific operational definitions were created for each autistic child for coding (*see Appendix B* for general operational definition form).

*Table 2: Behaviors of interest for coding analysis with the operational definitions, general examples, and specific examples for autistic children/adolescents.*

<b>Behavior of Interest</b>	<b>Operational Definition</b>	<b>General Examples</b>	<b>Specific Examples</b>
Appropriate Verbalization	Any instance of spontaneous, unprompted speech or verbalization that is contextually appropriate.	Topic Initiation Responding to Question Asking Questions Sustaining Topic Narrating Play	“What is your favorite toy to play with”  “Now my dinosaur roars!”
Inappropriate Verbalization	Any instance of spontaneous, unprompted speech that is not contextually appropriate and that indicate insistence of sameness, impatience, or inflexibility.	Interrupting Peers Complaining Whining Tantruming Tonally inappropriate responses	Screaming or whining during a tantrum

Prosocial Behavior	Any instance of nonverbal or verbal voluntary, positive behaviors explicitly directed at a partner that are intended to benefit the other.	<p>Helping (defined as providing aid to the other person)</p> <p>Praising (expression of warm approval/admiration often with the intent to reinforce behavior)</p> <p>Thanking (expressing gratitude)</p> <p>Physical comforting (easing or alleviation of the other's distress or pain)</p> <p>Sharing (offering toys, resources, or space to partner).</p>	<p>"You are great at making lego towers"</p> <p>Offering a hug to peer partner</p> <p>Helping partner locate desired item</p>
Cooperative Play	Play that can be categorized as existing of primarily spontaneous, unprompted play which involves the child/adolescent actively playing with their partner and interacting during playtime.	<p>Play with turn-taking with peer</p> <p>Play with role playing with peer</p>	<p>Building a castle out of blocks with a partner</p> <p>Creating imaginary game rules</p> <p>Turn taking with toys between children</p>
Parallel Play	<p>Play that can be categorized as existing of participants, adjacent to each other, playing separately.</p> <p>Participant is engaged in their toy/play but is not interacting with their playmate.</p>	Participants playing alone but next to each other	<p>Two children playing with trains separately but next to each other</p> <p>Child creating castle all by themselves</p>

Stereotypy	<p>Any instance of non-contextual or nonfunctional movements, postures, or utterances which are repetitive or ritualistic, specific to each child.</p> <p>Vocal stereotypy is the repetition of nonsense syllables or non contextual speech at least three times. Non Vocal stereotypy (such as rocking, hand/arm flapping, or jumping) should occur at least three times to be counted as repetitive.</p>	<p>Hand flapping</p> <p>Rocking body back and forth</p> <p>Flicking fingers</p> <p>Spinning themselves or an object</p> <p>Echolalia (repetition of noises or phrases that the child hears)</p>	<p>Rocking body back and forth</p> <p>Finger drawing in the air</p> <p>Tapping toys repeatedly on one's forehead</p>
Eloping	Any instance where child moves away from the blanket/tarp without permission and intention to leave, at least 3 feet away	Abandoning partner at tarp/blanket and walking off alone	<p>Running away from playmate towards wall</p> <p>Walking away to play with other nearby kids</p>
Aggression/Fighting	Any instance of spontaneous, unprompted negative social behavior related to fighting and aggression	<p>Threats to peer (defined as intimidation or intentional behavior that causes the other person to be fearful of injury or harm)</p> <p>Insults to peer (defined as disrespectful or hurtful comments)</p>	<p>Throwing toy at partner</p> <p>"I am going to get you in trouble"</p>

		which intentionally or accidentally offend the other)  Violent actions (defined as physical aggression and fighting directed at the other including touching partner, throwing items, or )	
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### *Inter-rater Reliability*

All sessions of observation were filmed by the primary experimenter. Two individuals who are unaware of the purpose of the study were trained on how to collect data using the data collection practice sheet, operational definitions, and example videos. Coders came from the Claremont Autism Center and were approved by the clinic director. All assistants were required to meet 80% agreement for their practice coding before beginning analysis. These assistants individually coded 40% of all dyads' sessions. Inter observer agreement was compared between the assistants and the primary researcher. One additional training session occurred for research assistants. Inter observer agreement did not fall below 80% for any behaviors of participants. Specific results of inter-rater reliability are stated in Table 3.

*Table 3: Inter observer agreement for behaviors for each autistic child (average % agreement, range in parentheses).*

Child	Appropriate Verbalizations	Prosocial Behavior	Inappropriate Verbalizations	Aggression or Fighting	Verbal/Nonverbal Stereotyping	Eloping	Cooperative Play	Parallel Play
Brandon	99.25 (97-100)	100	100	100	87.5 (83-100)	100	99.25 (97-100)	93.5 (87-100)
Sam	98.25 (93-100)	100	100	100	100	100	92.5 (83-97)	96.75 (93-100)
Wesley	88.5 (83-97)	96.75 (90-100)	99.25 (97-100)	100	90 (83-100)	100	95 (90-100)	87.5 (87-93)
Simon	98.25 (93-100)	99.25 (97-100)	100	100	88.25 (83-100)	98.25 (93-100)	99.25 (97-100)	92.5 (83-97)
Zane	98.25 (93-100)	100	99.25 (97-100)	100	89.25 (87-93)	100	100	93.5 (87-97)
Annie	98.5 (97-100)	100	100	100	100	100	96 (93-97)	93.25 (90-97)

## **Data Analysis**

Data was analyzed through descriptive and comparative statistics utilizing Excel software and R programming software. Analysis was done only for the behaviors of the autistic child in each dyad. P values less than 0.05 were considered significant and p values between 0.05 to 0.1 were considered a statistical trend. A Friedman test determined the difference in behaviors across all the participants between sibling play sessions and peer play sessions. Tables and bar graphs

for average frequency of behavior (as measured by percent per interval), with standard error of the mean bars, visually compared the autistic child's play behaviors between their peer and sibling sessions. An independent t-test compared the difference in observed behaviors of each child between their sibling and peer sessions. A principal component analysis (PCA) of behaviors determined covariance patterns across the behavioral measures. A one-way ANOVA with *post hoc* Tukey test compared the differences in principal component analyses of behaviors across the participants.

## **Results**

### **Condition Comparison: Sibling vs. Non-Sibling Peer**

I first tested whether there were differences in play behavior between the sibling and non-sibling conditions. A nonparametric Friedman test found that there were no significant differences when comparing average appropriate verbalization ( $\chi^2(1)=2.67$ ,  $p=0.102$ ), parallel play ( $\chi^2(1)=0.00$ ,  $p=1.00$ ), cooperative play ( $\chi^2(1)=0.067$ ,  $p=0.41$ ), stereotypy ( $\chi^2(1)=2.67$ ,  $p=0.102$ ), and eloping ( $\chi^2(1)=0$ ,  $p=1.0$ ) between the sibling and peer sessions across all autistic participants. However, there was a trend of higher prosocial behavior in sibling sessions compared to peer sessions ( $\chi^2(1)=3.00$ ,  $p=0.083$ ).

### **Child Specific Results**

I next analyzed whether individual children exhibited differences in their social behavior between sibling and peer sessions.

### **Brandon**

Brandon engaged in more positive play behaviors (cooperative play, appropriate verbalizations, prosocial behavior) with his sister than with a peer. His cooperative play was significantly higher across all sibling sessions ( $M=16.67$ ,  $SD=10.00$ ) compared to his peer sessions ( $M=1.33$ ,  $SD=1.82$ ),  $t(8)=3.373$ ,  $p=0.010$ , see Figure 1. He also conducted more appropriate verbalizations with his sister than with a peer:  $M=6.00$ ,  $SD=4.35$  with his sibling and  $M=2.67$ ,  $SD=4.35$  with his peer; these results were not statistically significant ( $p > 0.05$ ).

Brandon's prosocial behavior was also not significantly higher with his sibling than with a peer: ( $M=4.67$ ,  $SD=5.5$ ) with sibling and ( $M=0$ ,  $SD=0$ ) with peer, ( $p > 0.05$ ). Brandon's parallel play did not significantly differ between sibling ( $M=28.67$ ,  $SD=14.45$ ) and peer sessions ( $M=26.00$ ,  $SD=13.00$ ) (see Table 4), ( $p > 0.05$ ). Brandon's stereotypy was slightly lower with his sister than with a peer, ( $M=41.33$ ,  $SD=22.56$ ) and ( $M=55.33$ ,  $SD=23.64$ ) respectively; however this result was not statistically significant, ( $p > 0.05$ ). Brandon did not exhibit aggression, inappropriate verbalizations, or eloping during any play sessions.

*Table 4: Scored behaviors for Brandon (average % per interval  $\pm$  standard error).*

Behaviors	Sibling	Peer
Appropriate Verbalizations	$6.00 \pm 1.94$	$2.67 \pm 1.94$
Prosocial Behavior	$4.67 \pm 2.49$	$0.00 \pm 0$
Inappropriate Verbalizations	$0.00 \pm 0$	$0.00 \pm 0$
Aggression or Fighting	$0.00 \pm 0$	$0.00 \pm 0$
Verbal/Nonverbal Stereotypy	$41.33 \pm 10.09$	$55.33 \pm 10.57$
Eloping	$0.00 \pm 0$	$0.00 \pm 0$
Cooperative Play	$16.67 \pm 4.47$	$1.33 \pm 0.82$
Parallel Play	$28.67 \pm 6.46$	$26.00 \pm 5.81$

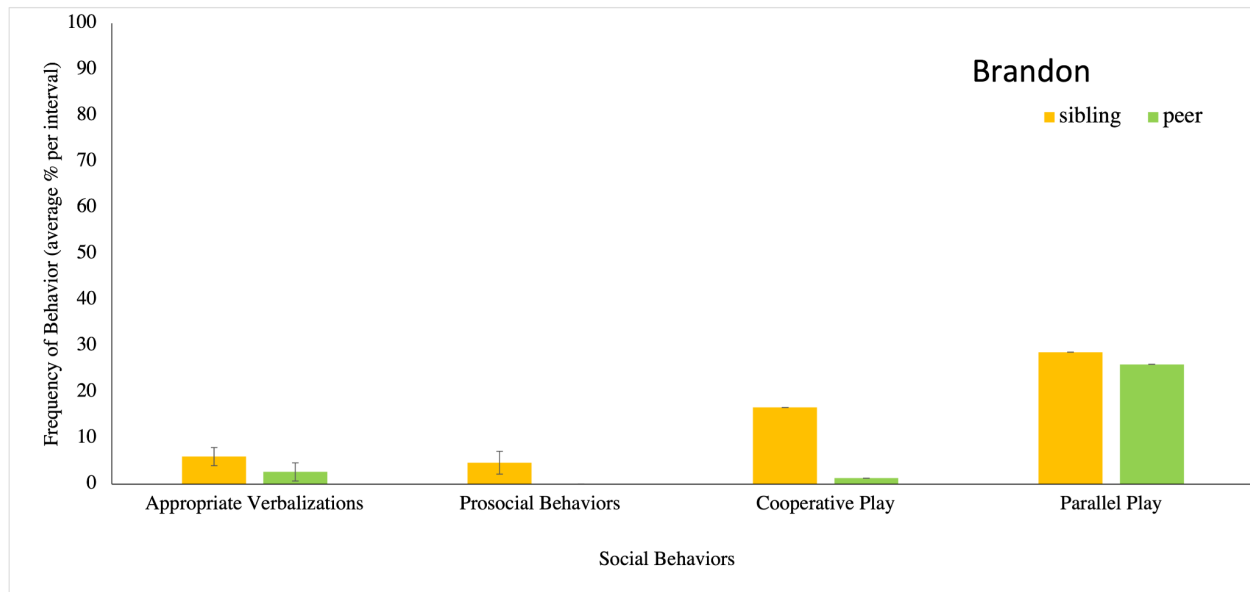


Figure 1: Brandon's frequency of social behaviors, as measured by average percent per interval, during his sibling and peer play sessions, with standard error bars. Social behaviors that did not occur in any sibling or peer sessions were excluded.

## Sam

Sam engaged in less cooperative play with his sister ( $M=24$ ,  $SD=25.75$ ) than with a peer ( $M=34$ ,  $SD=22.29$ ) (see Figure 2); however, this result was not statistically significant, ( $p > 0.05$ ). Sam also conducted less appropriate verbalizations with his sister ( $M=23.33$ ,  $SD=9.71$ ) than with a peer ( $M=31.33$ ,  $SD=8.69$ ); these results were not statistically significant, ( $p > 0.05$ ). Sam's prosocial behavior was not significantly different between his sibling ( $M=14$ ,  $SD=18.32$ ) compared to a peer ( $M=12$ ,  $SD=8.03$ ), ( $p > 0.05$ ). Sam's eloping appeared to be higher with his sister ( $M=4.67$ ,  $SD=4.47$ ) than with a peer ( $M=0.67$ ,  $SD=1.49$ ), but this result was not statistically significant, ( $p > 0.05$ ). Sam's parallel play did not significantly differ between sibling ( $M=70$ ,  $SD=19.86$ ) and peer sessions ( $M=74$ ,  $SD=26.08$ ), ( $p > 0.05$ ). Sam's aggression, inappropriate verbalizations, or stereotypy was very low across all play sessions (see Table 5).



Sam's stereotypy was not significantly higher with a peer (M=2.0, SD=2.98) than with his sister (M=0.67, SD=1.49), ( $p > 0.05$ ).

*Table 5: Scored behaviors for Sam (average % per interval  $\pm$  standard error).*

Behaviors	Sibling	Peer
Appropriate Verbalizations	23.33 $\pm$ 4.36	31.33 $\pm$ 3.89
Prosocial Behavior	14.00 $\pm$ 8.19	12.00 $\pm$ 3.59
Inappropriate Verbalizations	0.67 $\pm$ 0.67	0.67 $\pm$ 0.67
Aggression or Fighting	1.33 $\pm$ 1.33	1.33 $\pm$ 0.82
Verbal/Nonverbal Stereotypy	0.67 $\pm$ 0.67	2.00 $\pm$ 1.33
Eloping	4.67 $\pm$ 2	0.67 $\pm$ 0.67
Cooperative Play	24.00 $\pm$ 11.52	34.00 $\pm$ 9.97
Parallel Play	70.00 $\pm$ 8.89	74.00 $\pm$ 11.66

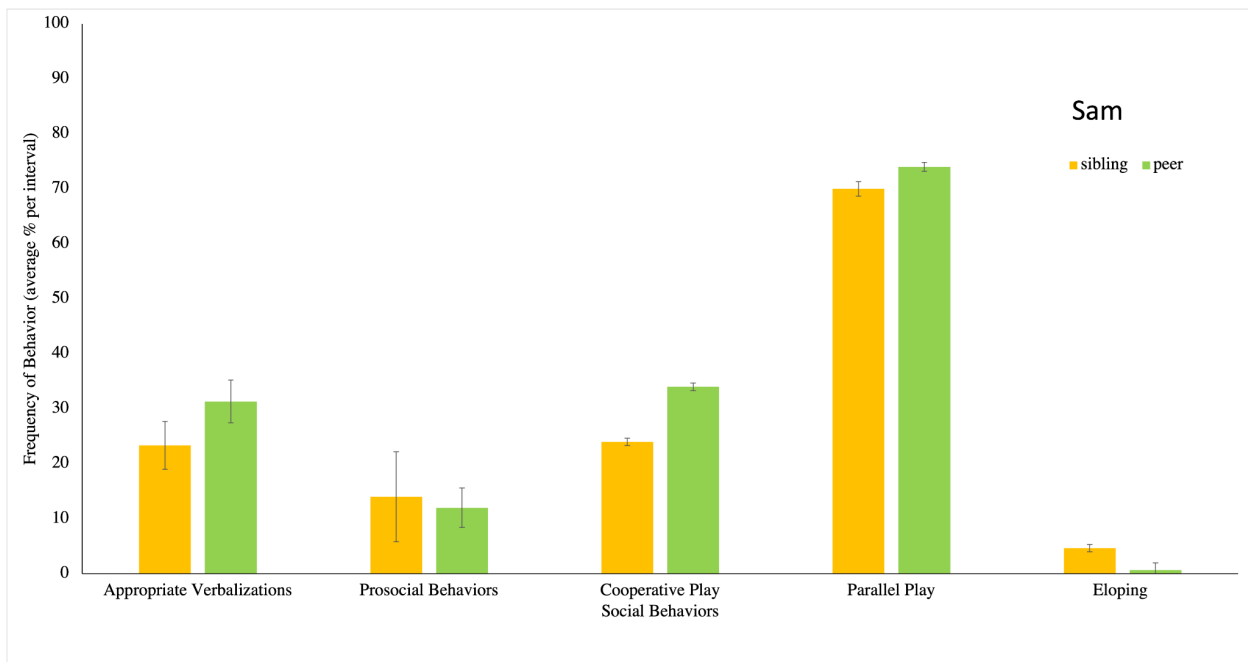


Figure 2. Sam's frequency of social behaviors, as measured by average percent per interval, during his sibling and peer play sessions, with standard error bars. Social behaviors that did not occur in any sibling or peer sessions were excluded.

## Annie

Annie engaged in more cooperative play with her sister ( $M=19.33$ ,  $SD=20.47$ ) than with a peer ( $M=8.00$ ,  $SD=12.38$ ) (see Figure 3); however, this result was not statistically significant, ( $p > 0.05$ ). In contrast to this result, Annie conducted less appropriate verbalizations with her sister ( $M=10.00$ ,  $SD=8.50$ ) than with a peer ( $M=18.67$ ,  $SD=11.21$ ); these results were not statistically significant, ( $p > 0.05$ ). Annie's prosocial behavior was higher, but not significantly, with her sibling than with a peer: ( $M=8.67$ ,  $SD=12.61$ ) with sibling and ( $M=4.00$ ,  $SD=7.23$ ) with peer, ( $p > 0.05$ ). Annie engaged in slightly less parallel play with her sister ( $M=72.67$ ,  $SD=18.77$ ) than with a peer ( $M=89.33$ ,  $SD=14.98$ ), however this result was not significant, ( $p > 0.05$ ). Annie did not engage in any aggression, inappropriate verbalizations, eloping and stereotypy was very low across all play sessions (see Table 6).

*Table 6: Scored behaviors for Annie (average % per interval  $\pm$  standard error).*

Behaviors	Sibling	Peer
Appropriate Verbalizations	10.00 $\pm$ 3.80	18.67 $\pm$ 5.01
Prosocial Behavior	8.67 $\pm$ 5.64	4.00 $\pm$ 3.23
Inappropriate Verbalizations	0.00 $\pm$ 0.00	0.00 $\pm$ 0.00
Aggression or Fighting	0.00 $\pm$ 0.00	0.00 $\pm$ 0.00
Verbal/Nonverbal Stereotypy	2.67 $\pm$ 1.25	0.67 $\pm$ 0.67
Eloping	0.00 $\pm$ 0.00	0.00 $\pm$ 0.00
Cooperative Play	19.33 $\pm$ 9.15	8.00 $\pm$ 5.54

Parallel Play	$72.67 \pm 8.39$	$89.33 \pm 6.70$
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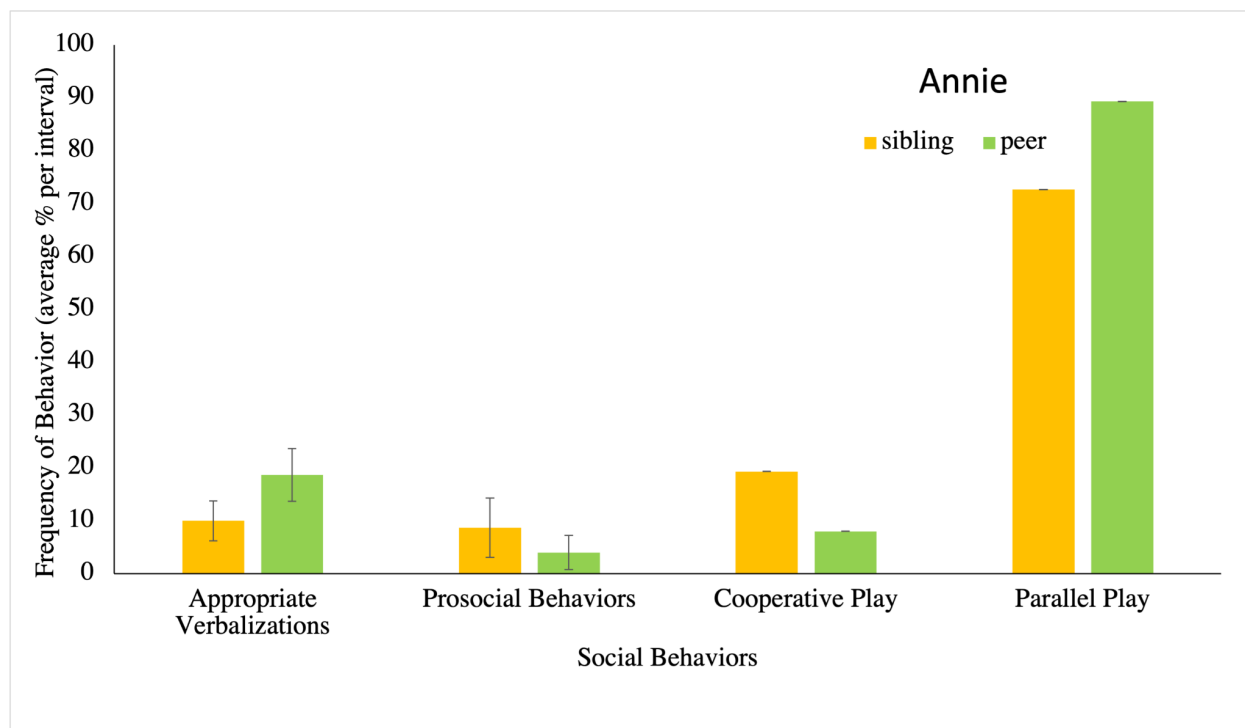


Figure 3. Annie's frequency of social behaviors, as measured by average percent per interval, during his sibling and peer play sessions, with standard error bars. Social behaviors that did not occur in any sibling or peer sessions were excluded.

## Wesley

Wesley's positive social behavior was consistently higher with his sister than with a peer (see Figure 4). Wesley's cooperative play was higher with his sister ( $M=49.33$ ,  $SD=17.54$ ) compared to a peer ( $M=38$ ,  $SD=35.79$ ); this result was not statistically significant, ( $p > 0.05$ ). Wesley's parallel play was slightly higher with his sister ( $M=61.33$ ,  $SD=22.19$ ) than with a peer ( $M=57.33$ ,  $SD=34.83$ ); this was also not statistically significant, ( $p > 0.05$ ). Wesley's appropriate verbalizations were marginally higher with his sister ( $M=52.67$ ,  $SD=22.04$ ) than with a peer ( $M=46.00$ ,  $SD=17.38$ ), but not statistically significant, ( $p > 0.05$ ). Wesley's prosocial behavior was low across all sessions; his prosocial behavior was marginally higher, but not statistically

significantly, with his sister ( $M=5.33$ ,  $SD=6.06$ ) than with a peer ( $M=4.67$ ,  $SD=5.06$ ), ( $p > 0.05$ ).

Wesley's stereotypy was significantly higher with his sister ( $M=17.33$ ,  $SD=7.60$ ) than with a peer ( $M=8.00$ ,  $SD=2.98$ ),  $t(8)=2.556$ ,  $p=0.049$ . He rarely exhibited inappropriate verbalizations and never aggression (see Table 7).

*Table 7: Scored Behaviors for Wesley's Sibling and Peer play Sessions (average % per interval  $\pm$  standard error).*

Behaviors	Sibling	Peer
Appropriate Verbalizations	$52.67 \pm 9.85$	$46.00 \pm 7.77$
Prosocial Behavior	$5.33 \pm 2.71$	$4.67 \pm 2.26$
Inappropriate Verbalizations	$1.33 \pm 0.82$	$0.00 \pm 0.00$
Aggression or Fighting	$0.00 \pm 0.00$	$0.00 \pm 0.00$
Verbal/Nonverbal Stereotypy	$17.33 \pm 3.40$	$8.00 \pm 1.33$
Eloping	$0.00 \pm 0.00$	$0.00 \pm 0.00$
Cooperative Play	$49.33 \pm 7.85$	$38.00 \pm 16.00$
Parallel Play	$61.33 \pm 9.92$	$57.33 \pm 15.58$

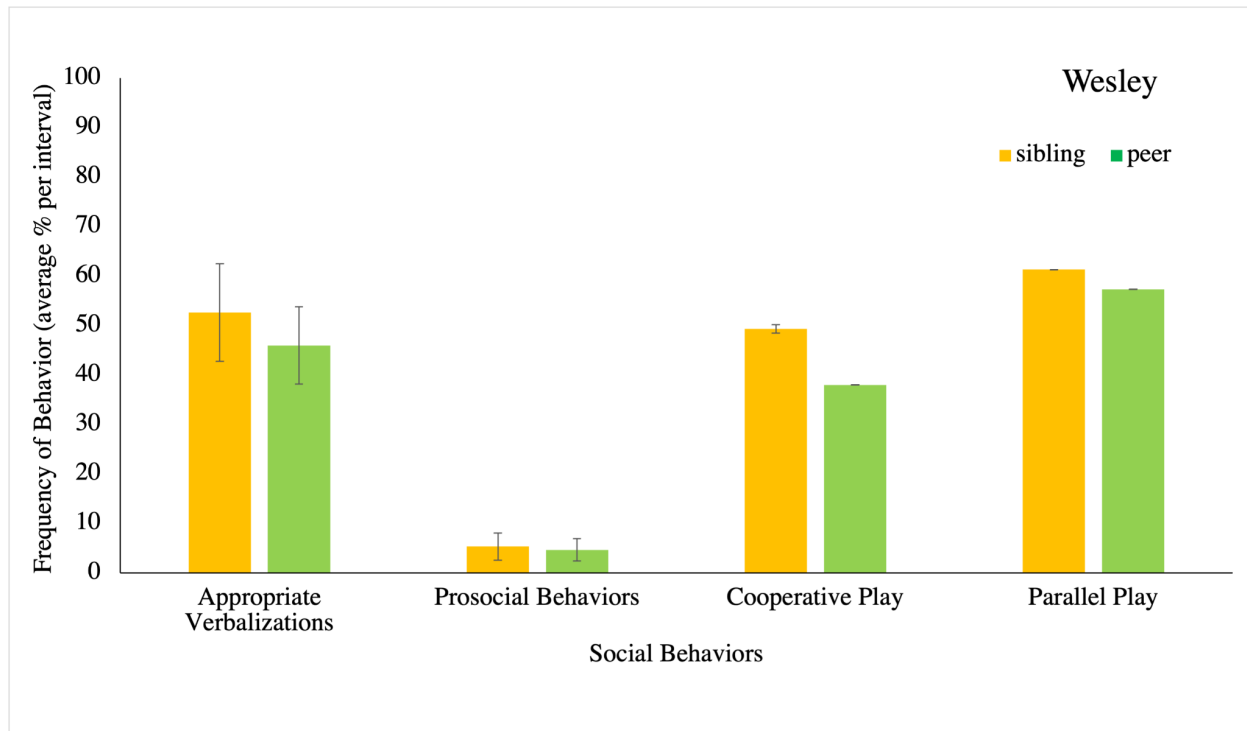


Figure 4. Wesley's frequency of social behaviors, as measured by average percent per interval, during his sibling and peer play sessions, with standard error bars. Social behaviors that did not occur in any sibling or peer sessions were excluded.

### Simon

Simon engaged in less cooperative play with his sister ( $M=1.33$ ,  $SD=1.83$ ) than a peer ( $M=6.67$ ,  $SD=9.13$ ), but this was not significant, ( $p > 0.05$ ) (see Figure 5). Simon primarily engaged in parallel play with both his sibling and with a peer; his parallel play was higher with his sibling than with a peer: ( $M=73.33$ ,  $SD=13.12$ ) with sibling and ( $M=84.67$ ,  $SD=11.93$ ) (see Figure 8); however, this result was not statistically significant, ( $p > 0.05$ ). Simon's appropriate verbalizations were low regardless of sibling or peer partner during his play sessions: ( $M=2.67$ ,  $SD=2.79$ ) for sibling and ( $M=4.00$ ,  $SD=3.65$ ) peer sessions. Simon's stereotypy was not significantly higher with his sibling ( $M=53.33$ ,  $SD=26.14$ ) than with a peer ( $M=38.00$ ,  $SD=13.46$ ), ( $p > 0.05$ ). Simon eloped slightly more from his sibling ( $M=4.67$ ,  $SD=2.98$ ) than a peer ( $M=2.0$ ,  $SD=2.98$ ), however this result was not significant, ( $p > 0.05$ ). Simon's

inappropriate verbalizations, aggression, and prosocial behavior were low across all play sessions, with no significant differences (see Table 8).

*Table 8: Scored behaviors of Simon for Peer and Sibling Sessions (average % per interval  $\pm$  standard error).*

Behaviors	Sibling	Peer
Appropriate Verbalizations	2.67 $\pm$ 1.25	3.99 $\pm$ 1.63
Prosocial Behavior	0.00 $\pm$ 0.00	0.00 $\pm$ 0.00
Inappropriate Verbalizations	1.33 $\pm$ 0.82	0.67 $\pm$ 0.67
Aggression or Fighting	0.00 $\pm$ 0.00	0.00 $\pm$ 0.00
Verbal/Nonverbal Stereotypy	53.33 $\pm$ 11.69	38.00 $\pm$ 6.02
Eloping	4.67 $\pm$ 1.33	2.00 $\pm$ 1.33
Cooperative Play	1.33 $\pm$ 0.82	6.67 $\pm$ 4.08
Parallel Play	73.33 $\pm$ 5.87	84.67 $\pm$ 5.33

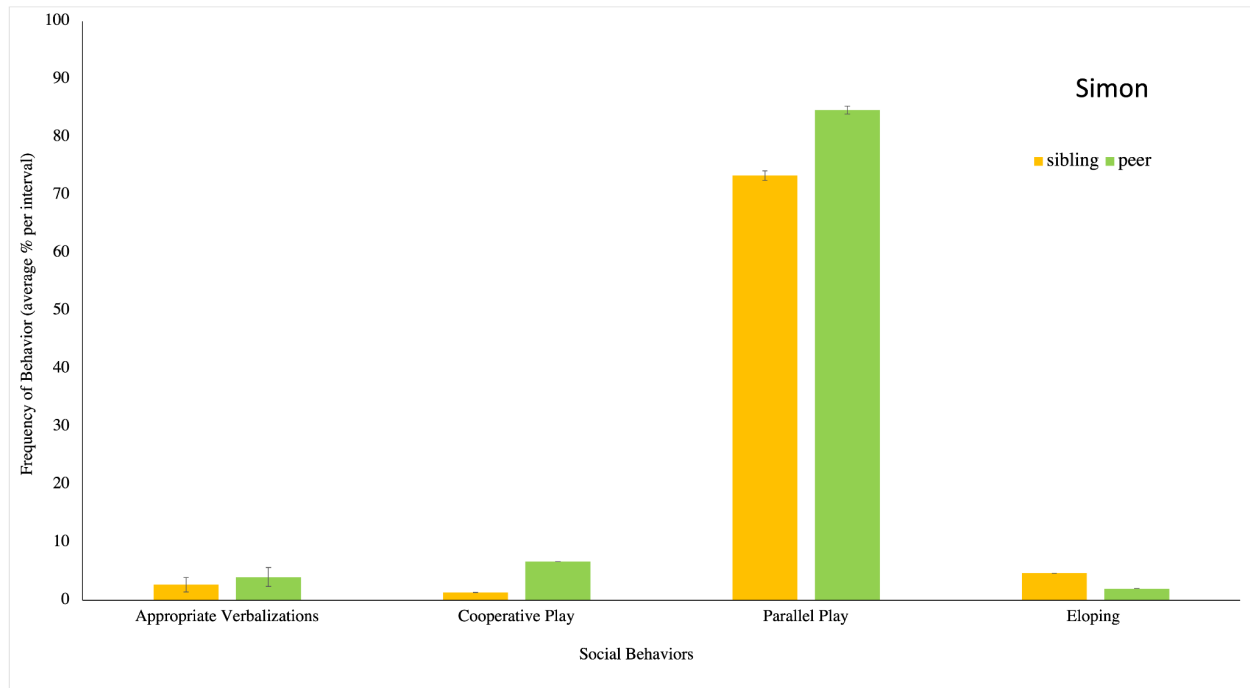


Figure 5. Simon's frequency of social behaviors, as measured by average percent per interval, during his sibling and peer play sessions, with standard error bars. Social behaviors that did not occur in any sibling or peer sessions were excluded.

## Zane

Zane rarely engaged in cooperative play or appropriate verbalizations across all play sessions; his cooperative play with his sister ( $M=5.33$ ,  $SD=6.91$ ) was not significantly higher than with a peer ( $M=0$ ,  $SD=0$ ), ( $p > 0.05$ ), (see Table 9). Zane primarily engaged in parallel play with both his sibling and with a peer; his parallel play was not significantly different with sibling ( $M=82$ ,  $SD=7.67$ ) and with peer ( $M=72$ ,  $SD=26.83$ ), ( $p > 0.05$ ). Zane's appropriate verbalizations were low regardless of sibling or peer partner during his play sessions: ( $M=1.33$ ,  $SD=2.98$ ) for sibling and ( $M=2.00$ ,  $SD=1.83$ ) peer sessions; this result was not statistically significant, ( $p > 0.05$ ). Zane's verbal and nonverbal stereotypy was not significantly different with his sibling ( $M=28.00$ ,  $SD=21.29$ ) than with a peer ( $M=16.67$ ,  $SD=16.67$ ); there was substantial variation in his stereotypy across all the sessions, ( $p > 0.05$ ). Zane eloped less during

his sibling sessions ( $M=2$ ,  $SD=1.83$ ) than with a peer ( $M=5.33$ ,  $SD=7.3$ ); however, this was not statistically significant, ( $p > 0.05$ ). Zane's inappropriate verbalizations were low across all play sessions, with no significant differences (see Table 9). Zane did not exhibit prosocial behavior or aggression during any of his play sessions. Zane's results are portrayed visually in Figure 6 below.

*Table 9: Zane's Scored behaviors for Sibling and Peer Play Sessions (average % per interval  $\pm$  standard error).*

Behaviors	Sibling	Peer
Appropriate Verbalizations	$1.33 \pm 1.33$	$2.00 \pm 0.82$
Prosocial Behavior	$0.00 \pm 0.00$	$0.00 \pm 0.00$
Inappropriate Verbalizations	$1.33 \pm 1.33$	$0.67 \pm 0.67$
Aggression or Fighting	$0.00 \pm 0.00$	$0.00 \pm 0.00$
Verbal/Nonverbal Stereotypy	$28 \pm 9.52$	$16.67 \pm 5.58$
Eloping	$2.00 \pm 0.82$	$5.33 \pm 3.26$
Cooperative Play	$5.33 \pm 3.09$	$0.00 \pm 0.00$
Parallel Play	$82.00 \pm 3.43$	$72.00 \pm 12.00$



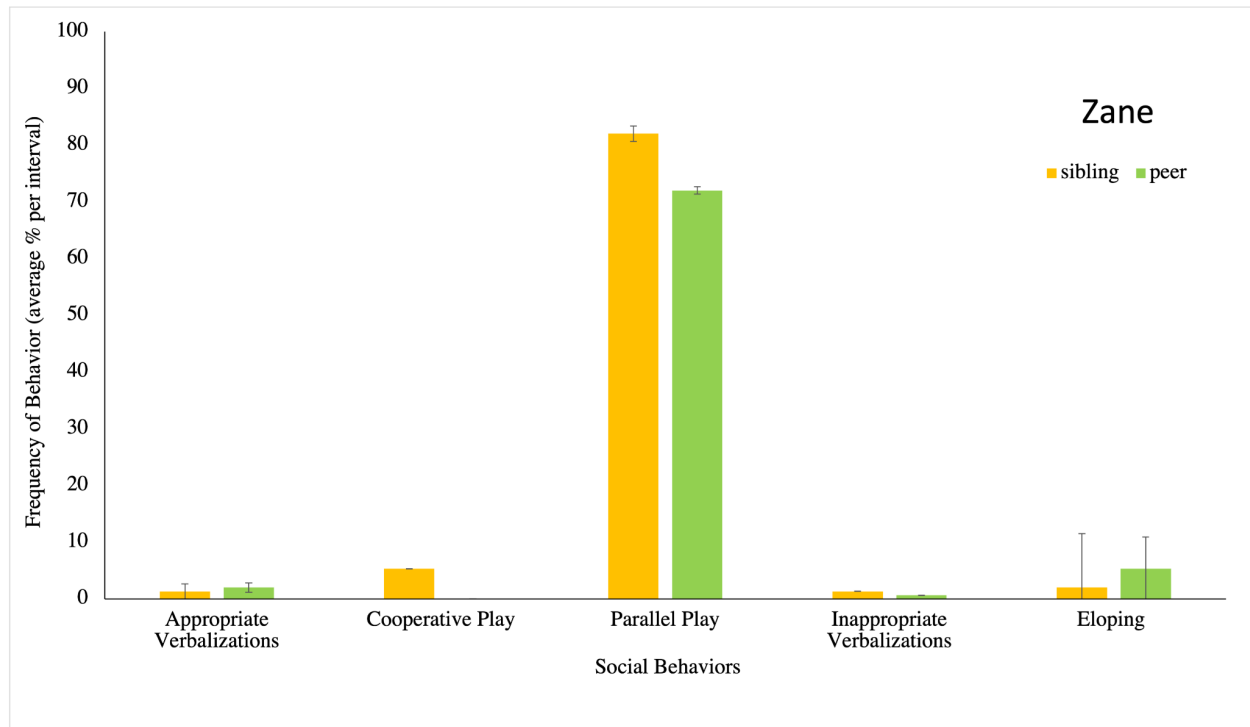


Figure 6. Zane’s frequency of social behaviors, as measured by average percent per interval, during his sibling and peer play sessions, with standard error bars. Social behaviors that did not occur in any sibling or peer sessions were excluded.

### Principal Component Analyses of Behavior

A principal component analysis was used to determine covariance patterns across the behavioral measures (see Figure 7). The PCA found that principal component 1 (PC1) accounted for 36.5% of the variation in the data and consisted of the variables appropriate verbalizations, cooperative play, and prosocial behavior. As PC1 consisted of positive social play behaviors, it was named “Positive Play.” All three of those behaviors (appropriate verbalizations, cooperative play, and prosocial behavior) aligned in the same way, signifying that they are likely related in function and co-occur. In addition, as PC1 accounts for 36.5% of the variation in the data, the three variables in includes play a crucial role in how much each child engages in positive play. In contrast, PC2, which accounted for 20.3% of the variation in the data, showcased that stereotypy

and parallel play load strongly and were in opposition to each other: as a child conducted more stereotypy they were likely not engaging in parallel play, and vice versa. The differences in PC1 and PC2 across all the children were found to be statistically significant, for the (PC1:  $F(5, 54)=14.871$ ,  $p < 0.001$ ); PC2: ( $F(5, 54)=14.838$ ,  $p < 0.001$ ). A *post hoc* Tukey test found there were statistically significant differences between many of the participants' positive social play behaviors (PC1), namely between Brandon and Wesley, Brandon and Sam, Zane and Annie, Zane and Wesley, Zane and Sam, Simon and Wesley, Simon and Sam, Simon and Annie, Annie and Wesley (Figure 8). A *post hoc* Tukey test found that there was a significant difference between Brandon's PC2 and all of the other participants' PC2 (Figure 9).

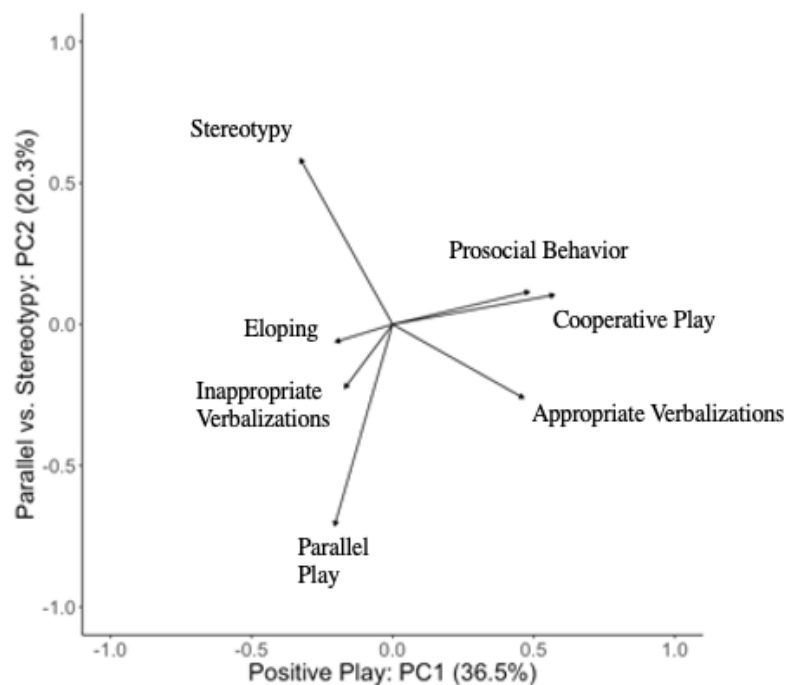


Figure 7. Principal component analysis (PCA) of social behaviors. PC1, named “Positive Play Behaviors”, (prosocial behavior, cooperative play, and appropriate verbalizations) accounted for 36.5% of the variation and were strongly aligned. PC2 accounted for 20.3% of the variation; stereotypy and parallel play were oppositely aligned in direction.

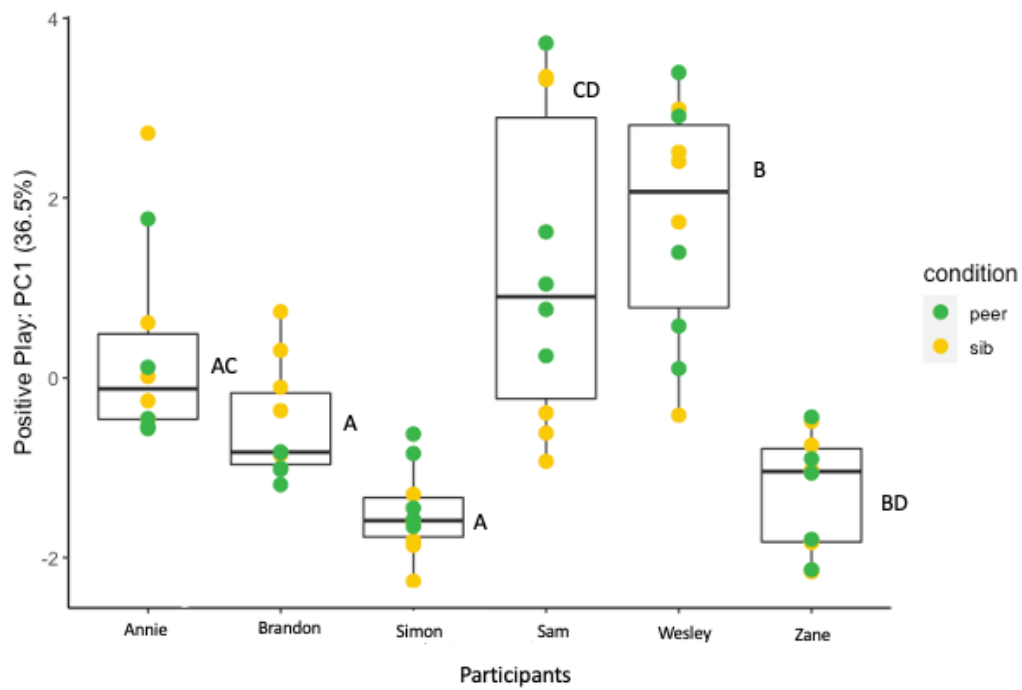


Figure 8. Positive social play behaviors, PC1, (including appropriate verbalizations, prosocial behavior, and cooperative play) across all autistic children in both peer and sibling play sessions. Significant differences were found among certain participants; participants with a different letter are significantly different and participants with the same letter do not differ.

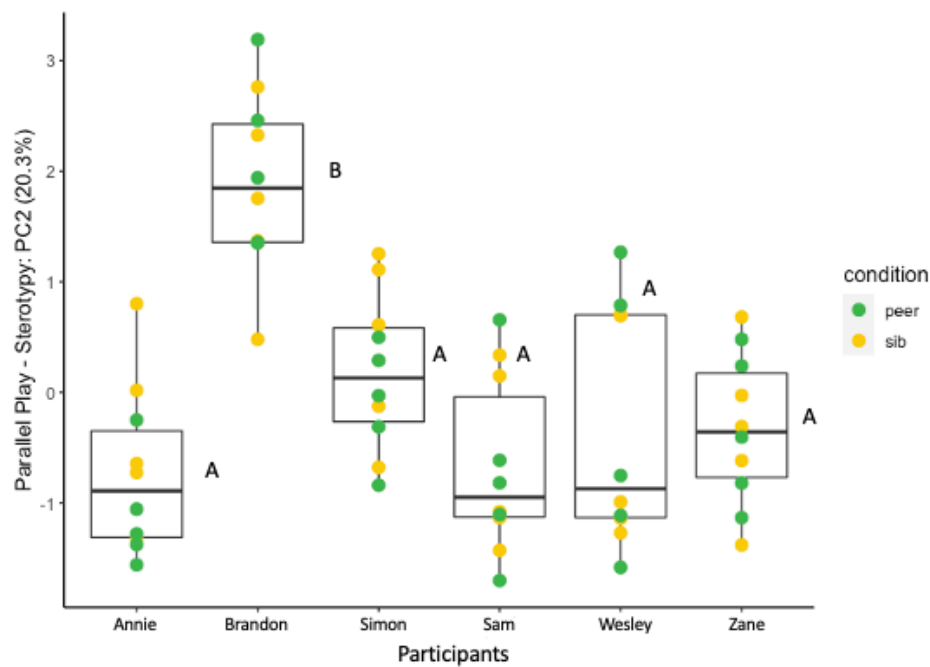


Figure 9. Stereotypy and parallel play behaviors, PC2, across all autistic children in both peer and sibling play sessions. All children did not have a significant difference in stereotypy and parallel play except Brandon; all similar participants are denoted “A” and Brandon is denoted as “B”.

## Verbal Ability and Behavioral Analyses

To test whether behavior varied based on verbal ability, the participants were divided by their verbal level (high or low) according to the clinic director at the Claremont Autism Center. Of the participants, three can be described as highly verbal (Sam, Wesley, Annie), and three are less verbal (Zane, Simon, Brandon). An independent t-test found that the higher verbal children had significantly higher “positive play” which includes appropriate verbalizations, cooperative play, and prosocial play ( $M=1.09$ ,  $SD=0.72$ ) than the less verbal children ( $M=-1.09$ ,  $SD=1.49$ ),  $t(58)=-7.200$ ,  $p<.001$ , see Figure 10. Independent t-tests confirmed these significant differences for the specific behaviors between the verbal groups (high and low): appropriate verbalizations, cooperative play, and prosocial play. An independent t-test showed that the higher verbal children had significantly lower stereotypy and higher parallel play (PC2) ( $M=-0.58$ ,  $SD=0.87$ )

compared to the lower verbal children, who engaged in more stereotypy and less parallel play ( $M=0.58$ ,  $SD=1.20$ ),  $t(58)=4.315$ ,  $p < .001$ , see Figure 11. To further investigate this result, an independent t-test confirmed that the high verbal children conducted significantly less stereotypy ( $M=5.22$ ,  $SD=6.98$ ) than the low verbal children ( $M=38.78$ ,  $SD=23.23$ ), ( $t(58)= -7.575$ ,  $p < .001$ ). However, the higher verbal children did not engage in significantly more parallel play ( $M=70.78$ ,  $SD=23.9$ ) compared to the low verbal children ( $M=61.11$ ,  $SD=28.53$ ), ( $t(58)=1.422$ ,  $p=0.160$ ).

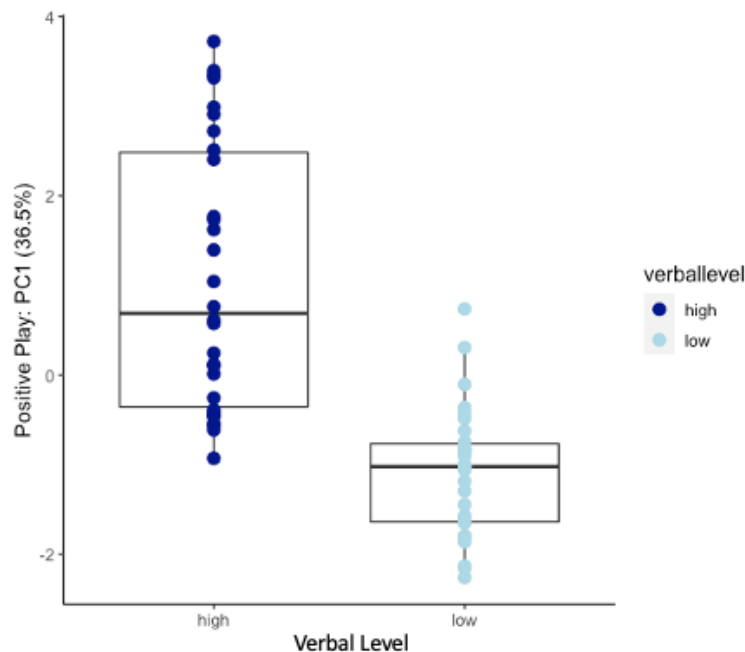


Figure 10. Positive play behaviors including appropriate verbalizations, cooperative play, and prosocial behavior compared between high verbal and low verbal participants. Positive play was significantly higher among the higher verbal group than the lower verbal group.

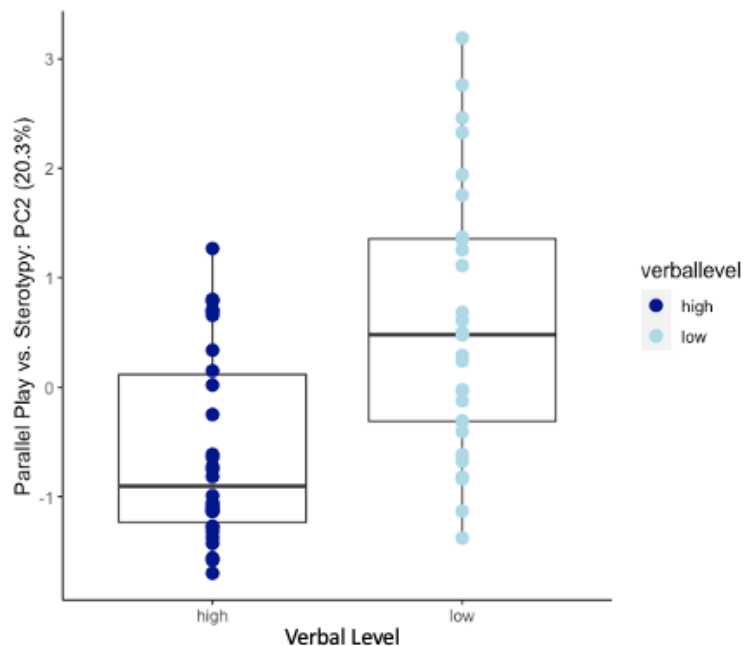


Figure 11. Parallel play and stereotypy (PC2) compared between high verbal and low verbal participants. Higher PC2 signifies higher levels of stereotypy and lower parallel play. The higher verbal participants had significantly lower stereotypy and higher parallel play compared to the low verbal participants.

## Discussion

The purpose of the present study was to examine the differences in social play behavior of autistic children when they play with their TD sibling compared to a TD peer. The initial hypothesis that play condition, sibling or peer, would affect social behavior was supported for some individuals, as there were differences in play behavior for certain participants. When grouping all participants together, there was a trend of higher prosocial behavior with their sibling, but no consistent significant differences for the other behaviors between sibling and peer sessions. When looking at each participant individually, there were significant differences in their social behaviors when comparing their sibling and peer sessions. The second hypothesis that positive social behaviors would covary and non-social or negative behaviors would covary

was supported by the PCA. The third hypothesis that participants would have different behavioral profiles from each other was supported by the comparison of PC1 and PC2 across children (Figures 8, 9). This study supports previous research that some autistic children have a positive relationship and enjoy playing with their siblings while others engage in more positive play with a peer (Kaminsky & Dewey, 2001, Angell et al., 2012, Braconnier et al. 2017, Kent et al., 2020). Moreover, there are three major takeaways from this study; for the most part, the individual child drives the variation in behavior not the peer type; there are some significant differences in how autistic participants played with a sibling vs. peer; and there are relationships among certain play behaviors (e.g. appropriate verbalizations, prosocial behavior, and cooperative play).

### **Children Varied in Their Play Behavior**

One of the overarching takeaways from this study is that the autistic child drives the differences in behavior, not the playmate type: peer vs. sibling. There were no significant differences in any of the play behaviors (with the exception of prosocial behavior) of the autistic children when comparing sibling and peer sessions, with all of the participants grouped together. Participants showed a trend of higher prosocial behavior with their sibling than with a peer; however there were many zeros in this data and prosocial behavior was consistently low (Figures 4, 5, 6, 7). In addition, many of the participants all had significantly different positive play behaviors (PC1: appropriate verbalizations, prosocial behavior, and cooperative play) and/or different parallel play/stereotypy (PC2) from each other (Figures 8, 9). One mediating factor, which may be driving some of the variation in play behavior, is verbal ability. Appropriate verbalizations, prosocial behavior, and cooperative play were significantly greater in the highly

verbal children Wesley, Annie, and Sam compared to the less verbal children: Zane, Simon, Brandon. This further supports a relationship between social speech and cooperative play. For the less verbal children, increasing their speech may also increase their cooperative play. In addition, this pattern helps to show validity in the measurement of appropriate verbalizations. The less verbal children also engaged in significantly more stereotypy than the high verbal children (Figure 11). Parallel play was not significantly different between the high or low verbal children. Similar to these results, Welsh (2011) found that turn taking, joint attention, imitation, and interaction initiation did not differ whether playing with a peer or their sibling when grouping all autistic children together. In conclusion, the effect of peer type (sibling or non-sibling) was not consistent across all of the autistic participants, supporting that the variation is driven largely by individual child differences.

### **Play Differences Between Peer and Sibling Sessions**

For certain children, there were differences in behaviors between the sibling and peer condition. Differences were seen in the following behaviors: parallel play, cooperative play, appropriate verbalizations, prosocial behavior, eloping, and stereotypy (for one child).

#### *Parallel Play and Cooperative Play*

Parallel play was much more frequent than cooperative play across all the children. These results are consistent with previous research showing that autistic children rely on parallel play for a longer time than their TD peers and struggle to engage in cooperative play (Brigano, 2011; Preissler, 2006). In addition, the younger children (Zane and Simon) engaged in much more parallel play than cooperative play, which is consistent with their development based on their



biological ages and mental ages. Cooperative play varied between the different participants when comparing conditions (sibling vs. peer). Four out of the six children engaged in more cooperative play with their sibling compared to a peer: Brandon, Annie, Wesley, and Zane (Figure 1, 3, 4, 6). In contrast, Sam and Simon engaged in more cooperative play with peers compared to with their sisters (Figures 2, 5). These results for cooperative play mirror the findings of Welsh (2011), who found that two of her three participants engaged in more turn taking with their sibling compared to a peer. In addition, similar to this study, one of the subjects in Welsh's (2011) study took turns more often with a peer. Moreover, the result of higher cooperative play during sibling sessions (for 4 of the autistic children) opposes the findings of Kent et al. (2020), who found that playfulness was lower among sibling dyads compared to peer dyads. In conclusion, some autistic children play more cooperatively with their peers and others with their siblings, thus the needs of specific children and sibling/peer attitudes towards inclusion in research are particularly important.

Levels of parallel play varied considerably among the children: Brandon, Wesley, and Zane were higher with their sibling; Sam, Annie, and Simon had higher parallel play with a peer (see Figures 1-6). However, the differences in parallel play between sibling and peer sessions were less striking than the differences in cooperative play, with many children showing similar levels between their sibling and peer sessions.

#### *Appropriate Verbalizations*

Two children spoke more with their sibling (Brandon, Wesley) and two children (Sam, Annie) talked more with a peer (see Figures 1-4). Additionally, Zane and Simon had almost identical levels of appropriate verbalizations in their sibling and peer sessions (see Figure 5, 6).

As described earlier, the variation in these results is most likely based on verbal ability not peer type (sibling or peer). However, some children did show a trend of preferring to converse with their sibling or with a peer. Further research with more sessions could investigate if these sibling vs. peer differences of appropriate verbalizations are significant for the children in this study.

### *Prosocial Behavior*

All the autistic children exhibited low levels of prosocial behavior during their play sessions (regardless of peer type). No participants exceeded more than 14% (per interval) of prosocial behavior during any sessions, with two participants engaging in 0% prosocial behavior (per interval) across all of their sibling and peer sessions (Zane and Simon). However, for the children who did exhibit prosocial behavior, their prosocial behavior was marginally higher with their siblings compared with a peer: Sam, Annie, Brandon, and Wesley (see Figures 4-7). These results support previous research that autistic individuals tend to have lower prosocial skills compared to their TD peers (Oerlemans et al., 2018). Interestingly, none of the autistic participants in this study had an older TD sibling. Ben-Itzhak et al. (2016) found that prosocial behavior is higher among autistic children who have an older TD sibling, as they tend to imitate prosociality of their older sibling. Future studies could investigate whether autistic children with an older TD sibling display higher prosociality when playing with their sibling, who they would likely imitate, compared to a peer. In addition, research could investigate the differences in OT levels and OXTR gene expression in autistic subjects to learn more about the hormonal and genetic pathology underlying prosocial behavior during play sessions. Specifically, levels of OT could be compared between sibling and peer play sessions to see if those behavioral differences

are maintained hormonally (John & Jaeggi, 2021; Parker et al., 2014; Sikich et al., 2021; Yamasue et al., 2012).

### *Stereotypy*

Stereotypy did not differ for the vast majority of the participants (see Tables 4-9). As stereotypy is not a direct social behavior, this result is unsurprising. For Wesley, his stereotypy was significantly higher with his sister than with peers (see Table 7). Since Wesley's stereotypy often consisted of hand flapping and repetitive vocalizations, his stereotypy may co-occur with higher play (which was higher with his sister). However, further research with more sessions could investigate these findings.

### *Eloping*

Three of the six participants never eloped from any of their partners. Both Sam and Simon eloped more from their sisters (see Figures 2, 5), while Zane eloped more from his peer partner (see Figure 6). These results directly show which type of peer (sibling or non-sibling) the participants would prefer to play with. Sam and Simon's high eloping and lower cooperative play with their siblings supported that they engaged more positively with their peers than their sisters. In contrast, Zane played more (both cooperative and parallel) and eloped less from his sister, supporting that he engaged more positively with his sister than with his peer partner.

## **Relationships Among Play Behaviors**

The results of the PCA showed that several of the play behaviors co-vary and load strongly on the same PCs. There was a strong alignment of three positive social play behaviors (which made up PC1: “positive social play”): appropriate verbalizations, prosocial behavior, and cooperative play. Moreover, “positive social play” (PC1) accounted for 36.5% of the variation in the data, signifying that those three behaviors were of key importance. In addition, the PC 2 results showed that stereotypy and parallel play were in opposing directions, meaning that as a child engaged in parallel play their stereotypy decreased. This stereotypy-play relationship was seen in individual participants’ stereotypy and cooperative play results. Children who engaged in more cooperative play showed lower levels of stereotypy: Wesley, Annie, and Sam. Conversely, Simon, Brandon, and Zane all showed low cooperative play and high stereotypy. Previous research supports that play can substitute stereotypy, through reciprocal inhibition (Allison et al, 1995, Greenberg et al., 2016, McLaughlin A & Fleury V, 2020). In addition, athletic play has also been found to lower stereotypy, particularly stereotypy which is automatically maintained (McLaughlin, Constance 2010). While play increases engagement, it is important to note that autistic children can still engage in stereotypy while playing, but they tend not to. These results can help therapists create behavioral programming emphasizing play to increase social engagement and help decrease challenging behaviors for autistic children. Lastly, PC3, which included eloping and inappropriate verbalizations, was higher in sibling sessions compared to peer sessions, signifying a condition effect (*data not provided in results*). However, these behaviors occurred much less frequently. Future research with a bigger sample size could investigate whether less common behaviors like eloping are more likely to differ between sibling and peer sessions; regarding PC3, autistic children would elope more from their sibling.

These results can be used to help clinicians identify areas of support for autistic children, potential peers for related interventions, and the importance of improving sibling play. Therapists may focus on increasing a child's cooperative play and decreasing their parallel play since those were particularly low, such as for Sam; in contrast, for another child therapists may focus on increasing cooperative and parallel play and decreasing stereotypy, such as for Brandon. As many of the participants did not have striking behavioral differences between their sibling and peer sessions, therapy centers should consider integrating non-sibling peers for mediated interventions. Non-sibling peers are ideal for autistic children who do not have a TD sibling and those who have a TD sibling, but that sibling is not a good option, such as, if the sibling cannot participate, does not wish to participate, or the sibling relationship is strained. In addition, integrating some TD siblings into interventions for their autistic sibling can be negative: the TD child may not want to participate, the TD child may become burned out from the intervention/research, and the TD child may resent their autistic sibling (Locke et al., 2012). However, some TD siblings are keen to participate in interventions and can be very beneficial for improving an autistic child's play behavior. For example, in this study, Cassidy served as an ideal sibling peer as she helped to facilitate Brandon's cooperative play, appropriate verbalizations, and prosocial behavior by asking him questions and creating games for him. Lastly, several of the sibling dyads consisted of low cooperative play, high stereotypy, less speech, and in some cases eloping. These sibling dyads should receive more support to improve their sibling relationships and increase play because higher at-home play will improve both of their social skills and create a more positive home environment.

## **Experimental Considerations**

Although the results of this study offer promising insight into the social behavior of autistic children in sibling and peer dyads, there are a few limitations. This study had a relatively small sample size ( $n=14$ ) and few play sessions (5) which introduces a greater chance of error into the study. Regarding the statistical analyses, significance was likely underestimated due to the small sample size. Prosocial behavior may have been overestimated in significance since there were many zeros in the data for some participants. Due to the Covid-19 pandemic, participants wore masks and played outdoors which made it harder to see facial expressions and watch them speak to each other. Due to the nature of the clinic, participants conducted play sessions while the large social skills group was occurring. Participants may have wanted to rejoin the social skills group and were overall less engaged than they typically would be during a playdate. In addition, all the TD peers had a sibling diagnosed with ASD. These children may be more aware of how to engage with autistic children. However regardless of this common background, the peers were still unrelated to the autistic child. Lastly, analysis of the sibling and peers' behavior during the play sessions could provide insight into how individuals can best provoke social interactions and positive play of an autistic child.

### **Conclusion**

Overall, the present study provides preliminary support that some autistic children exhibit higher levels of social play with their sibling and others with a peer. For certain autistic participants, there were substantial differences in their frequency of specific behaviors (such as cooperative play) while playing with a sibling compared to a peer. In addition, social play behaviors including appropriate verbalizations, prosocial behavior, and cooperative play tend to co-occur. In contrast, parallel play opposed stereotypy, supporting that play can substitute

stereotypy. By highlighting each child's strengths and challenges and the nature of their sibling/peer relationships, this study can inform clinicians of areas of support to increase social skills, play skills, improve their sibling dynamics, and help them make friends.

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## Works Cited

- Abramovitch, R., Corter, C., Pepler, D. J., & Stanhope, L. (2021). *Sibling and Peer Interaction: A Final Follow-Up and a Comparison*. 14.
- Allison, D. B., Faith, M. S., & Franklin, R. D. (1995). Antecedent exercise in the treatment of disruptive behavior: A meta-analytic review. *Clinical Psychology: Science and Practice*, 2(3), 279–303. <https://doi.org/10.1111/j.1468-2850.1995.tb00045.x>
- American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.)  
<https://doi.org/10.1007/s10802-016-0133-0>
- Angell, M. E., Meadan, H., & Stoner, J. B. (2012). Experiences of Siblings of Individuals with Autism Spectrum Disorders. *Autism Research and Treatment*, 2012, 1–11. <https://doi.org/10.1155/2012/949586>
- Ben-Itzhak, E., Nachshon, N., & Zachor, D. A. (2019). Having Siblings is Associated with Better Social Functioning in Autism Spectrum Disorder. *Journal of Abnormal Child Psychology*, 47(5), 921–931. <https://doi.org/10.1007/s10802-018-0473-z>
- Ben-Itzhak, E., Zukerman, G., & Zachor, D. A. (2016). Having Older Siblings is Associated with Less Severe Social Communication Symptoms in Young Children with Autism Spectrum Disorder. *Journal of Abnormal Child Psychology*, 44(8), 1613–1620. <https://doi.org/10.1007/s10802-016-0133-0>
- Beyer, J., & Gammeltoft, L. (2000). Autism and play. London: Jessica Kingsley.
- Braconnier, M. L., Coffman, M. C., Kelso, N., & Wolf, J. M. (2018). Sibling Relationships: Parent–Child Agreement and Contributions of Siblings With and Without ASD. *Journal of Autism and Developmental Disorders*, 48(5), 1612–1622.



<https://doi.org/10.1007/s10803-017-3393-9>

Brigano M.O. (2011) Parallel Play. In: Goldstein S., Naglieri J.A. (eds) Encyclopedia of Child Behavior and Development. Springer, Boston, MA.

Charlop-Christy, M. H., Lang, R., & Rispoli, M. (2018). *Play and social skills for children with autism spectrum disorder* (Ser. Evidence-based practices in behavioral health). Springer.  
<https://doi.org/10.1007/978-3-319-72500-0>

Charlop-Christy, M. H., LeBlanc, L. A., Carpenter, M. H. (1999). Naturalistic teaching strategies (NATS) to teach speech to children with autism: Historical perspective, development, and current practice. *The California School Psychologist*, 4, 30–46.

Dirks, M. A., Persram, R., Recchia, H. E., & Howe, N. (2015). Sibling relationships as sources of risk and resilience in the development and maintenance of internalizing and externalizing problems during childhood and adolescence. *Clinical psychology review*, 42, 145–155. <https://doi.org/10.1016/j.cpr.2015.07.003>

Dunn J. (1989) Siblings and the Development of Social Understanding in Early Childhood In: Zukow P.G. (eds) *Sibling Interaction Across Cultures*. Springer, New York, NY.  
[https://doi.org/10.1007/978-1-4612-3536-1\\_6](https://doi.org/10.1007/978-1-4612-3536-1_6)

Ferraioli, S. J., Hansford, A., & Harris, S. L. (2012). Benefits of Including Siblings in the Treatment of Autism Spectrum Disorders. *Cognitive and Behavioral Practice*, 19(3), 413–422. <https://doi.org/10.1016/j.cbpra.2010.05.005>

Georgiades S, Szatmari P, Zwaigenbaum L, Bryson S, Brian J, Roberts W, Smith I, Vaillancourt T, Roncadin C, Garon N. A prospective study of autistic-like traits in unaffected siblings of probands with autism spectrum disorder. *JAMA Psychiatry*. 2012;69(9):doi:10.1001/2013.jamapsychiatry.1.

- Greenberg, Jeremy H., Lau, Wendy & Lau, Sandy (2016). Teaching appropriate play to reduce stereotypy using a treatment package with students having autism. *Global Education Review*, 3 (3). 94-104
- Grindle, C. F., Kovshoff, H., Hastings, R. P., & Remington, B. (2009). Parents' Experiences of Home-Based Applied Behavior Analysis Programs for Young Children with Autism. *Journal of Autism and Developmental Disorders*, 39(1), 42–56.  
<https://doi.org/10.1007/s10803-008-0597-z>
- Jones, C. D., & Schwartz, I. S. (2004). Siblings, Peers, and Adults: Differential Effects of Models for Children With Autism. *Topics in Early Childhood Special Education*, 24(4), 187–198. <https://doi.org/10.1177/02711214040240040101>
- Jones, E. A., Fiani, T., Stewart, J. L., Sheikh, R., Neil, N., & Fienup, D. M. (2019). When One Sibling has Autism: Adjustment and Sibling Relationship. *Journal of Child and Family Studies*, 28(5), 1272–1282. <https://doi.org/10.1007/s10826-019-01374-z>
- Jordan, R. (2003). Social Play and Autistic Spectrum Disorders: A Perspective on Theory, Implications and Educational Approaches. *Autism*, 7(4), 347–360.  
<https://doi.org/10.1177/1362361303007004002>
- Kent, C., Cordier, R., Joosten, A., Wilkes-Gillan, S., & Bundy, A. (2020). Can We Play Together? A Closer Look at the Peers of a Peer-Mediated Intervention to Improve Play in Children with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, 50(8), 2860–2873. <https://doi.org/10.1007/s10803-020-04387-6>
- Kent, C., Cordier, R., Joosten, A., Wilkes-Gillan, S., & Bundy, A. (2020). The Play Differences of Children With Autism Spectrum Disorder (ASD) Within Sibling and Nonsibling Peer Dyads. *The American Journal of Occupational Therapy*, 74(4\_Supplement\_1),

7411515357p1-7411515357p1. <https://doi.org/10.5014/ajot.2020.74S1-PO2109>

Lane, J. D., Lieberman-Betz, R., & Gast, D. L. (2016). An Analysis of Naturalistic Interventions for Increasing Spontaneous Expressive Language in Children With Autism Spectrum Disorder. *The Journal of Special Education*, 50(1), 49–61.

<https://doi.org/10.1177/0022466915614837>

Ledford, J. R., & Pustejovsky, J. E. (2021). Systematic Review and Meta-Analysis of Stay-Play-Talk Interventions for Improving Social Behaviors of Young Children. *Journal of Positive Behavior Interventions*, 109830072098352.

<https://doi.org/10.1177/1098300720983521>

Locke, J., Rotheram-Fuller, E., & Kasari, C. (2012). Exploring the Social Impact of Being a Typical Peer Model for Included Children with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, 42(9), 1895–1905.

<https://doi.org/10.1007/s10803-011-1437-0>

McLaughlin, C. A. H. (2010). *Decreasing stereotypy in preschoolers with autism spectrum disorder: The role of increased physical activity and function* (Order No. 3424274).

Available from ProQuest Dissertations & Theses Global; Publicly Available Content

Database; Social Science Premium Collection. (756918726).

<http://ccl.idm.oclc.org/login?url=https://www.proquest.com/dissertations-theses/decreasing-stereotypy-preschoolers-with-autism/docview/756918726/se-2>

Oerlemans, A. M., Rommelse, N. N. J., Buitelaar, J. K., & Hartman, C. A. (2018). Examining the intertwined development of prosocial skills and ASD symptoms in adolescence.

*European Child & Adolescent Psychiatry*, 27(8), 1033–1046.

<https://doi.org/10.1007/s00787-018-1114-3>

Orm, S., Haukeland, Y., Vatne, T. *et al.* Prosocial Behavior Is a Relative Strength in Siblings of Children with Physical Disabilities or Autism Spectrum Disorder. *J Dev Phys Disabil* (2021) .<https://doi.org/10.1007/s10882-021-09816-7>

Parker, K. J., Garner, J. P., Libove, R. A., Hyde, S. A., Hornbeak, K. B., Carson, D. S., Liao, C.-P., Phillips, J. M., Hallmayer, J. F., & Hardan, A. Y. (2014). Plasma oxytocin concentrations and OXTR polymorphisms predict social impairments in children with and without autism spectrum disorder. *Proceedings of the National Academy of Sciences*, *111*(33), 12258–12263. <https://doi.org/10.1073/pnas.1402236111>

Rum, Y., Zachor, D. A., & Dromi, E. (2021). Prosocial behaviors of children with autism spectrum disorder (ASD) during interactions with their typically developing siblings. *International Journal of Behavioral Development*, *45*(4), 293–298. <https://doi.org/10.1177/0165025420971042>

Shivers, C. M., Jackson, J. B., & McGregor, C. M. (2019). Functioning Among Typically Developing Siblings of Individuals with Autism Spectrum Disorder: A Meta-Analysis. *Clinical child and family psychology review*, *22*(2), 172–196. <https://doi.org/10.1007/s10567-018-0269-2>

Sikich, L., Kolevzon, A., King, B. H., McDougale, C. J., Sanders, K. B., Kim, S.-J., Spanos, M., Chandrasekhar, T., Trelles, M. D. P., Rockhill, C. M., Palumbo, M. L., Witters Cundiff, A., Montgomery, A., Siper, P., Minjarez, M., Nowinski, L. A., Marler, S., Shuffrey, L. C., Alderman, C., ... Veenstra-VanderWeele, J. (2021). Intranasal Oxytocin in Children and Adolescents with Autism Spectrum Disorder. *New England Journal of Medicine*, *385*(16), 1462–1473. <https://doi.org/10.1056/NEJMoa2103583>

- Tomchek, S., & Koenig, K. (2016). *Occupational therapy practice guidelines for children and adolescents with Autism Spectrum Disorders*. American Occupational Therapy Association, Inc.
- Tsao, L.-L., & Odom, S. L. (2006). Sibling-Mediated Social Interaction Intervention for Young Children With Autism. *Topics in Early Childhood Special Education*, 26(2), 106–123.  
<https://doi.org/10.1177/02711214060260020101>
- Welsh, Laura E., "Effect Of Siblings And Peers On Social Interaction Of Children With Autism" (2011). Masters Theses. 98. <http://thekeep.eiu.edu/theses/98>
- Wong, C., & Kasari, C. (2012). Play and Joint Attention of Children with Autism in the Preschool Special Education Classroom. *Journal of Autism and Developmental Disorders*, 42(10), 2152–2161. <https://doi.org/10.1007/s10803-012-1467-2>
- Yamasue, H., Yee, J. R., Hurlemann, R., Rilling, J. K., Chen, F. S., Meyer-Lindenberg, A., & Tost, H. (2012). Integrative Approaches Utilizing Oxytocin to Enhance Prosocial Behavior: From Animal and Human Social Behavior to Autistic Social Dysfunction. *Journal of Neuroscience*, 32(41), 14109–14117a.  
<https://doi.org/10.1523/JNEUROSCI.3327-12.2012>
- Zager, D. B., Wehmeyer, M. L., & Simpson, R. L. (Eds.). (2012). Educating students with autism spectrum disorders: Research-based principles and practices. *Routledge*.
- Zhang, J. (2021). *A Meta-Analysis of Peer-Mediated Interventions for Young Children with Autism Spectrum Disorders*. 17.

## Appendices

### Appendix A- Data Collection Instrument

This instrument shows the partial interval scoring format for 5 minutes. During official scoring, the interval will be for 10 minutes.

Time	Prosocial Behavior	Appropriate Spontaneous Verbalization	Inappropriate Spontaneous Verbalization	Aggressive/Fighting Behavior	Eloping	Stereotypy	Cooperative Play	Parallel Play
0:01-0:10								
0:11-0:20								
0:21-0:30								
0:31-0:40								
0:41-0:50								
0:51-1:00								
1:01-1:10								
1:11-1:20								
1:21-1:30								
1:31-1:40								
1:41-1:50								
1:51-2:00								
2:01-2:10								
2:11-2:20								
2:21-2:30								

2:31-2:40								
2:41-2:50								
2:51-3:00								
3:01-3:10								
3:11-3:20								
3:21-3:30								
3:31-3:40								
3:41-3:50								
3:51-4:00								
4:01-4:10								
4:11-4:20								
4:21-4:30								
4:31-4:40								
4:41-4:50								
4:51-5:00								

Appendix B- Operational Definitions

Operational Definitions

**Prosocial Behavior:** assessing explicit prosocial behavior. **Any instance of nonverbal or verbal voluntary, positive behaviors directed at a partner that are intended to benefit the other.**  
Verbal examples include: helping (defined as providing aid to the other person), praising (expression of warm approval or admiration of, often with the intent to reinforce behavior), thanking someone.  
Nonverbal examples include: physical comforting (The easing or alleviation of the other’s distress or pain) such as a hug or rub on the back, volunteering time, expertise, or effort, and sharing (offering toys, resources, or space to partner). (e.g. “I can help you color in the house” or “I’m sorry that you lost that round”).

- (+) includes prosocial behaviors
- (n) no prosocial behaviors occurred

**Appropriate Verbalizations:** assessing appropriate verbalizations. **Any instance of spontaneous, unprompted verbalization that is contextually appropriate.** Examples include topic initiation, responding to a peer's question, sustaining a topic, asking peers conversationally relevant questions, commenting on what someone else said, acting out toys, or narrating play ((e.g. "I also like to watch TV!" or "I think green is the best color too" or "The dragon flies to the castle").

- (+) contextually appropriate spontaneous speech
- (n) includes no appropriate verbalizations occurred

**Inappropriate Verbalizations:** assessing inappropriate verbalization. **Any instance of spontaneous, unprompted speech that is not contextually appropriate and that indicate insistence of sameness, impatience, or inflexibility.** Examples include interrupting peers, saying something unrelated to the current topic of conversation, tonally inappropriate responses (Like complaining, whining, or yelling at a peer), or throwing a tantrum (verbal behaviors of a tantrum can include: crying with/or without tears and screaming)

- (+) contextually inappropriate speech
- (n) includes no inappropriate verbalizations occurred

**Aggressive/Fighting Behaviors:** Assessing aggression/fighting behaviors. **Any instance of spontaneous, unprompted negative social behavior related to fighting and aggression.** Examples include threats to their peer (defined as intimidation or intentional behavior that causes the other person to be fearful of injury or harm), insults to a peer (defined as disrespectful or hurtful comments which intentionally or accidentally offend the other), and violent actions (defined as physical aggression and fighting directed at the other). (e.g. "I'm going to get you in trouble" and "You're bad at this game")

- (+) aggressive behavior (insult, threat, violence) occurred
- (n) no aggressive behaviors occurred

**Stereotypy:** Assessing stereotypy. Any instance of non-contextual or nonfunctional movements, postures, or utterances which are repetitive or ritualistic, specific to each child. **Non Vocal stereotypy (such as rocking, hand/arm flapping, or jumping) should occur at least three times to be counted as repetitive. Vocal stereotypy is the repetition of nonsense syllables or non contextual speech at least three times.**

Physical Stereotypy examples are lining up items in a row, hand flapping, rocking back and forth, flicking, pacing, spinning themselves or an object (360 degrees). Verbal stereotypy includes asking a repetitive question, repeating words to themselves, or echolalia: repetition of noises or phrases that the child hears). (e.g. Person 1: "How are you doing? Person 2: "How are you doing?"")



(+) spontaneous stereotypy behavior occurred

(n) no stereotypy behavior occurred

**Parallel Play:** assessing parallel play. **Play that can be categorized as existing of participants, adjacent to each other, playing separately.** Participant is engaged in their toy/play but is not interacting with their playmate. An example would be a participant playing with their toy train but not speaking, playing, or interacting with their partner.

- (+) parallel play occurred
- (n) no parallel play occurred

**Cooperative Play:** assessing cooperative/joint play. **Play that can be categorized as existing of primarily spontaneous, unprompted play which involves the child/adolescent actively playing with their partner and interacting during playtime, such as play with turn-taking or role playing with a partner.** Examples include playing imaginatively with dolls together or actively creating a castle with blocks together.

- (+) cooperative play occurred
- (n) no cooperative play occurred

**Eloping:** assessing elopement. Participant runs away from their playmate and leaves the blanket/tarp or blanket without the permission of the researcher (more than 3 feet away from the tarp/blanket). Includes running away or walking away with intent to leave the play area.

- (+) eloping occurred
- (n) no eloping occurred

## Appendix C: Parental Consent Forms

### Parental Consent Form

#### Social Play Behaviors Differences of Children with Autism Within Sibling and Non-sibling Peer Dyads

Your child is invited to participate in a research project. This study will require your child to play with either their brother/sister or a friend for 5 minutes. They would be asked to participate in five 5 minute play sessions. Your child's involvement in the study is entirely up to you and your child. You may withdraw your child at any time for any reason. Your child may withdraw themselves from the study at any time. Please continue reading for more information about the study. Your child is being asked to participate because he, she, or they have received a diagnosis of autism spectrum disorder.

**STUDY LEADERSHIP:** This research project is led by Clare Boldt, a senior at Scripps College, and an undergraduate staff member at the Claremont Autism Center, for her senior thesis. The present project is being supervised by Dr. Marjorie H. Charlop, Director at the Claremont Autism Center at Claremont McKenna College (CMC).

**PURPOSE:** The purpose of this study is to examine and investigate the differences in social behavior between siblings and non-siblings while playing games together. The current study aims to investigate social behaviors such as prosocial behaviors, cooperative play, verbalization, smiling/laughing, and aggressive behaviors.

**ELIGIBILITY:** Children and young adults diagnosed with autism spectrum disorder (ASD) who have a typically developing sibling are eligible for the study. All individuals at the center with a sibling can participate.

**PARTICIPATION:** If you decide to consent to having your child participate in this study, your child will be asked to participate in an observational study where they will play games with their sibling or another friend at the clinic who has also consented to being in the study. They will be required to give their assent to participate in the study through signing a developmentally appropriate form that they will read or have read to them. Your child will be given three separate chances to say if they want to participate in the study before being ruled out of the study. Additionally, we may want to observe your child playing with a friend from the clinic who also has been diagnosed with autism. This will occur during their weekly social skills group. Playing the games will be conducted outside in a quiet space and will consist of 5-minute sessions with your child and their sibling or peer. During those 5 minutes they will be instructed to play together (toys will be offered such as Legos, toy dinosaurs, superheroes, and trains). They will participate in a total of ten 5 minute play sessions (5 with their sibling and 5 with a friend). They will be told to chat with their friend. Your child will be recorded on an i-Pad for analysis later. Your child's confidentiality will be maintained at all times. They may participate in more than one play session with their sibling. All data collection will be done by May 3<sup>rd</sup>.

**RISKS & BENEFITS:** There are no risks for your child participating in this study beyond those normally experienced at social skills sessions and in normal non research play situations with other children, including those diagnosed with Autism Spectrum Disorder. There are no direct benefits to participating in this study. This study could improve your child's social skills through playing with their sibling and friend.

**COMPENSATION:** N/A

**VOLUNTARY PARTICIPATION:** Please understand that participation in this study is completely voluntary. Your decision whether or not to allow your child to participate will in no way affect you or your child's current or future relationship with Scripps College, Claremont McKenna College, the Claremont Autism Center, or any of their faculty, staff, therapists, or students. You have the right to withdraw your child from the research at any time without penalty. You also have the right for your child to refuse to participate in any part of the research for any reason without penalty. If you or your child do not consent to participate, your child will not be pulled out for this research project and will stay with the rest of the group for regular activities.

**CONFIDENTIALITY:** The individual privacy of your child will be maintained in all publications or presentations resulting from this study. All names will be kept confidential using codes for their names that only the primary researchers will know. All other data on data sheets and video recordings will be associated only with participant pseudonyms and will be kept separately from informed consent

documents that include participants' real names but do contain visual footage of the participants. Video recordings of the play sessions will not be shown at any point following the research. These recordings will be taken using Tablet recordings and directly uploaded to a hard drive inside the CAC, with limited access to only therapists and the primary investigators of this study because the videos make participants personally identifiable. The videos may be uploaded to the computers inside the CAC that are password protected. The participant's real names do not show up on the recordings of sessions. The content of the videos will be participants playing games and chatting with each other, not participants providing sensitive information. Over the spring semester, only research assistants working on this project will have access to the videos. Confidentiality of your children will be maintained at all times in the study.

**ADDITIONAL INFORMATION:** If you have any questions or would like additional information about this research, please contact the clinic office at 626 487-4729 or Clare via email at [Cboldt1189@scrippscollege.edu](mailto:Cboldt1189@scrippscollege.edu). You can also contact my research advisor, Dr. Marjorie Charlop at [mcharlop@cmc.edu](mailto:mcharlop@cmc.edu). The Scripps Institutional Review Board (IRB) has approved this study and its procedures. This Board is responsible for ensuring the protection of research participants. If you have any ethical concerns about this project or your child's rights as a participant in research, you may contact the Scripps IRB at [irb@scrippscollege.edu](mailto:irb@scrippscollege.edu). If you or your child experience any distress at any point during the study, please contact Dr. Charlop at the clinic.

A signed copy of this consent form will be given to you, if you wish to keep it.

**CONSENT:** Your signature below means that you understand the information on this form, that someone has answered any and all questions you may have about this study, you voluntarily agree for your child to participate in this study, and you certify that you are at least 18 years old of age. By signing this you are agreeing that: 1) you consent to your child participating in the study, 2) you consent to your child being recorded in the "outdoor room", 3) you consent to allowing undergraduates at the clinic to code your child's video for assessing the way your child plays with others.

Printed Name of Child \_\_\_\_\_

Printed Name of Parent/Guardian \_\_\_\_\_

Signature of Parent/Guardian \_\_\_\_\_ Date: \_\_\_\_\_

The undersigned researcher has reviewed the information in this consent form with the participant and any of his/her/their questions about the study.

Signature of Researcher \_\_\_\_\_ Date: \_\_\_\_\_

#### Parental Consent Form for Sibling

Social Play Behaviors Differences of Children with Autism Within Sibling and Non-sibling Peer Dyads

Your child is invited to participate in a research project. This study will require your child to play with either their brother/sister or a friend for 5 minutes. They would be asked to participate in five 5 minute play sessions. Your child's involvement in the study is entirely up to you and your child. You may withdraw your child at any time for any reason. Your child may withdraw themselves from the study at any time. Please continue reading for more information about the study. Your child is being asked to participate because he, she, or they have a sibling who has a diagnosis of autism spectrum disorder.

**STUDY LEADERSHIP:** This research project is led by Clare Boldt, a senior at Scripps College, and an undergraduate staff member at the Claremont Autism Center, for her senior thesis. The present project is being supervised by Dr. Marjorie H. Charlop, Director at the Claremont Autism Center at Claremont McKenna College (CMC).

**PURPOSE:** The purpose of this study is to examine and investigate the differences in social behavior between siblings and non-siblings while playing together. The current study aims to investigate social behaviors such as prosocial behaviors, cooperative play, verbalization, smiling/laughing, and aggressive behaviors.

**ELIGIBILITY:** Children and young adults who are typically developing and have a sibling diagnosed with autism spectrum disorder (ASD) are eligible for the study. All individuals at the center with a sibling can participate.

**PARTICIPATION:** If you decide to consent to having your child participate in this study, your child will be asked to participate in an observational study where they will play games with their sibling and another friend at the clinic who has also consented to being in the study. They will be required to give their assent to participate in the study through signing a developmentally appropriate form that they will read or have read to them. Your child will be given three separate chances to say if they want to participate in the study before being ruled out of the study. This will occur during their weekly social skills group. Playing the games will be conducted outside in a quiet space and will consist of ten-minute sessions with your child and their sibling or another child at the center who has been diagnosed with autism spectrum disorder. During those 5 minutes they will be instructed to play together (toys will be offered such as Legos, toy dinosaurs, superheroes, and trains). They will participate in a total of ten 5 minute play sessions (5 with their sibling and 5 with a friend). They will be told to chat with their friend while playing. Your child will be recorded on an i-Pad for analysis later. Your child's confidentiality will be maintained at all times. They may participate in more than one play session with their sibling or a friend. All data collection will be done by May 3<sup>rd</sup>.

**RISKS & BENEFITS:** There are no risks for your child participating in this study beyond those normally experienced at social skills sessions and in normal non research play situations with other children, including those diagnosed with Autism Spectrum Disorder. There are no direct benefits to participating in this study. This study could improve your child's social skills through playing with their sibling and friend.

**COMPENSATION:** N/A

**VOLUNTARY PARTICIPATION:** Please understand that participation in this study is completely voluntary. Your decision whether or not to allow your child to participate will in no way affect you or your child's current or future relationship with Scripps College, Claremont McKenna College, the Claremont Autism Center, or any of their faculty, staff, therapists, or students. You have the right to withdraw your child from the research at any time without penalty. You also have the right for your child to refuse to participate in any part of the research for any reason without penalty. If you or your child do not consent to participate, your child will not be pulled out for this research project and will stay with the rest of the group for regular activities.

**CONFIDENTIALITY:** The individual privacy of your child will be maintained in all publications or presentations resulting from this study. All names will be kept confidential using codes for their names that only the primary researchers will know. All other data on data sheets and video recordings will be associated only with participant pseudonyms and will be kept separately from informed consent documents that include participants' real names but do contain visual footage of the participants. Video recordings of the play sessions will not be shown at any point following the research. These recordings will be taken using Tablet recordings and directly uploaded to a hard drive inside the CAC, with limited access to only therapists and the primary investigators of this study because the videos make participants personally identifiable. The videos may be uploaded to the computers inside the CAC that are password protected. The participant's real names do not show up on the recordings of sessions. The content of the videos will be participants playing games and chatting with each other, not participants providing sensitive information. Over the spring semester, only research assistants working on this project will have access to the videos. Confidentiality of your children will be maintained at all times in the study.

**ADDITIONAL INFORMATION:** If you have any questions or would like additional information about this research, please contact the clinic office at 626 487-4729 or Clare via email at Cboldt1189@scrippscollege.edu. You can also contact my research advisor, Dr. Marjorie Charlop at [mcharlop@cmc.edu](mailto:mcharlop@cmc.edu). The Scripps Institutional Review Board (IRB) has approved this study and its procedures. This Board is responsible for ensuring the protection of research participants. If you have any ethical concerns about this project or your child's rights as a participant in research, you may contact the Scripps IRB at [irb@scrippscollege.edu](mailto:irb@scrippscollege.edu). If you or your child experience any distress at any point during the study, please contact Dr. Charlop at the clinic.

A signed copy of this consent form will be given to you, if you wish to keep it.

**CONSENT:** Your signature below means that you understand the information on this form, that someone has answered any and all questions you may have about this study, you voluntarily agree for your child to participate in this study, and you certify that you are at least 18 years old of age. By signing this you are agreeing that: 1) you consent to your child participating in the study, 2) you consent to your child being recorded in the "outdoor room", 3) you consent to allowing undergraduates at the clinic to code your child's video for assessing the way your child plays with others.

Printed Name of Child \_\_\_\_\_

Printed Name of Parent/Guardian \_\_\_\_\_

Signature of Parent/Guardian \_\_\_\_\_ Date: \_\_\_\_\_

The undersigned researcher has reviewed the information in this consent form with the participant and any of his/her/their questions about the study.

Signature of Researcher \_\_\_\_\_ Date: \_\_\_\_\_

## Appendix D: Participant Assent Forms

### Participant Assent Form for Sibling

When you are at the clinic and at home, **you play games**. We want to see the differences in how you play with your sibling compared to a friend from the clinic.

We want to know how it makes you and other kids **feel** when you play games with your sibling and friends. We also want to know if playing with a friend or a sibling could be better for improving how you talk and play with others.



We want to **record a movie** of you and your friend or sibling spending time together and playing so we can see how it makes you feel and what is best for you and other kids.



*If we are playing and you want to stop you can tell Clare and we will stop playing.*

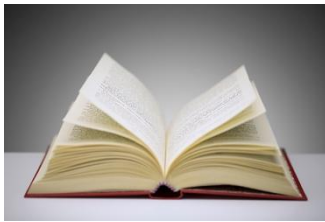
**Can we watch you play some games with a buddy, like when you play a game with us during group time?** Circle: YES NO

**Can we record a movie of you spending time with your friends?** Circle: YES NO



**Can we tell other friends how you spent time with Clare and your friends playing? This could help kids that you don't know on how they spend time playing these kinds of games with friends.**

Circle: YES NO



**\*\* If you change your mind and don't want to be recorded later, you can say NO, and we will stop recording and won't tell anyone about how you spend time with your friends.**

Sign your Name: \_\_\_\_\_ Date: \_\_\_\_\_

Researcher name, signature, and date: \_\_\_\_\_

### Participant Assent Form

When you are at the clinic and at home, **you play games.** We want to see the differences in how you play with your sibling compared to a friend.

We want to know how it makes you and other kids **feel** when you play games with your sibling and friends. We also want to know if playing with a friend or a sibling could be better for improving how you talk and play with others.





We want to **record a movie** of you and your friends or sibling spending time together and playing games so we can see how it makes you feel and what is best for you and other kids.



*If we are playing and you want to stop you can tell Clare and we will stop playing.*

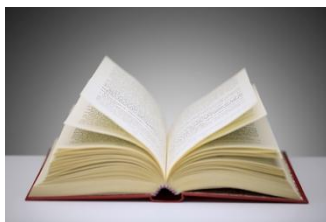
**Can we watch you play with a buddy, like when you play a game with us during group time?** Circle: YES NO

**Can we record a movie of you spending time with your friends?** Circle: YES NO



**Can we tell other friends how you spent time with Clare and your friends playing? This could help kids that you don't know on how they spend time playing these kinds of games with friends.**

Circle: YES NO



**\*\* If you change your mind and don't want to be recorded later, you can say NO, and we will stop recording and won't tell anyone about how you spend time with your friends.**

Sign your Name: \_\_\_\_\_ Date: \_\_\_\_\_

Researcher name, signature, and date: \_\_\_\_\_



## Appendix E: Recruitment Form

Hello \_\_\_\_,

For my senior thesis research project I am really excited to be studying play behavior interactions between siblings and non-siblings at the Claremont Autism Center. This study has been approved by Scripps College Institutional Review Board. This research study is primarily observational as I will be analyzing how children interact and play with each other in a fun, natural, and unprompted environment. They will play with toys such as toy dinosaurs, trains, and Legos. Your children will play with their sister/brother for 5 minutes. They will also play with a friend from the clinic. Your children will participate in five 5 minute play sessions. Confidentiality will be maintained for your child at all times in the study.

My hope is that your children will enjoy playing and interacting with their peers and sibling. This study is completely voluntary and whether or not your child decides to participate will in no way affect their access to the services they receive at the Claremont College Autism Center. If you are interested in having your children participate in this study, please see the attached consent form with a more logistical explanation. Your children will also have to show their approval to participate in the study by signing a developmentally appropriate consent form. They will be provided this form to read for themselves or I will read it to them aloud if needed.

Best,

Clare Boldt

## Appendix F: Debriefing document

### Social Play Behaviors Differences of Children with Autism Within Sibling and Non-sibling Peer Dyads

Thank you for allowing your child to participate in this study. The purpose of this study was to see the behavioral differences between sibling and peer dyads while playing together. Playing could be a good outlet for practicing appropriate social skills and decreasing instances of inappropriate behaviors. This research will tell us whether having your child play with their sibling vs. friend changed their social behavior. To do this, every participant played games with their sibling and a friend. Participants were informed of what exactly we would be doing. It is possible that the results of this research will be presented at academic conferences and/or published as an article in a journal in print or online. Again, your child's individual behavior and survey responses will be kept confidential during this process, and participants will only be described using pseudonyms.

If you have any questions or would like additional information about this research, please contact the clinic office at (626) 487-4729 or Clare via email at [Cboldt1189@scrippscollege.edu](mailto:Cboldt1189@scrippscollege.edu). You can also contact my research advisor, Dr. Marjorie Charlop at [mcharlop@cmc.edu](mailto:mcharlop@cmc.edu). The Scripps Institutional Review Board (IRB) has approved this study and its procedures. This Board is responsible for ensuring the protection of research participants. If you have any ethical concerns about this project or your child's rights as a participant in research, you may contact the Scripps IRB at [irb@scrippscollege.edu](mailto:irb@scrippscollege.edu). If you or your child experience any distress at any point during the study, please contact Dr. Charlop or your graduate contact at the clinic.