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**OUTSIDE THE BOX: USING A SIBLING TRAINING PROTOCOL TO
INCREASE IMAGINATIVE PLAY AMONG AUTISTIC CHILDREN**

submitted to

Professor Marjorie Charlop

by

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for

Senior Thesis

Fall 2021 - Spring 2022

April 25, 2022

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Acknowledgements

Each child I've had the honor of knowing and working with has gifted me a unique life lesson. In elementary school, my peers at Mercer shaped my empathy and understanding for autistic people. Friendship Circle and Friendship in Teams taught me to be selfless during times when I was most selfish. Anisfield showed me the true meaning of patience. Ramapo gave me a window into the world of being a caregiver for someone with autism. My time in Rishon LeZion pushed me to realize that there is always a way to communicate with someone, you just have to be willing to find it. My CAC kids solidified in me what I have always known, that working with autistic children is what I am meant to do.

Thank you to my clinic family (Alanna, Bri, Catherine, Jaime, Kate, Clare, and Ben) for never doubting my abilities, even when I doubted myself. Thank you to Professor Marjorie Charlop, who is more than just my thesis reader but my greatest mentor, for taking a chance on me freshman year and never looking back.

Thank you to my CMC sisters (Hailey, Hallie, Carley, Teslin, Chloe, Saskia, Scharff, Jess, and Maddie) and to Shaker's finest (Abi, Lori, and Leah) for your unwavering friendship. I am lucky to be loved and supported by such incredible people who have gotten me through the best and worst of times.

Finally, thank you to my family - you make me, me. My grandparents, Barbara and Stanley Brown for their constant support. My brothers, Matthew and Josh, for their constant affection in the form of annoyances. My dad, who never fails to show me what it is to be kind. And to my mom, who I am lucky to be compared to. I truly am the luckiest granddaughter, sister, and daughter in the world.

Abstract

Autistic children seldom develop imaginary play skills. Previous studies have demonstrated the efficacy of therapist and parent training interventions to increase imaginative play among autistic children. However, few studies have utilized a sibling training model, especially when tackling the complexities of pretend play. The purpose of this study is to examine a sibling training program as a supported intervention for increasing imaginative play among autistic children. The results indicated that the sibling training program was effective in increasing the imaginative play of autistic children. This study demonstrates the importance of incorporating typically developing siblings as change agents in behavioral interventions for autistic children.

Keywords: autism, imaginative play, symbolic play, sibling training, joint engagement

Outside the Box: Using a Sibling Training Protocol to Increase Imaginative Play Among
Autistic Children

Autism Spectrum Disorder

Autism spectrum disorder is a neurodevelopmental disorder categorized by persistent deficits in social communication and interaction, and restrictive repetitive behaviors that affects 1 in 44 children (Centers for Disease Control and Prevention). As a spectrum disorder, the severity of autism ranges considerably between individuals and impacts various aspects of development (Zachor & Ben-Itzhak, 2016). Specific social communication and interaction deficits can include deficits in social-emotional reciprocity, and difficulties developing, understanding, and maintaining relationships.

Social participation issues for autistic children can stem from challenges related to core differences, such as initiating interactions, difficulty with sensory regulation, and staying engaged in conversations (Tomchek & Koenig, 2016). These relational difficulties can make it challenging for autistic individuals to make friends and engage in imaginative play. Additionally, deficits in socio-emotional reciprocity can lead to reducing sharing of interests and diminished ability to respond to social interactions (American Psychiatric Association, 2013).

Imaginative Play

Previous studies have shown that autistic children have socio-emotional understanding deficits. Emotional understanding involves imagination, perspective taking, and affect expression. These skills are related to social communication and prosocial behavior (Carlo et al. 1991). Imaginative play has been shown to aid in the development of the capacity to express and understand emotions (Sidera et al., 2021).

Furthermore, imaginative play taps into specific positive behaviors as it is a loosely structured form of play that generally includes role-play, object substitution and nonliteral behavior.

In typically developing peers, imaginative play skills tend to appear around the age of two (Harris, 2000). However, preschool-aged autistic children have impaired pretend play skills compared to typically age-matched peers (Kasari et al., 2006). Studies have indicated that autistic children spend more time in functional play or not playing with toys at all (Zyga et al., 2015). Prior research has indicated the efficacious nature of increasing imaginative play in autistic children: promoting internal experiences of playfulness, refining cognitive skills, and increasing general imagination (Chen et al. 2019; Doernberg, Russ & Dimitropoulos 2020).

Imaginative play refers to a child's ability to use objects or perform actions in play situations in a way that is not consistent with facts or reality (McCune, 2010). This type of play has been shown to be one of the most important basic skills in child development (Copple et al., 2009). Imaginative play has also been linked to increases in executive functioning and language competence (White & Carlson, 2021). Furthermore, imaginative play is associated with positive emotional expression and regulation, as well as increased social competence.

There are many variations of imaginative play, including symbolic play, role play, and narrative play. Symbolic play refers to object substitutions, attributions of pretend properties, and imaginary objects (Barton, 2010). For example, using a block as an airplane. Role play refers to taking on the persona of a character or creature. For example, pretending to be an astronaut or pretending to be an animal. Narrative play refers to story

based imaginative play. For example, pretending to go on a quest or pretending to engage in an epic battle. Children who engage in story-related pretend play show greater inhibitory control than those who engage in a non-pretense activity (White & Carlson, 2021).

Existing Imaginative Play Interventions

Facilitating interventions to increase imaginative play among autistic children has been an integral part of research within the field.

In 2021, Doernberg and colleagues aimed to increase imaginative play through therapist interventions consisting of prompting, modeling, scaffolding, praise, reflecting emotions, and following the child's lead over the course of five weekly sessions. Researchers saw significant increases in imaginative and cognitive play skills as a result (Doernberg et al., 2021). In a separate study, guided stories and engaging in role play with adult partners was used to enhance the understanding of social roles among autistic children (Hess, 2006). Studies have also been conducted on the efficacy of joint video modeling on play behaviors of autistic children. Autistic participants demonstrated improvement on unscripted verbalizations during pretend play with typically developing peers (Dueñas, 2019). Additionally, Matrix training has been incorporated into imaginative play-based research studies in an effort to increase generalizability with some success (Macmanus et al., 2015). Pivotal response training, a naturalistic teaching format that teaches autistic children functioning social communication and adaptive behaviors, has been explored as a constructive medium for facilitating imaginative play (Lydon et al., 2010). Some researchers have even attempted to incorporate circumscribed

interests, an aspect of restrictive repetitive behaviors, in efforts to increase imaginative play skills in autistic children (Porter, 2012).

The Nature of Sibling Relationships

Sibling relationships play a critical role in child socialization and development. Positive sibling relationships are an important system of support for all individuals throughout their lives (Stoneman, 2005). Interacting with siblings and having shared experiences aids in the development of emotional skills, social skills, and social understanding (Buist et al., 2013). Not only do siblings influence the socio-cognitive development of one another, they also influence personality and interests (Whiteman et al., 2011).

Sibling relationships involving a child with a disability have been found to be more positive than those between neurotypical sibling pairs (Abramovitch et al., 1987). Ben-Itzhak and colleagues (2019) found that having an older sibling is a significant benefit to the social functioning of autistic children. Autistic children who have older siblings also tend to present great social communication abilities and fewer restrictive repetitive behaviors (Ben-Itzhak et al., 2019).

Benefits of sibling relationships have also been found in neurotypical children. For example, Perenc and colleagues (2015) detected greater prosocial behaviors in individuals with neurodiverse siblings. Additionally, parents of children with disabilities reported more instances of positive sibling relationships than parents of typically developing children (Roper et al., 2014).

Sibling Training Programs

Previous studies have begun to explore the impact of sibling training interventions for autistic children. Typically, trained therapists implement interventions. However, motivations are clear for developing treatment to be delivered by those with more significant relationships to the target child, such as siblings, parents, and peers (Shivers & Plavnick, 2015). For example, studies have shown that interventions mediated by those in a familial role lead to greater generalizability by creating more opportunities to practice learned skills outside of clinical settings (Chan et al., 2009). El-Ghoroury and Romanczyk (1999) found that autistic children were more likely to engage with their typically developing siblings than their parents during playtime. Siblings have also been used to help teach a variety of learning tasks and to refine motor skills (Scribman et al., 1983; Colletti & Harris, 1977). However, evidence suggests that joint interaction for siblings becomes more difficult as the severity of disability increases (Stoneman, 2005).

Furthermore, siblings have been used to improve play skills for autistic children. For example, Celiberti and Harris (1993) trained siblings to elicit play, play related speech, to praise actions of their autistic brother or sister, and to use prompting when their autistic sibling would not respond. Tsao and Odom (2006) used typically developing siblings to facilitate social skills programs, which led to increased social invitations and social responses. Also in 2006, Reagon and colleagues used siblings as models within the video modeling portion of their study to increase pretend play. Walter and Ingersoll (2012) improved the joint engagement and reciprocal imitation of autistic children through the use of sibling training. Guglatch and Machalicek (2021) utilized sibling training protocols as well as a sibling support group to increase complementary and

reciprocal interactions during play. Despite these positive conclusions, the literature basis for sibling training programs is not nearly as robust as that of 1 on 1 play-based interventions by therapists.

Proposed Study

Imaginative play interventions have largely relied on modeling, prompting, video modeling, and scaffolding led by licensed therapists. While recent studies have just begun to tap into the efficacy of utilizing neurotypical siblings in social and behavioral skill interventions, the research basis for this area is relatively slim in comparison to that of parent training and therapist interventions. Most studies using significant others as interventionists rely on self-reporting methods of data collection. There is a definitive need for further observational data on interventions for play skills with participants of wider age ranges and more variability in autism severity. Utilizing sibling training paradigms as a means to increase imaginative play is altogether unstudied. A supplementary motivation for the present study is to provide families with the tools to facilitate prosocial behaviors for their autistic children in their own homes, without the need for a therapist. This stems from the observed effects on the COVID-19 pandemic on families of children needing support services, as well as the large financial burden that families experience in trying to improve the lives of their loved ones.

The present study aimed to teach autistic children to engage in imaginative play through a sibling training protocol and assess whether these skills acquired can be maintained. The following methods outline a study measuring how imaginative play and ancillary joint engagement behaviors change within sibling dyads after teaching intervention skills to the neurotypical siblings of autistic children. This study instead uses

dyadic learning, consistent pairings, and externally measures changes in behavior. The paper concludes with a discussion of what the expected outcomes of this study will be, in the hopes that this research will inform future iterations of the proposed intervention and, more broadly, offer further insight into the use of sibling training programs for autistic children and teens.

It was hypothesized that after a sibling training intervention for imaginative play, imaginative play would increase during post training play probes with sibling dyads.

Method

Participants

The participants for this experiment included four dyads composed of one autistic child and one neurotypical sibling (NT sibling), for a total of eight participants. Autistic participants ranged in age from ten to fifteen. Of the four target participants, three participants identified as male and one participant identified as female. All four of the NT sibling participants identified as female. All participants attended an after-school social skills program at a behavioral autism research and social skills clinic, which includes NT siblings within social skills groups. Research was conducted as an additional part of the autistic participants' therapy services at the center. Autism diagnoses were made by a licensed clinical psychologist, not associated with this research project. Additionally, the participants were assessed using the Childhood Autism Rating Scale-2 (CARS-2; Schopler et al., 2010).

Table 1*Participants*

Dyad	Age (Y)	CARS-2 Rating	Ethnicity
Dyad 1 Sam	10	Moderate/Severe	Middle Eastern- American
Nancy (NT Sibling)	10	N/A	Middle Eastern -American
Dyad 2 Annie	12	Moderate/Severe	Korean American
Sally (NT Sibling)	9	N/A	Korean American
Dyad 3 Brandon	15	Severe	Chinese American
Katie (NT Sibling)	7	N/A	Chinese American
Dyad 4 Wesley	10	Moderate/Severe	Korean American
Abby (NT Sibling)	8	N/A	Korean American

Dyad 1 - Sam and Nancy

Sam is a ten-year-old Middle Eastern American autistic male. Sam scored within the Moderate to Severe range on the CARS-2 rating scale. He has strong verbal abilities. However, as explained by a licensed clinical psychologist and his mother, Sam often plays by himself at home and lacks cooperative play skills. He tends to elope from play situations. Sam's twin sister, Nancy, is a typically developing ten-year-old Middle Eastern American female. Both Sam and Nancy have been attending social skills programming at the Claremont Autism Center for close to three years.

Dyad 2 - Annie and Sally

Annie is a twelve-year-old Korean American autistic female. Annie scored within the Moderate to Severe range on the CARS-2 rating scale. Like Sam, Annie has strong verbal abilities. Annie has restricted repetitive interests within social communication, particularly aspects of Korean culture such as Korean music, television shows, and food. According to Annie's mother, Annie has difficulty sustaining relationships with her peers at school. Annie's sister, Sally, is a typically developing nine-year-old Korean American female. Both Annie and Sally have been attending social skills programming at the Claremont Autism Center for over four years.

Dyad 3 - Brandon and Katie

Brandon is a fifteen-year-old Chinese American autistic male. Brandon scored within the Severe range of the CARS-2 rating scale and is minimally verbal. According to a licensed clinical psychologist, Brandon often engages in echolalia or stereotypy as a method of self-soothing. Brandon requires constant prompting during activities. His younger sister, Katie, is a typically developing seven-year-old Chinese American female. Both Brandon and Katie have been attending social skills programming at the Claremont Autism Center for six years.

Dyad 4 - Wesley and Abby

Wesley is a ten-year-old Korean American autistic male. Wesley scored within the Moderate to Severe range of the CARS-2 rating scale. Wesley has strong verbal skills. According to Wesley's mother, he often grows fixated on mistakes and engages in repetitive speech. Wesley's younger sister, Abby, is a typically developing eight-year-old

Korean American female. Both Wesley and Abby have been attending social skills programming at the Claremont Autism Center for the past five years.

Recruitment

Prior to the experiment, the parents of participants were asked if they would be interested in having their children participate in this study. Participants were selected based on the specific criteria of the study and the advising of the clinic director.

Therefore, all children were selected because they lack cooperative and imaginative play skills. The informed consent document contained information on the study that allowed the parents to determine if they were comfortable with their children to participate in the research.

Parents were informed that if they chose not to have their children participate they could without any consequences. Those who wished to have their children included in the study were instructed that, by signing the informed consent document, they were certifying that they were voluntarily agreeing for their child to participate in this study. Children of consenting parents were given an assent form with an understandable, accessible, and developmentally appropriate explanation of the study. The child assent form can be viewed in Appendix A. Participants whose parents agreed to the informed consent document and who expressed assent of their wish to participate were enrolled in the study. Assent from children was assured to be ongoing through active participation in the research tasks and the developmentally appropriate assent form. Prior to each play and training session, verbal assent of participants was ascertained. Participants did not receive monetary compensation for participation in this study.

Materials and Setting

All sessions were conducted at the Claremont Autism Center. Due to COVID-19 concerns, the majority of sessions were conducted outside. Participants were seated on a large tarp to prevent wetness and grass stains. A small portion of sessions were conducted inside due to rain. In order to keep these sessions as consistent as possible despite the change in setting, indoor sessions were also conducted on a tarp with the same selection of toys. Participants were given a wide selection of toys during each session. Toy items were selected based on a preference assessment at the play room of the Claremont Autism Center in which both the autistic child and the NT sibling were allowed to approach toys of interest to them. All toy selections were age appropriate. The toys provided to the dyads during sessions were consistent across all sessions.

Sessions were recorded on an Apple iPad and then uploaded to a desktop computer at the Claremont Autism Center.

Design

A multiple baseline design across dyads (Cooper, Heron, & Heward, 2007) was used in this study in order to determine the effectiveness of the sibling training method in teaching the autistic children imaginative play skills. In a multiple baseline design, the amount of time that each dyad spends in the baseline phase varies in order to stagger the effects of treatment over time. This staggering allows the experimenter to control for confounding variables and conclude that the sibling training is responsible for any observed behavioral changes.

Dependent Measures

Imaginative play was operationally defined as a child using an object to represent something that it is not, acting out a story, or pretending to be someone they are not during a ten second interval. Examples of imaginative play include using a block as an airplane, pretending to be an astronaut, and making an imaginary meal. Ancillary data was collected for joint engagement behaviors including social speech, same toy engagement, and turn taking. Social speech was operationally defined as speech directed towards the NT sibling related to the play scenario within a ten second interval. Same toy engagement was operationally defined as the autistic child playing with the same toy at the same time as their NT sibling within a ten second interval. Turn taking was operationally defined as the handing off of a toy from the autistic child to the NT sibling within a ten second interval. Each 5-minute video was scored by a coder, using ten second interval scoring, to determine whether an instance of imaginative play occurred. The percentage of occurrence was calculated by dividing the number of ten second intervals in which target behaviors occurred by the total amount of intervals (thirty).

To determine that the sibling was reliably implementing the training, post training play sessions were also scored at random intervals on the sibling training checklist used during the training phase of the experiment. If the NT sibling did not reach 80% on the sibling training checklist, an additional training booster session was implemented before the next post training play session following the same protocol as the original sibling training sessions to ensure that the autistic child receives intervention via the NT sibling. To ensure inter-rater reliability, one third of the videos were coded by both the primary

researcher and an undergraduate research assistant, with a standard of at least 90% inter-observer agreement.

Procedure

Baseline

The number of baseline sessions varied for each dyad due to the staggering of a multiple baseline design. Therefore, sibling training and play sessions occurred at different points in time for each dyad. During baseline the autistic child and their NT sibling sat together on a tarp and were provided with a selection of toys and prompted to, “Use the toys to play together.” No additional instructions were given to children during the baseline sessions. Baseline sessions were five minutes in length. Each dyad completed between three and nine baseline sessions.

Sibling Training

During the sibling training phase, which occurred in between baseline sessions and post training play sessions, only the NT sibling was present to receive training. The researcher explained to the NT sibling that they were going to learn strategies for how to play with their autistic brother or sister in more creative and fun ways. The researcher then went through a series of imaginary play scenarios, in order to demonstrate the various aspects of imaginative play to the NT sibling. Imaginative play was broken down into symbolic play, role play, narrative play, and the use of representative gestures. Items for cooperative play and praise were also included within the training checklist.

Symbolic play was taught by asking the NT sibling to find a toy that they think their autistic brother or sister would enjoy playing with. They were then asked to think of a way they can use the object to represent something that it's not. For example, using

blocks to represent animals and balls to represent planets. The experimenter would then ask the child to demonstrate how they would play with these newly designated objects.

Narrative play and role play were taught through a number of different imaginative play scenarios. The experimenter would select from the table below, and act out the scenario with the NT sibling prompting the NT sibling through questions, and infusing teaching of the use of praise and representative gestures. The experimenter and the NT sibling would act out their characters and story, being reminded along the way how they can use these ideas when playing with their autistic siblings. A sample script of a play scenario can be found in Table 3.

These sessions were recorded on an Apple iPad and reviewed by a coder to ensure that the NT sibling completed at least 80% of the required tasks during two consecutive sessions before moving on to the post training play sessions. The training checklist can be found in Appendix B.

Table 2*Play Scenarios*

Play Scenario	Imagination Prompts	Representative Gestures
Pirates	“Where are we going on our ship?” “What sort of treasure are we looking for?”	Using a sword Swimming in water
Wizards	“What sort of potion should we make?” “Can you show me how to cast a spell?”	Waving a wand Stirring a cauldron
Astronauts	“What planet are we going to?” “What should we discover on our planet?”	Blasting off Pressing buttons on a Rocketship
Princesses	“What kingdom do you rule?” “Can you show me how a princess acts?”	Bowing Twirling a dress
Superheroes	“How did you get your super powers?” “Who should we battle?”	Flying Fighting
Going on a vacation	“Where should we go?” “What do we need to bring on our trip?”	Packing a suitcase Buckling seat belt
Going to a restaurant	“Which restaurant are we eating at?” “Who are we eating with?”	Eating Making food

Table 3*Sample Script For “Going to a restaurant” Play Scenario*

Going to a restaurant
Instructor: Today I am going to teach you some fun ways to play with _(insert autistic sibling name)_. It should only take a few minutes. Is that okay with you?
Wait for NT sibling response
<u>Instructor:</u> Awesome. See all of these toys in front of us? Why don't you pick one that you and _(insert autistic child name)_ might like to play with.
Wait for NT sibling response
Instructor: Good choice. Can you show me how you and I can play with this toy together?
Wait for NT sibling response
Instructor: Great job! It is super important to remember that toys are meant to be shared, and that you and _(insert autistic sibling name)_ can play with the same toy at the same time. Next time you play with _(insert autistic sibling name)_, try to make sure you two are playing together by sharing the toys. How can you ask _(insert autistic sibling name)_ to share with you?
Wait for NT sibling response
Instructor: Perfect. Saying ‘Can I have a turn?’ or just ‘My turn’ is a great way to ask to share. I also wanted to show you all of the different ways you can play with toys. Is that okay with you?
Wait for NT sibling response
Instructor: Cool. First, why don't we pretend we're in a restaurant! What restaurant should we go to?
Wait for NT sibling response
Instructor: Great! Okay what kind of food do they serve here?
Wait for NT sibling response
Instructor: Mmm sounds good. Can you find some toys that we can use to pretend to be food? Here, we can use this frisbee as a plate!
Wait for NT sibling response

Instructor: Perfect. I'm going to make a sandwich using these blocks. Do you want to try it?

Wait for NT sibling response

Model pretending to take a bite of the "sandwich" and then pass it to the NT sibling

Instructor: Yummy! That was good. Now I'm super thirsty. Can you find us something to drink?

Wait for NT sibling response

Instructor: Great job. Okay let's find some money so that we can pay before we leave the restaurant! Can you find a toy that we can use as money?

Wait for NT sibling response

Instructor: Awesome. Thanks for going to this restaurant with me!

Post Training Play Sessions

Each dyad completed four post training play sessions. During post training play sessions, the autistic child and their NT sibling sat together on a tarp and were provided with a selection of toys. The dyad was prompted to, “Use the toys to play together.” No additional instructions were given to the children during the post training play sessions. Post training play sessions were five minutes in length. Each dyad completed four post training play sessions. During post training play sessions, NT siblings were evaluated through the sibling implementation checklist to ensure that they were reliably implementing the learned training skills.

Booster Sessions

Booster sessions were administered in the event that the NT sibling did not score above 80% on the sibling implementation checklist during one of the post training play sessions. Booster sessions were procedurally identical to the sibling training phase of the study. Once the NT sibling met the requirement of scoring above 80% on two consecutive sessions, post training play sessions resumed.

Results

Participants’ imaginative play scores from baseline and post training play sessions are presented in Figure 1. Increases in imaginative play scores were seen in each participant, however the magnitude of these increases varied across dyads. Ancillary data for joint engagement behaviors are presented in Figure 2. Ancillary data demonstrated increases in joint engagement behaviors for three out of the four autistic children. Particular increases were seen in social speech and same toy engagement. Sibling training

scores for NT siblings are presented in Table 4. In summary, the sibling training program was largely successful in augmenting imaginative play.

Dyad 1 - Sam and Nancy

Sam and Nancy completed three baseline sessions and four post training play sessions. Nancy completed two sibling training sessions, during which her average score was 95%. During post training play sessions, Nancy's average sibling implementation score was 85%. Imaginative play increased dramatically for Sam, as his sister was able to guide him through various imaginary play scenarios. Examples of imaginary play scenarios facilitated by Nancy during post training play sessions included pretending to be pirates, creating a racetrack for cars, going to a photobooth, and participating in a fashion show. Sam's average imaginative play score during baseline was 13%. Sam's average imaginative play score during post training play sessions was 53%. Therefore, sibling training intervention was effective in increasing Sam's imaginative play within Dyad 1.

Dyad 2 - Annie and Sally

Annie and Sally completed five baseline sessions and four post training play sessions. Sally completed two sibling training sessions and two booster sessions in between the first two post training play sessions and the last two post training play sessions. Sally's average sibling implementation score during training and booster sessions was 90%. During post training play sessions, Sally's average sibling implementation score was 70%. Sibling training appeared to be the least effective for Annie and Sally. Also, Annie did not display any imaginative play across all five baseline sessions. In post training play sessions, Annie exhibited many more instances of

imaginative play. During Annie and Sally's first post training play session, Sally and Annie constructed phones out of blocks and used them to speak with each other. Annie became fixated on building phones throughout each of the post training play sessions, and engaged in very few other elements of imaginative play. Annie's average imaginative play score during baseline was 0%. Annie's average imaginative play score during post training play was 26%. Therefore, sibling training was minimally effective in increasing Annie's imaginative play within Dyad 2.

Dyad 3 - Brandon and Katie

Brandon and Katie completed seven baseline sessions and four post training play sessions. In addition to this, Katie completed two sibling training sessions. Katie's average sibling implementation score during training was 95%. During post training play sessions, her average sibling implementation score was 92.5%. Despite Brandon being the most minimally verbal of the autistic participants, he showed marked improvements in imaginative play. During baseline sessions, unless prompted by his sister, Brandon would typically choose one toy and simply hold it for the entirety of the session. Some of the imaginative play scenarios that Brandon and Katie used during post training play sessions were superheroes, defeating bad guys, building houses, and pretending to use a phone. Brandon's average imaginative play score during baseline was 3%. Brandon's average imaginative play score during post training play sessions was 42%. Therefore, sibling training was effective in increasing imaginative play within Dyad 3.

Dyad 4 - Wesley and Abby

Wesley and Abby completed nine baseline sessions and four post training play sessions. Abby completed two sibling training sessions. Abby's average sibling

implementation score during training sessions was 100%. During post training play sessions, Abby's average sibling implementation score was 90%. Throughout baseline, Wesley often refused to engage in activities that did not involve his own interests.

Imaginative play incrementally increased during post training play sessions. Examples of imaginative play during post training play sessions included pretending to be in a band, destroying buildings with "TNT", and a battle between a killer whale and a boat.

Wesley's average imaginative play score during baseline was 22%. Wesley's average imaginative play score during post training play sessions was 52%. Therefore, the sibling training protocol was effective in increasing imaginative play within Dyad 4.

Ancillary Data

Ancillary data for the three joint engagement behaviors – social speech, same toy engagement, and turn taking – were reviewed for each autistic child through visual inspection. In Sam's case, social speech and same toy joint engagement increased. For Sam, turn taking behavior appeared to remain constant throughout the phases of the study. In Annie's case, her social speech and same toy engagement decreased. Like Sam, Annie's turn taking behavior was not subject to change throughout the study. In Brandon's case, his social speech, same toy engagement, and turn taking behaviors all appear to increase after sibling training was implemented. In Wesley's case, his social speech, same toy engagement, and turn taking behaviors all appear to increase after sibling training was implemented. However, the increase in turn taking behaviors was slight.

Figure 1

Percentage of Imaginative Play

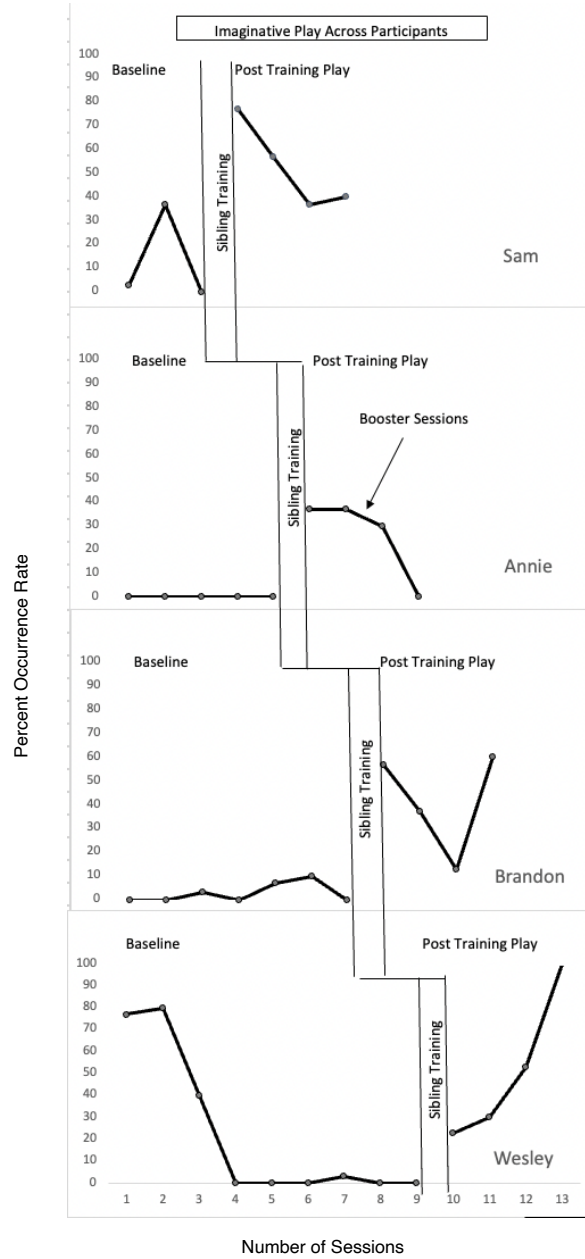


Figure 1. Imaginative Play. Percentage of 10-second intervals with imaginative play during baseline and post training play sessions.

Figure 2

Ancillary Data on Joint Engagement Behaviors

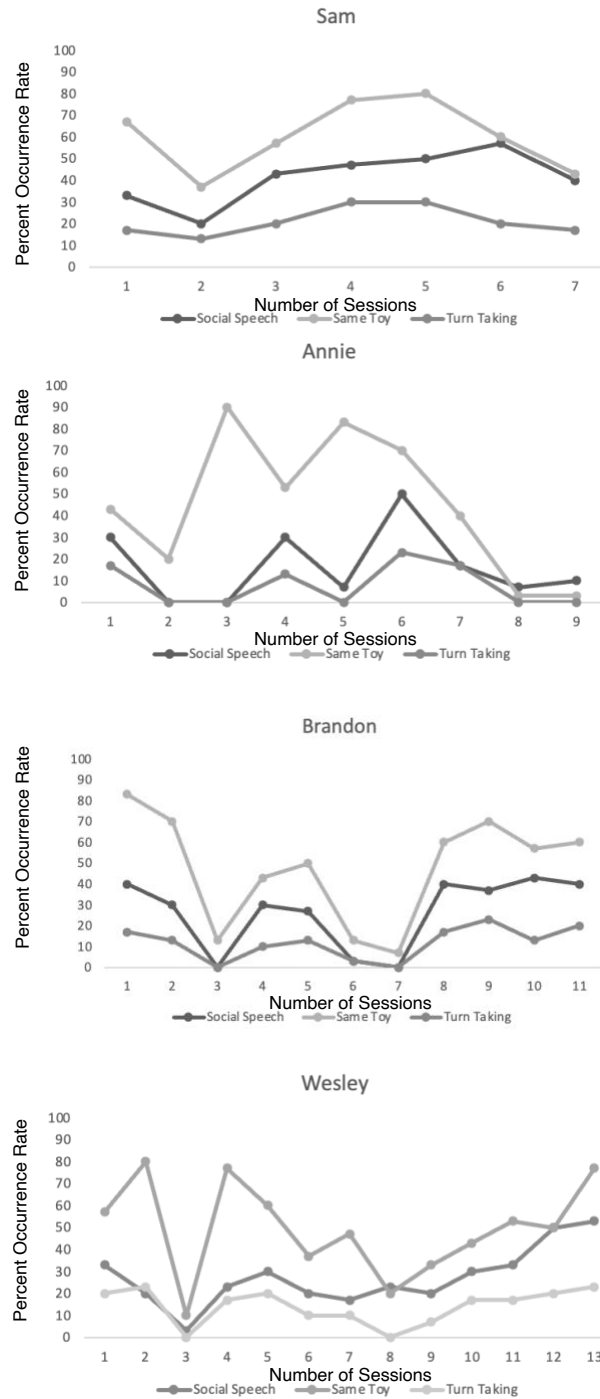


Table 4*Training Scores for NT Siblings*

	Nancy	Sally	Katie	Abby
Training 1	100%	100%	90%	100%
Training 2	90%	90%	100%	100%
Post Training Play 1	90%	80%	100%	90%
Post Training Play 2	90%	40%	100%	80%
Booster 1	N/A	80%	N/A	N/A
Booster 2	N/A	90%	N/A	N/A
Post Training Play 3	80%	80%	80%	90%
Post Training Play 4	80%	80%	90%	100%

Table 4. Training scores for sibling training intervention based off of the Sibling Implementation Checklist found in Appendix B.

Discussion

A sibling mediated intervention was used to increase imaginative play among autistic children. Four dyads, each composed of one autistic child and one NT sibling, took part in this study. Results demonstrated increases in imaginative play in all four dyads. Ancillary data indicated increases in social speech and same toy joint engagement behaviors for three of the four dyads. Turn taking behavior did not change as a result of

the intervention. Therefore, the sibling training intervention was shown to be an effective method of increasing imaginative play among autistic children.

Existing research has demonstrated the importance of autistic children developing imaginative play skills (Chen et al. 2019; Doernberg, Russ & Dimitropoulos 2020). Imaginary play interventions have led to refined cognitive skills, including executive functioning and language competence (White & Carlson, 2021). Prior methods of increasing imaginative play within autistic children have included therapist mediated interventions such as prompting, modeling, scaffolding, joint video modeling, Matrix training, and pivotal response training (Doernberg et al. 2021; Dueñas 2019; Macmanus et al. 2015; Lydon et al., 2010). Previous studies have explored the use of sibling mediated interventions to help autistic children develop play skills such as social speech, joint engagement, and reciprocal imitation, and complementary interactions (Celiberti & Harris 1993, Tsao & Odom 2006; Reagon et al. 2006; Walter & Ingersoll 2012; Guglatch & Machalicek 2021). This study expands on the previous research conducted and combines evidence from imaginative play-based interventions and sibling mediated play interventions to evaluate the effectiveness of a sibling mediated play intervention for imaginative play.

While this sibling mediated intervention led to increases in imaginative play amongst all four dyads, sibling training was minimally effective for the autistic child in Dyad 2, Annie. It is possible that the nature of Annie and Sally's sibling relationship is responsible for their results. Child socialization and development is largely dependent on sibling interaction, and positive sibling relationships are extremely important in founding an emotional support system (Stoneman, 2005). Children with autism who have siblings

tend to present greater social communication and social functioning abilities (Ben-Itzhak et al. 2019). Annie's mother has reported instances of physical and verbal fighting between Annie and Sally at home, indicating that their sibling relationship may not be positive. If this is the case, it offers a potential explanation for the lack of impact that the sibling mediated intervention had on Annie's imaginative play.

Ancillary data on joint engagement behaviors demonstrated additional benefits to the sibling mediated intervention apart from the increase in imaginative play skills. Three of the four dyads saw increases in social speech and same toy engagement. During baseline sessions, many of the autistic children would not engage with their NT sibling at all. Speech during Brandon's baseline sessions was largely nonsensical vocal stereotypy. After sibling training for imaginative play was implemented, Wesley, Brandon, and Sam's social speech increased markedly. Additionally, same toy engagement increased for Sam, Wesley, and Brandon. During baseline sessions, these three autistic children would mostly play with toys of interest to them, disregarding requests from their NT siblings to play with other toys. After sibling training was implemented, same toy engagement increased. Instances of turn taking appeared to increase slightly for Brandon and Wesley throughout the different phases of the experiment. A potential reasoning for the increase of these ancillary joint engagement behaviors is that imaginative play has been linked to emotional expression and regulation, increased understanding of social roles, and increased social competences (White & Carlson, 2021; Hess 2006). Furthermore, previous imaginative play interventions for autistic children included improvement on unscripted verbalizations (Dueñas 2019).

Limitations of this study were largely related to the COVID-19 pandemic. In order to prevent the spread of COVID-19 and to ensure the utmost safety of participants involved, masks were worn during all sessions. Since autistic children already struggle to pick up on social cues, mask wearing may have made it more difficult for autistic children to connect with their siblings during the play sessions. Additionally, almost all sessions were recorded outdoors. Conducting the sessions outdoors was an added challenge because other group activities occurred simultaneously. At times participants would be distracted by their peers.

Due to time constraints, limited booster sessions were able to be administered. Perhaps if more booster sessions were able to be completed, imaginative play scores and ancillary joint engagement behaviors could have been increased further.

This study merely scratches the surface of the potential benefits of sibling training programs for autistic children. Using family members, such as siblings, has been shown to lead to increased generalizability across settings of findings (Keen et al., 2010). This is likely because the interventionist is present in several settings as opposed to just the clinical setting. Previous studies have demonstrated that autistic children are more likely to engage in natural social interactions with NT siblings than parents (El-Ghoroury & Romanczyk, 1999). NT siblings are an automatic playmate for autistic children, and they will always be present in the lives of an autistic person. Therefore, NT siblings provide their autistic brother or sister with social interaction and play opportunities (Baker, 2000).

The present study also adds to the growing research base on naturalistic teaching strategies, and demonstrates the need for further research on naturalistic interventions. Naturalistic teaching strategies incorporate interventions into the natural environment

with naturally occurring contexts and contingencies (Schreibman et al., 2015). The COVID-19 pandemic categorically decreased availability and access to services for autistic children. Naturalistic teaching strategies, such as sibling training interventions, offer a way to combat the limited ability of therapists to interact directly with their clients by offering families the resources to properly use intervention strategies. Furthermore, sibling training interventions are cost effective. On average, families spend close to \$20,000 per year on childcare expenses for autistic children. For autistic children with severe behavioral challenges, costs of supporting the child can exceed \$50,000 (Grosse et al., 2021). By providing families with alternatives to costly therapist interventions, such as using sibling mediated interventions, support for autistic children can become more readily accessible.

Further research should incorporate sibling training interventions in order to increase the generalizability, accessibility, availability, and cost effectiveness of intervention techniques for autistic children.

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Appendix A

Child Assent Form

What is a research study?

Research studies help us learn new things. We can test new ideas. First, we ask a question. Then we try to find the answer.

When you come to Social Skills, you talk and play with friends, siblings, and college students. Is it okay that we:

- 1) Watch you play with your sibling?

Circle YES NO



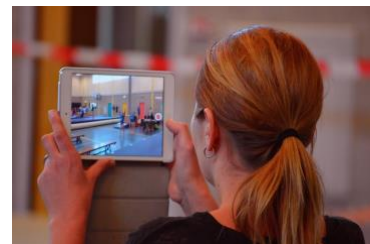
- 2) Help you play with your sibling?

Circle YES NO



- 3) Record a video of you playing with your sibling?

Circle YES NO



****If you change your mind and don't want to play with your siblings or be recorded, you can say NO, and we will stop recording.**

Sign your name:

Signature of Researcher:

Date:

Appendix B

Sibling Training Checklist

Sibling Implementation Checklist

Sibling _____ **Session** _____ **Date** _____ **Coder** _____

	<u>Yes</u>	<u>No</u>
1) Did the sibling play cooperatively with their partner <u>without toys</u> ?	<input type="checkbox"/>	<input type="checkbox"/>
2) Did the sibling play cooperatively with their partner <u>with toys</u> ?	<input type="checkbox"/>	<input type="checkbox"/>
3) Did the sibling demonstrate <u>symbolic play</u> during two or more instances? <i>Using an item to represent something else. For example, using a block as an airplane. Instance 1</i>	<input type="checkbox"/>	<input type="checkbox"/>
4) Did the sibling demonstrate <u>symbolic play</u> during two or more instances? <i>Using an item to represent something else. For example, using a block as an airplane. Instance 2</i>	<input type="checkbox"/>	<input type="checkbox"/>
5) Did the sibling pretend to be <u>someone</u> they are not? <i>For example, pretending to be an astronaut or a princess.</i>	<input type="checkbox"/>	<input type="checkbox"/>
6) Did the sibling demonstrate <u>narrative play</u> ? <i>Using toys to act out a story. For example, using toys to act out going to school, or going on a secret mission.</i>	<input type="checkbox"/>	<input type="checkbox"/>
7) Did the sibling use <u>gestures</u> to symbolize an action? <i>For example, holding fists up in turning them in the motion of turning a steering wheel to symbolize driving a car.</i>	<input type="checkbox"/>	<input type="checkbox"/>
8) Did the sibling speak to their brother or sister during the play session?	<input type="checkbox"/>	<input type="checkbox"/>
9) Did the sibling use <u>praise</u> to reinforce their brother or sister's behavior during two or more instances? <i>Instance 1</i>	<input type="checkbox"/>	<input type="checkbox"/>
10) Did the sibling use <u>praise</u> to reinforce their brother or sister's behavior during two or more instances? <i>Instance 2</i>	<input type="checkbox"/>	<input type="checkbox"/>

Score : ____ / ____ = ____ %