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TEACHING CHILDREN TO USE INTERACTION STRATEGIES WITH THEIR YOUNGER SIBLINGS THAT ARE MINIMALLY VERBAL

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TEACHING CHILDREN TO USE INTERACTION STRATEGIES WITH THEIR
YOUNGER SIBLINGS THAT ARE MINIMALLY VERBAL

THESIS

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Science in the
College of Educations
at the University of Kentucky

By
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Lexington, Kentucky
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2022

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ABSTRACT OF THESIS

TEACHING CHILDREN TO USE INTERACTION STRATEGIES WITH THEIR YOUNGER SIBLINGS THAT ARE MINIMALLY VERBAL

Children that are minimally verbal often lack same- or near-age peer interaction outside of the home environment. This study attempted to bridge that gap by training older siblings of minimally verbal children to use interaction strategies during play sessions. Through this, researchers were able to examine both the fidelity of use of the trained interaction strategies as well as their effect of the younger siblings' communication skills.

KEYWORDS: Siblings, Interaction Strategies, Social Communication, Minimally Verbal

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04/28/2022

Date

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TABLE OF CONTENTS

LIST OF TABLES	v
LIST OF FIGURES	vi
Teaching Children to Use Interaction Strategies with Their Younger Siblings That Are Minimally Verbal.....	1
Method	6
Participants	6
Children.....	6
Dyad 1.....	7
Dyad 2.....	7
Other.....	8
Instructional Setting and Arrangement	8
Materials and Equipment	9
Dependent Variables and Measurement System.....	9
Narrating Their Own Play.....	10
Asking Questions	11
Commenting on Siblings' Play	11
Offering Choices	12
Expanding Language.....	12
Initiations.....	13
Responses.....	13
Screening Procedures	14
Experimental Design	15
General Procedures	16
Baseline Procedures	17
Instructional Procedures.....	17
Training Sessions	17
Play-based Sessions	19
Maintenance Procedures	20
Reliability and Fidelity	20
Data Collector Training.....	20
Interobserver agreement.....	21
Procedural fidelity.....	22
Results.....	24
Sibling Dyad 1.....	24
Younger Sibling	26
Sibling Dyad 2.....	27
Younger Sibling	30
Discussion.....	32

Limitations and Challenges	32
Future Research.....	34
Appendices.....	37
Appendix A. Language Sample Form.....	37
Appendix B. Training Procedural Fidelity	38
Appendix C. Play Session Procedural Fidelity	39
References.....	40
Vita.....	44

LIST OF TABLES

Table 1. Mean Percent IOA Across Play Sessions Per Condition (Older Sibling Behaviors)	22
Table 2. Mean Percent IOA Across Training Sessions.....	22
Table 3. Mean Percent IOA Across Probe Sessions (Younger Sibling Behaviors).....	22
Table 4. Mean Percent Procedural Fidelity Across Play Sessions Per Condition	23
Table 5. Mean Percent Procedural Fidelity Across Training Sessions	23

LIST OF FIGURES

Figure 1. Will's Rate Per Minute Using Interaction Strategies	25
Figure 2. Will's Rate Per Minute Using Closed- and Open-Ended Questions	26
Figure 3. James' Communication Across Sessions	27
Figure 4. Henry's Rate Per Minute Using Interaction Strategies	29
Figure 5. Henry's Rate Per Minute Using Closed- and Open-Ended Questions	30
Figure 6. Noah's Communication Across Sessions	31

Teaching Children to Use Interaction Strategies with Their Younger Siblings That Are Minimally Verbal

Social communication delays are often present in children with autism spectrum disorder (ASD) and intellectual disability (ID). Social communication is defined as the ability to share thoughts and information with others, as well as use nonverbal communication through gestures, eye contact, or body language (Fuller & Kaiser, 2020). The ideal arrangement for learning social communication is during social interactions with others in authentic settings, such as the home or the classroom. Social learning opportunities in early childhood are foundational in the development of complex communicative abilities. Children with social communication delays are frequently excluded among their typically developing (TD) peers, as their lack of communicative abilities inhibits them from interacting in many social activities, such as free play (Sajaniemi et al., 2010). In addition, children that display delays in social communication often engage in challenging behavior when transitioning to novel social settings such as school because they cannot easily communicate their needs and emotions to others (Robertson & Ohi, 2016). This further marginalizes them by reducing the number of opportunities to engage in social communication with same age peers.

Several interventions and supports are recommended to address such delays. The current research surrounding these interventions focuses on promoting interactions between the adult and child (Covey & Alber-Morgan, 2021). These adult and child interactions, while important, do not allow the child to build skills necessary for same-age peer interaction. In contrast, peer-mediated instruction (PMI) focuses on interactions between children with disabilities and same or similarly aged peers. Positive outcomes

within these studies have been reported in the form of increased play-based skills, imitation of peers, and response to peer initiation (Bauminger-Zviely et al., 2020). While these are desired results, a limitation of PMI is its cultivation of a mentoring relationship for children with disabilities in which the TD peer is a helper rather than long-term friend (Therrien & Light, 2018). This does not allow children with social delays to learn skills that are important in growing and maintaining friendships over longer periods of time (Laugeson & Frankel, 2011).

PMI also tends to be implemented in school-based settings (Platos & Wojaczek, 2018). School environments involve structured activities that do not always reflect the activities that children participate in outside of the classroom, therefore social communication skills learned in the school setting might not generalize to other settings. For example, a child might learn how to discuss a previously determined academic topic with peers in the classroom but not learn to utilize that skill across nonacademic topics during out of school activities. The ability to use this type of intervention is contingent on students being in school frequently, which can be affected by sickness, weather, and a multitude of other factors. Alternate opportunities for children to interact with others are typically restricted to out of school activities and home environments. For many children with ASD, out of school activities are limited to less people and fewer environments when compared to their peers with typical development (Hilton et al., 2008). This results in fewer opportunities to contact any social communication with same age peers, in both structured and unstructured environments.

Parents of young children with social communication delays often feel unequipped to promote growth in their child's targeted skill areas, such as expressive

communication (Kaiser & Hampton, 2017). Parent training models for home-based interventions can increase the comfortability of the parent and social communication of the at-risk children by providing them with access to effective interventions and high-quality training (Lane et al., 2016). As in school settings, research in home-based settings have typically focused on the adult and child relationship (Trent et al., 2005). While it is ideal that all adults present in a child's life are able to participate in parent training models, this is not always feasible due to extraneous factors such as work schedules, other children, or illness. This can increase stress for the adult or adults that do receive training, as they are not only learning to implement a newly learned intervention, but now responsible for training any other family members that are frequently involved with the child. There are also vast differences in how parents learn based on their familiarity with the intervention, their career or education, and their culture. This is especially apparent when considering parents with low socio-economic status (Leijten et al., 2013). As most parent trainings occur in short, standardized sessions, and now some even through telehealth, there is not enough individualization in training to adapt to each parent's learning preferences or abilities (Daley et al., 2018). This can lead to lower procedural fidelity, which will hinder the intervention's effectiveness, and might lead to an overall discontinuation of the treatment due to disappointment in the results.

While it is important to train parents as they are oftentimes considered the primary interventionists of young children, a child needs to be involved in a variety of interactions to continue to expand on their social communication. A solution to this problem would be to include siblings as interventionists that reflect their same-age peers, because they may be similar in age. Less research has been produced regarding

interventions that promote social communication between siblings. With in-person school occurring less frequently, siblings have become the primary source of same-age interaction for some. For children with ASD, having an older sibling is associated with increased social-communication skills as it presents opportunities for similar age interaction that they otherwise might not receive (Ben-Itzhak et al., 2016). Skills learned through interactions with siblings differ from those learned through interaction with parents. Parents typically initiate and encourage engagement in a way that same age peers would not. Siblings work less to engage each other, pushing children with social-communication delays to strengthen initiation skills (El-Ghoroury & Romanczyk, 1999). While siblings might display a more hierarchal relationship, in that the older sibling has more knowledge or experience, there is also a peer-like relationship in their similar interests and childhood experiences (Harrist et al., 2014). Experiencing this type of relationship is beneficial for forming friendships and communicating in more authentic settings (Hilton et al., 2008). Most of our current knowledge surrounding siblings and social skills come from observational studies. Training siblings could build on the foundation of learning that occurs between siblings and develop our knowledge related to the significance of these interactions (Trent-Stainbrook et al., 2007).

Interventions led by peers and parents have both shown positive effects by increasing social communication in children (Chang & Locke, 2016; Roberts & Kaiser, 2011). Yet, there are numerous limitations regarding both approaches as discussed in previous paragraphs. Incorporating siblings into sessions could address the limitations in parent training, such as increased parent stress and a lack of same age interaction. It could

also address limitations of peer intervention, such as the creation of a mentoring relationship and restricted environment.

The purpose of this study is to bridge the gap in research regarding training siblings of children with social-communication delays to implement social skills interventions. This will involve both assessing the feasibility of training a sibling to implement an intervention and determining whether the intervention, when implemented appropriately, will lead to an increase in social-communication skills for the child with disabilities.

Research Questions

1. Is there a functional relationship between training siblings of children with disabilities and their fidelity in independently implementing social communication interventions when interacting with their sibling at home?
2. Will sibling led interventions increase initiations and responses for children with disabilities during play?
3. Will the interaction strategies continue to be used in the absence of training sessions?

Method

Participants

Children. Two sibling dyads were recruited for this study. Each dyad included a younger sibling who was minimally verbal (Kaiser et al., 2016) and an older sibling who displayed age-appropriate social communication skills. Inclusion criteria for participating in this study were as follows: (a) the family included two siblings, (b) the younger sibling was between ages 4 and 11, (c) the older sibling was between ages 6 and 12, (d) the younger sibling was minimally verbal, (e) the older sibling was within normal range for social communication skills within their age group, (f) parent provided consent for both siblings (including consent for video and use of their home for sessions), and (g) the older sibling provided assent. Exclusion criteria were (a) the older sibling had delayed social communication, (b) one or more stakeholders (parents or either sibling) expressed disinterest in participating, or (c) siblings did not have a typical interaction time in which they play in the same area for a consecutive 5 min without interruption (e.g., lived at separate houses, family's daily routine did not involve siblings being together frequently).

Both children's social communication abilities were assessed within a 10 min play session in the children's home. The researcher conducted a language sample for the younger sibling and collected data on interaction strategy usage by the older sibling. In Kaiser et al. (2016), minimally verbal was indicated for the participant if less than 20 spontaneous words were used during three separate language samples. This study conducted one language sample in which the same criteria, less than 20 spontaneous vocalizations, was used. Anecdotal data was used to determine the older siblings' social

communication abilities in relation to the norm for their age (i.e., parent report, interactions with researcher). Data on their interaction strategy usage determined which strategies would be targeted during intervention. Behaviors used at a rate of 0.2 uses per minute or above were not included in training.

Dyad 1. The first dyad consisted of Will and James. Will was a 7-year-old male that displayed social communication skills within the norm for his age range. James was a 5-year-old male diagnosed with autism spectrum disorder (ASD) that was determined minimally verbal through the language sample and parent report. James had 12 spontaneous vocalizations during the language sample, with nine being novel vocalizations and the other three being repetitions of previously said words. He would imitate Will and his mom frequently, but rarely engaged in vocal communication independently. Based on observation, James tended to cry to express his wants.

Dyad 1's play involved Will and James engaging in separate activities while in the same area. Their mom expressed that they had just recently become comfortable interacting with one another and hadn't developed many joint play skills.

Dyad 2. The second dyad consisted of Henry and Noah. Henry was a 7-year-old male that displayed social communication skills within the norm for his age range. Noah was a 4-year-old male diagnosed with ASD that was determined minimally verbal through the language sample and parent report. Noah had three spontaneous vocalizations during the language sample, which were all novel vocalizations. He engaged in repetitive humming and babbling for a majority of the observation. When he did engage in vocalization, he would repeat the same word (e.g., Henry asked him to say "cheese" for the camera and he began repeating the word "cheese").

Dyad 2's play involved Henry being in more of a helper role to Noah. They seemed comfortable interaction, and Henry would typically try to engage Noah in activities by labeling toys and narrating play. Their mom had previously received services on the use of interaction strategies and expressed that Henry had begun using some of the same strategies as her.

Other. The primary researcher in this study is a master's student in Applied Behavior Analysis at the University of Kentucky. Their experience prior to the study included managing challenging behaviors at the University of Kentucky Center for Applied Behavior Support, early childhood intervention through the TIERS Grant, and parent training for social communication support through the PACE Program. Personnel collecting reliability data included a Board Certified Behavior Analyst and other students pursuing a master's degree in Applied Behavior Analysis at the University of Kentucky. All personnel had previous experience in working with children with and without disabilities.

Instructional Setting and Arrangement

Initial observations, baseline sessions, and intervention sessions occurred in the dyad's home in a room that was typical for each dyad to interact (e.g., playroom, living room, bedroom) and outside in areas that siblings enjoyed playing in (e.g., trampoline, playset, driveway). Both siblings and the primary researcher were present during these sessions. The parent was allowed to be present but was asked not to interact with the children as the study will be focusing on one-to-one interaction between siblings. The parent was asked to act as they naturally would at home when their children are playing together, as to reduce any distraction that might be caused by uncommon parent

observation. Training sessions with the older sibling were conducted in the child's bedroom or another area in the home. Parents were allowed to be present but were asked to not interfere with the training by adding questions or giving explanations. The younger sibling was not present, and no potentially distracting items were present during these sessions (e.g., toys, electronics).

Materials and Equipment

The Countee app on an iPhone (160.8mm x 78.1mm x 7.65mm) was used to count each behavior being measured throughout the duration of each session. Other data collection materials included a language sample form (Appendix A) and procedural fidelity data sheets for training (Appendix B) and play sessions (Appendix C). Any anecdotal notes taken were collected in a running record document on a MacBook Air laptop (1.56cm x 30.41cm x 21.24cm). A Nikon D3300 camera (124mm x 98mm x 75.5mm) was used to record session and collect data following the session. Toys provided for the children during play sessions were dependent on their need, the age of the children, and their interests. Toys were selected by the children before each session and if they did not pick out a sufficient amount (at least 5), the implementor selected some for them. A MacBook Air was used to display the model videos during training sessions with the older sibling. Household toys and items were used during these play sessions. Electronic devices were not used during the sessions (e.g., iPads, Phones, Tablets) as they do not promote communication-based play (Trent et al., 2007).

Dependent Variables and Measurement System

The primary dependent variable was the older siblings' use of interaction strategies during play-based activities with a younger sibling. In addition, probe sessions

were conducted to monitor the younger sibling's increases in responses and initiations. A count system with time stamps was used to track these behaviors across the study (Ledford & Gast, 2018, p. 102). This was done through use of the Countee App (<https://apps.apple.com/us/app/countee/id982547332>), which allowed the data collector to track the number of behaviors that occurred, the time that each occurred, and the rate of behaviors per minute. During initial observations of the dyad, the older sibling was measured on 5 target behaviors – narrating their own play, asking questions, commenting on the siblings' play, offering choices, and expanding language. Three behaviors were selected based on low responding in initial observation sessions (less than 0.2 responses per minute) to target during intervention. If more than three interaction strategies were considered low responding, strategies would be selected based on levels of increased complexity, with consideration of importance to the family (e.g., sibling should be taught a simpler strategy such as narrating their own play rather than a more complex strategy such as offering choices) and feasibility (e.g., if the younger sibling has infrequent spontaneous vocalization, expanding language could be difficult for the older sibling to achieve). The following behaviors were monitored for the older sibling, based on behaviors used in Lane et al. (2016), the PACE (2020) manual, and Trent et al. (2005):

Narrating Their Own Play. Correct narration was defined as using 1-2 words to name either the object being manipulated during play or the action on the object. Separate instances of narration were counted when at least 5 s passed between narrations. Examples included labeling a toy during play (e.g., playing with a yellow ball and saying, “yellow ball”) or naming an action on an object (e.g., rolling a car and saying “fast”).

Nonexamples included referring to an item or action unrelated to the activity (e.g., “I’m leaving for a snack”).

Asking Questions. Correct question asking was defined as asking the younger sibling an open-ended question related to the current activity. Separate instances of asking questions were counted when at least 5 s pass between questions. Examples included asking about a toy the younger sibling was using during play (e.g., “What color is that Lego?”) or asking about the action on the object (e.g., “What are the animals doing?” when younger sibling is playing with farm animal toys). Nonexamples included providing a choice (e.g., “Do you want the red car or the green car?”, that should be marked as an instance of Offering Choices) or asking a question unrelated to play (e.g., “What do you want for lunch?”), asking another person in the room a questions (e.g., asking the implementor “How do I work this toy?”).

Modification. Following training on asking questions, the implementer noticed that Will was having difficulty understanding the difference between open- vs. closed-ended questions. In addition, Will indicated that James would not reliably respond to such questions. Given this observation, sibling feedback, and that video records were available for sessions, data were reviewed, counted, and graphed accordingly. This modification was used for the next dyad. It was decided that both forms of questions would be tracked as correct uses of the strategy, allowing participants to continue to the next training.

Commenting on Siblings’ Play. Correct commenting on siblings’ play was defined as the older sibling using 1-2 words to name either the object the younger sibling was manipulating or the action that described the movement the younger sibling was

creating. Separate instances of commenting were counted when at least 5 s elapsed between comments. Examples included labeling a toy the sibling is playing with (e.g., younger sibling playing with a yellow ball and older sibling saying, “yellow ball”) and labeling an action the sibling is creating (e.g., younger sibling rolling a car and older sibling saying “fast car”). Nonexamples included referring to an item or action unrelated to the activity (e.g., older sibling saying “bless you” when younger sibling sneezes), older sibling using a full sentence to describe younger sibling’s play (e.g., “You’re rolling the ball down the slide”), and making corrective statements (e.g., older sibling saying, “that’s wrong” regarding how younger sibling is using a toy).

Offering Choices. Correct choice offering was defined as the older sibling presenting two items or activities to the younger sibling and vocally offering the choices, including the names of both items and activities. Separate instances of offering choices were counted when at least 5s pass between an offer. Examples included offering the same item with variations (e.g., “Do you want the green Lego or the blue Lego?) and offering different activities (e.g., “Do you want to play with the blocks or the trains?”). Nonexamples included only offering one item but presented as a choice (e.g., “Do you want the doll or not”) and offering activities that can’t be physically presented (e.g., “Do you want to sing or dance”).

Expanding Language. Correct language expansion was defined as the older sibling vocally responding within 1-3 s to the young sibling’s attempt to communicate (e.g., gesture, vocalization, words) by expanding (adding 1-2 meaningful words) or recasting vocalizations/verbalizations or providing language for a non-vocal behavior (at the target language level). Examples included expanding on vocal communication (e.g.,

younger sibling says “ball” and older sibling replies, “red ball”), expanding on non-vocal communication (e.g., younger sibling points to a block and older sibling says “block”), and completing vocalization attempts (e.g., younger sibling says “tru-” and older sibling replies, “truck”). Nonexamples included repeating words with no expansion, adding a word that is not meaningful (e.g., younger sibling says “ball” and older sibling replies “the ball”) and expanding on unidentifiable vocalizations/gestures (e.g., younger sibling pointing up with no context and older sibling saying “sky”).

The following behaviors were monitored for the younger siblings:

Initiations. Correct initiations were defined as the younger sibling making vocal or nonvocal attempts to engage their older sibling without preceding prompts or cues for at least 10 s prior to the initiation. Separate instances of initiations were counted when at least 5 s passed between an attempt to initiate an interaction. Examples included vocal attempts to interact (e.g., younger sibling saying, “race cars” while watching the older sibling play with cars) and nonvocal attempts to interact (e.g., younger sibling tapping older sibling on the shoulder, trying to merge play). Non-examples included aggression towards older sibling (e.g., throwing an object at their sibling), spontaneous vocalizations without secondary indicator of meaning (e.g., talking to self, narrating own play to self, babbling), and taking an item from the older sibling.

Responses. Correct responses were defined as the younger sibling using words or gestures to respond to initiations, including questions and statements, from the older sibling within 5 s of the initiation. These responses included a secondary indicator of meaning (e.g., looking at sibling while vocalizing). Echoic were included as responses contingent on these secondary indicators, which allowed for differentiation between

instances in which the younger sibling was repeating as a means of communication and when they were repeating words without communicative intentions. Examples included vocal responses to older sibling, nonvocal responses to older sibling (e.g., nodding head yes), and imitating their older sibling's initiation (e.g., if the older sibling pointed to a tower and said "tower", the younger sibling also pointing to the tower and imitating "tower"). Nonexamples included spontaneous vocalization not associated with the initiation prompt (e.g., older sibling says, "What are your cars doing?" and younger sibling says "no"), imitations with no secondary indicator of meaning (e.g., the older sibling saying "jump" while jumping, and the younger sibling repeating "jump" while focus on another unrelated activity), and problem behaviors (e.g., hitting older sibling when they initiate play, screaming at them).

Screening Procedures

One 10 min initial observation session was conducted in the children's home. During this observation, children were directed to play together in a general area (e.g., "It's time to go play in the living room") and were observed together by the researcher. A language sample was taken for the younger sibling. This included writing down spontaneous vocalizations that occurred within 10 min. If less than 20 spontaneous vocalizations occurred, the child was considered to have a significant communication delay and met one of the main criteria for involvement in the study. Anecdotal notes were used to determine the older siblings' social communication abilities in relation to the norm for their age. This included interacting with the child and asking for parent report on their communicative abilities. Data were collected during this session on the older siblings' use of the five interaction strategies being assessed in this study. From this data,

three strategies were selected based on the strategies with the lowest responding. Low responding is considered less than two uses during the 10 min session (0.2 uses per minute). If more than three interaction strategies were considered low responding, strategies would be selected based on levels of increased complexity, with consideration of importance to the family (e.g., sibling should be taught a simpler strategy such as narrating their own play rather than a more complex strategy such as offering choices) and feasibility (e.g., if the younger sibling has infrequent spontaneous vocalization, expanding language could be difficult for the older sibling to achieve). For both dyads, the strategies selected for training were Asking Questions, Commenting on Sibling Play, and Offering Choices. In initial observations, Will used Narrating Own Play at a rate of 0.7 uses per minute. Henry used Narrating Own Play at a rate of 0.3 uses per minute.

Experimental Design

A multiple baseline across behaviors design was used to evaluate the effectiveness of the intervention for promoting responsive behaviors in older siblings of younger children who are minimally verbal (narrating their own play, asking questions, commenting on the siblings' play, offering choices, and/or expanding language). Multiple baseline designs are appropriate for monitoring improvements in reversible and non-reversible behaviors and may be well suited when a behavior could be perceived as potentially reversible or non-reversible (given examples in the literature). This design does not require removal of the intervention to evaluate presence or absence of a functional relation. This design allowed for data collection in tiers that had not yet received intervention, and from this the researcher was able to constantly assess if covariation or other threats to interval validity were occurring. It was unlikely that the

behaviors in untrained tiers would be learned without intervention, therefore covariation is unlikely for this study. Maturation was controlled for as this study only lasted for 10 weeks for dyad 1 and 6 weeks for dyad 2, which was not a time period in which significant communication progress would have been made in the absence of intervention. Testing threats were controlled for by conducting sessions in a familiar home environment for short periods of time. Two dyads were recruited in attempt to control for attrition (Ledford & Gast, 2018, p. 268).

General Procedures

Within the context of the experimental design, baseline data were collected to establish a clear pre-intervention pattern of responding of target behaviors. Once baseline data were stable, the first training session was conducted with the older sibling. When the older sibling met fidelity in training (a rate of one use of the given strategy approximately once per minute), play sessions were conducted in which both siblings interact for 5 min while behaviors were recorded. As responding levels in play sessions met criterion for moving to the next tier (a rate of 0.4 uses of the given strategy per minute across three sessions), the process was repeated with the next interaction strategy introduced during training and then monitored during play. The number of sessions conducted per week and the amount of session conducted each visit was dependent on the family's schedule and availability but was no less than once per week with two sessions per visit. In addition, for younger siblings, initiations and responses were evaluated during one probe session in each condition of the study to assess the impact of the siblings' implementation of the intervention strategies. These were not run separately; the younger sibling's data were

collected along with older sibling's behaviors during their typical play sessions. Parents were required to stay in the home for the duration of all sessions.

Baseline Procedures

At the beginning of each 5-min session, children were directed to play in a specific area of the house. The location varied and typically was determined by the parent (e.g., "It's time to go play in the living room"). The dyads were asked to select some toys to play with and bring them to the selected area. If they did not get at least five, the implementor brought some to the area as well. If a child attempted to leave the area, the timer was stopped and the child was redirected into the area (e.g., "Let's keep playing in this room!"). If a child continued attempting to leave, the implementor would keep the timer stopped and engage both children in a new activity. No prompts or other supports were provided during sessions.

Instructional Procedures

Training Sessions. For each interaction strategy, a training session was conducted with the older sibling prior to play-based sessions. This involved directing the older sibling to an area that had been previously determined as suitable for one-on-one training (e.g., "Let's go talk at the kitchen table"). Training sessions lasted between 30- and 45-min, with the length of time dependent on the older sibling's level of responding and breaks to play or have a snack. Each training sessions consisted of four components: (a) explaining the purpose of the behavior, (b) modeling how to engage in the behavior, (c) asking comprehension questions, and (d) rehearsing how to engage in the target behavior. During the explanation portion of the training, the implementor provided a clear explanation of how to engage in the given behavior and why it is helpful to their

younger sibling. For example, when training to narrate their own play, the implementor might say:

“Narrating your own play means to talk about what you are doing, while you are doing it. This could mean when you are building with blocks, you could say, ‘I’m building a tower’. This can help (younger siblings name) start to play with you, ask you questions about what you’re doing, or start to talk about what they are playing with!”

During the modeling portion, the implementor showed the participant a short video (~1 min) that modeled the desired behavior occurring between siblings. For asking questions, the implementor asked questions (e.g., “What is a choice that you could give your younger sibling while playing?”) to ensure understanding of the desired behavior. The implementor also allowed the participant to ask questions (e.g., “What questions do you have about that?”). The final phase was the rehearsal phase. This portion of the training lasted between 5 and 10 min during which the implementor acted as the younger sibling and instructed the older sibling to engage in the given strategy being taught within 2 min sessions. Reaching 100% fidelity required the use of the strategy at least once per minute (minimum of twice per rehearsal session). The participant needed to meet 100% for two consecutive sessions to proceed to play conditions with the younger sibling. Between rehearsal sessions, the participant was given opportunities to take breaks, see another model, or ask any questions they had. If fidelity was met after the 45 min period, a second training session was scheduled for another time so that the participant did not feel overworked. Verbal reinforcement was provided during, throughout, and after the training (e.g., “You’re doing a great job listening and learning!”).

Play-based Sessions. Once the mastery criterion was met in training sessions, play sessions began. These sessions began with the implementor telling the dyad “We’re going to play in here for five minutes!”. Play sessions consisted of the same procedures outlined in baseline sessions, consisting of 5 min of play between the dyad and stopping the timer to redirect if any participants left the play area. Use of interaction strategies were measured for the older sibling during these sessions. Sessions continued until the older sibling reached mastery criterion of using the interaction strategy at least 2 times within the 5 min session for three consecutive sessions (rate of 0.4 uses per minute). Once the previous interaction strategy was mastered, a new interaction strategy was introduced in a training session. This continued until all interaction strategies were introduced and used to mastery criterion. The number of sessions conducted per week and the amount of session conducted each visit remained the same as in baseline and was dependent on the family’s schedule. This added a component of generalization, as sessions were conducted at different times of the day and on different days.

Modifications. A modification occurred for one older sibling during the study. For Will, it was necessary to introduce additional reinforcers, outside of potential reinforcers during play-based activities, into the session. This resulted in the implementor creating a token board in which Will could receive a reward after completing the training and three sessions for the day. Larger rewards were selected based on parent report of their preferences.

Pre-planned modifications were made prior to begin the study, with a plan to implement procedures, if needed. Given this study is ongoing, the modifications have been retained in this section. If five consecutive sessions occurred in which the target

dependent variable did not show an increasing trend towards mastery criterion for advancing to the next tier, behavior specific praise was introduced in play sessions. This included the researcher giving praise for correct instances of the target behavior (e.g., “Great job providing a choice!”). If five consecutive sessions occurred in which the target dependent variable did not show an increasing trend towards mastery criterion following the introduction of behavior specific praise, feedback was added to sessions. This included 5 min one-on-one sessions with the older sibling following play sessions in which feedback was given for their use of the interaction strategy in the session, along with the behavior specific praise being given during play sessions.

Maintenance Procedures

Due to the nature of the design, maintenance data were collected for mastered behaviors as new interaction strategies were introduced. As the study is ongoing, maintenance data for the remaining tiers will be collected across three sessions following mastery of all target behaviors to assess the continued use of interaction strategies.

Reliability and Fidelity

Data Collector Training. IOA data collectors were trained first through a presentation that discussed operational definitions of the behaviors. They then watched practice videos of training and play sessions that the implementor had taken with other children. The data they collected during these practice videos was compared to the implementors’ previously collected data. Mastery criteria was met once data collectors had above 90% agreement for two consecutive practice videos. Two data collectors were used for play session IOA, one focusing on older sibling behaviors and another focusing on younger sibling behaviors. One data collector was used for training session IOA. PF

data collectors were also trained through a presentation that discussed the PF data sheet. They then watched practice videos of training and play sessions that the implementor had taken with other children. The data they collected during these practice videos was compared to the implementors' previously collected data. Mastery criteria was met once data collectors had above 90% agreement for two consecutive practice videos. One data collector was used for play session PF data, and another was used for training session PF data.

Interobserver agreement. Inter-observer agreement was taken for 33.3% of play sessions (see Table 1), training sessions (see Table 2), and probe sessions (see Table 3) in each condition for each behavior for each participant (see Table 1). This involved both observers using the Countee app to track the frequency of the behavior. IOA was calculated by dividing the number of agreements (behaviors time stamped within 2 s of each other) by the number of agreements plus disagreements (behaviors timed stamped within over 2 s of each other or only recorded by one observer) and multiplying the quotient by 100. The formula is as follows:

$$[\# \text{ Agreements} / (\# \text{ Agreements} + \# \text{ Disagreements})] \times 100 = \text{IOA Percentage}$$

The average IOA for Will's use of Asking Questions, Commenting on Sibling Play, and Offering Choices during play sessions was 95%, ranging from 90% to 100%. The average IOA for Henry's use of Asking Questions, Commenting on Sibling Play, and Offering Choices during play sessions was 90.9%, ranging from 80.9 to 100%. The average IOA for James' use of Initiations and Responses during play sessions was 100%. The average IOA for Noah's use of Initiations and Responses during play sessions was 100%.

Table 1. Mean Percent IOA Across Play Sessions Per Condition (Older Sibling Behaviors)

Participant	Session Type				
	Play (Baseline)	Play (AQ)	Play (CSP)	Play (OC)	Play (Maintenance)
Will	100	90			
Henry	100	80.9	91.7		

Note. Play (AQ) represents sessions that occurred following training on Asking Questions. Play (CSP) represents sessions that occurred following training on Commenting on Sibling Play. Play (OC) represents sessions that occurred following training on Offering Choices.

Table 2. Mean Percent IOA Across Training Sessions

Participant	Session Type
	Training
Will	100
Henry	100

During the rehearsal phase of training, IOA was collected for participants' use of the strategy being trained. The average IOA for Will's use of the strategy was 100%. The average IOA for Henry's use of the strategy was 100%.

Table 3. Mean Percent IOA Across Probe Sessions (Younger Sibling Behaviors)

Participant	Session Type
	Probe
James	100
Noah	100

Procedural fidelity. Procedural fidelity data were taken for 33% of sessions in each condition for each participant for play sessions (see Table 4) and training sessions (see Table 5). This involved an observer marking correct and incorrect steps on the PF data sheet and converting into a percentage of correct steps. In all conditions, including

maintenance, procedural fidelity data were collected on the researcher beginning the session correctly and ending the session once 5 min had been recorded. During training sessions, procedural fidelity data was collected on the researcher appropriately training the older sibling to mastery criteria. This was calculated as the number of correct steps (+) divided by the total number of steps, multiplied by 100.

$$(\# \text{ Correct} / \# \text{ Steps}) \times 100$$

The average PF for the implementor while conducting play sessions with Will and James was 100%. The average PF for the implementor while conduction play sessions with Henry and Noah was 100%. The average PF for the implementor while conduction training sessions with Will was 100%. The average PF for the implementor while conduction training sessions with Henry was 100%.

Table 4. Mean Percent Procedural Fidelity Across Play Sessions Per Condition

Dyad	Session Type				
	Play (Baseline)	Play (AQ)	Play (CSP)	Play (OC)	Play (Maintenance)
Will & James	100	100			
Henry & Noah	100	100	100		

Note. Play (AQ) represents sessions that occurred following training on Asking Questions. Play (CSP) represents sessions that occurred following training on Commenting on Sibling Play. Play (OC) represents sessions that occurred following training on Offering Choices.

Table 5. Mean Percent Procedural Fidelity Across Training Sessions

Participant	Session Type
	Training
Will	100
Henry	100

Results

Data were visually analyzed within and between conditions during the study, with consideration of level, trend, stability, overlap, consistency of effect, and immediacy of effect (Barton et al., 2018). In addition, because a time-lagged design was used to evaluate the intervention, vertical analysis of data occurred by monitoring covariation in untreated tiers. These visual analysis tools were used to decide about if a basic demonstration of effect was present in each tier, as well as presence or absence of a functional relation (at least three demonstrations of effect at three different points in time). At this time, results are based on performance within at least two tiers for the older siblings. The study is ongoing with an anticipated completion date of late April 2022.

Sibling Dyad 1

During baseline sessions, the rate of responding displayed by Will across all three behaviors were at a low level with a zeroaccelerating trend in the data (see Figure 1). Following the first training for Asking Questions, there was an immediate change in level from 0 instances of the target behavior to rate per min of between 2 and 2.4 uses per minute of asking questions. Responding relative to the baseline condition was indicative of a basic demonstration of effect. Baseline levels remained low for the second and third tiers, indicating lack of covariation in the data. Open ended questions and closed ended questions were graphed separately based on modifications to the study (see Figure 2). Closed ended questions occurred at a higher rate, as displayed through significantly higher levels than open ended questions. At this point in time, maintenance data are not available for Will.

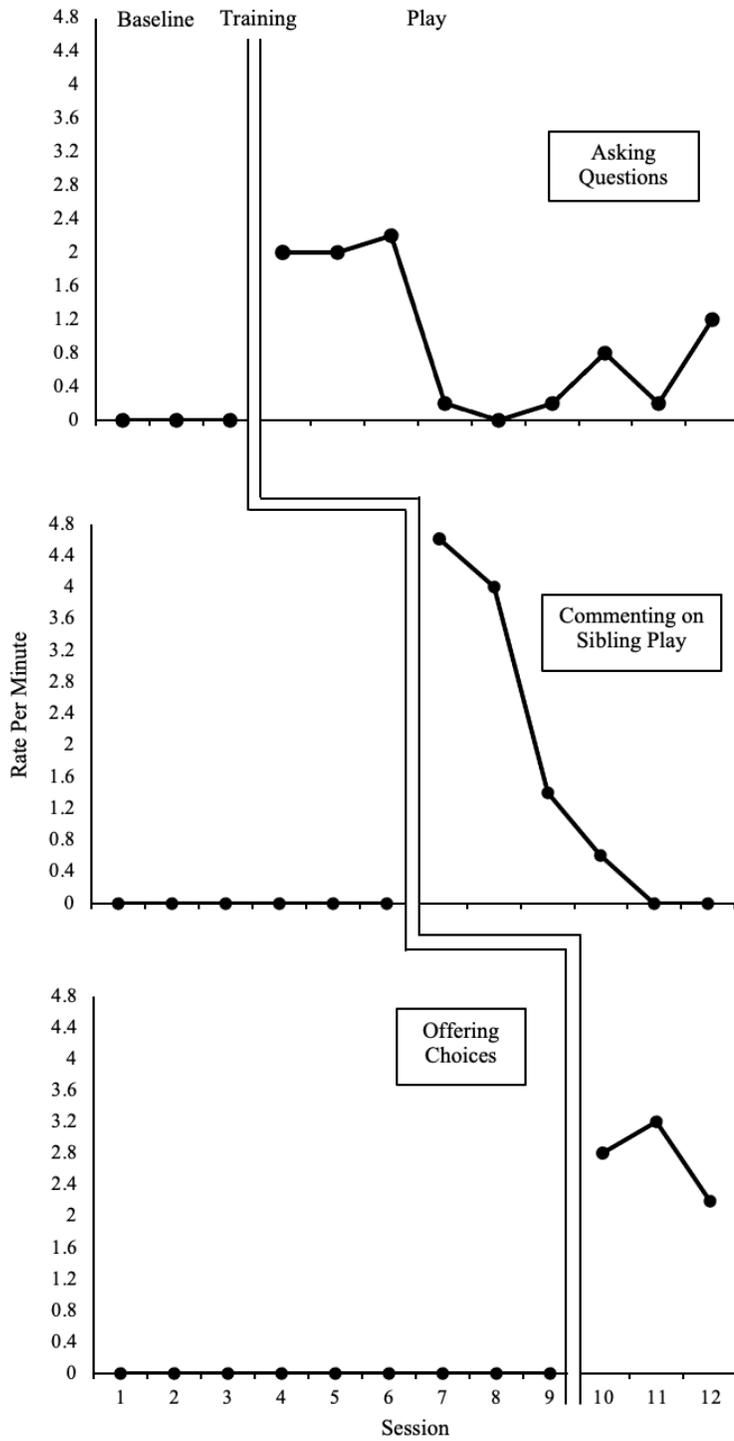


Figure 1. Will's Rate Per Minute Using Interaction Strategies

Note. Reward system modification began in session 7.

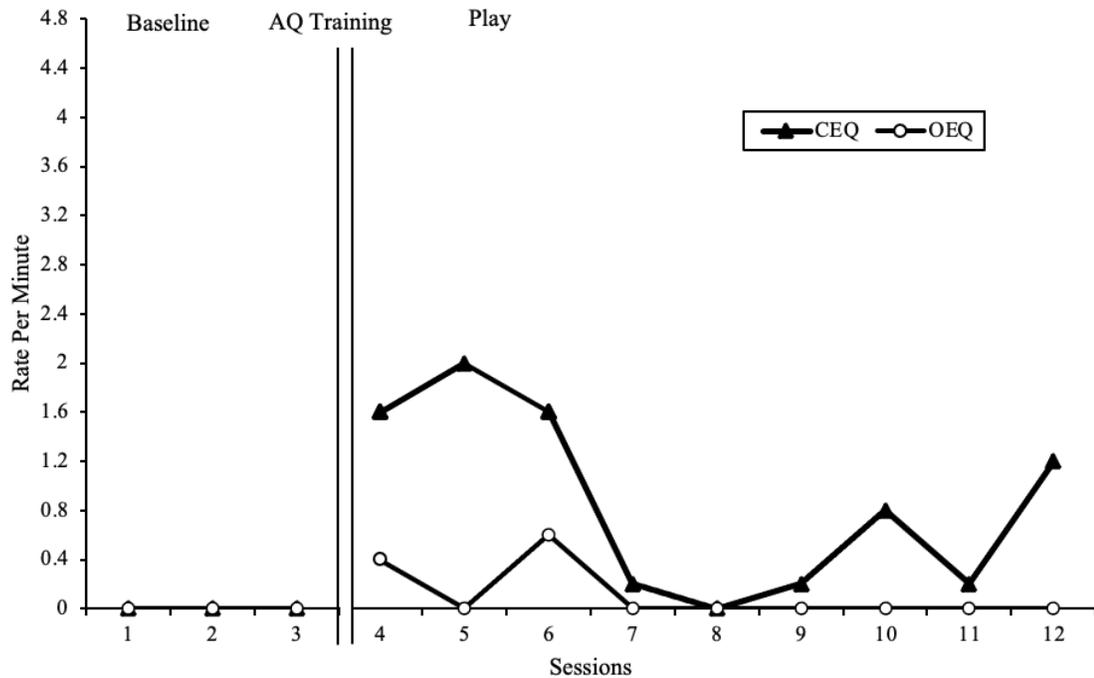


Figure 2. Will's Rate Per Minute Using Closed- and Open-Ended Questions

Younger Sibling. James did not display responses and initiations to his older sibling during the initial probe session conducted during the baseline condition (see Figure 5). Following Will's training on Asking Questions, James displayed an increased rate in responses and initiations at a rate of 0.8 and 0.4 occurrences per minute. There is currently not a sufficient amount of data to determine a trend for James' use of the communicative behaviors. Also, given how data are collected, any improvements are considered correlational at best.

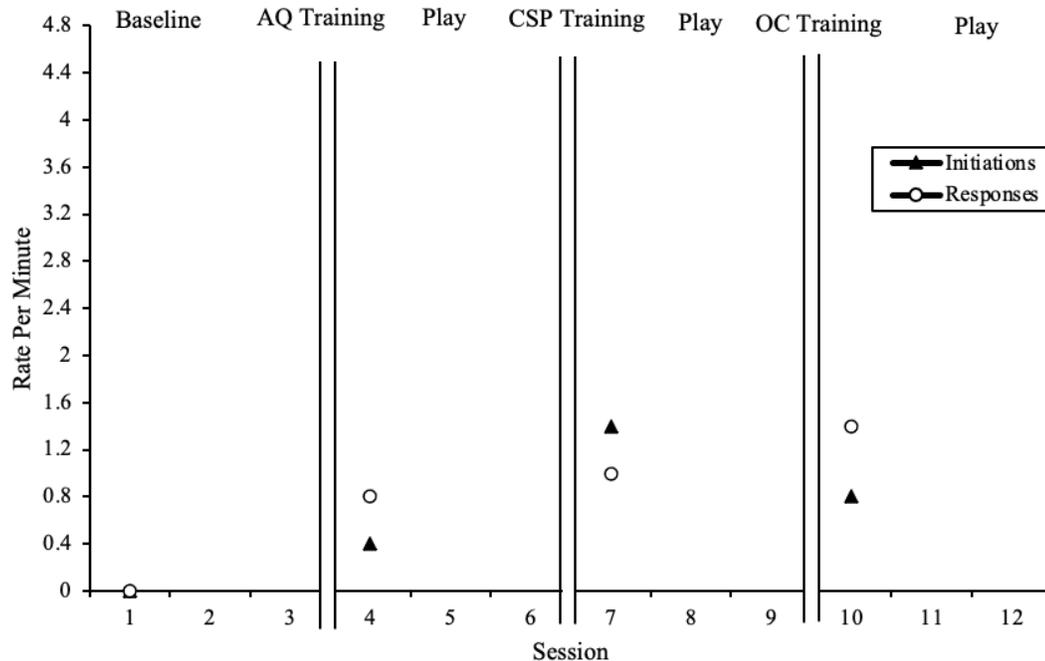


Figure 3. James' Communication Across Sessions

Note. AQ Training represents Will's training on Asking Questions. Play represents the play session following training. Results are correlational.

Sibling Dyad 2

During baseline sessions, the rate of responding displayed by Henry across all three behaviors were at a low level with a zeroaccelerating trend in the data (see Figure 3).

Following training on Asking Questions, there was an immediate change in level from 0 uses per minute to a high level of 1.4 uses per minute. This frequency decelerated to a moderate level for the remaining sessions, ranging from 0 to 0.6 uses per minute.

Responding relative to the baseline condition was indicative of a basic demonstration of effect. Baseline levels remained low for the second and third tiers, indicating lack of covariation in the data. Following training on Commenting on Sibling Play, there was not an immediate change in level, but a stable trend in data. The data began to trend in a

therapeutic direction after three sessions, ranging from 0.4 to 1.4 uses per minute in the following three sessions. Figure 4 displays uses of open-ended questions and closed ended questions. Henry used closed ended questions at a higher frequency than open ended questions, as displayed through higher levels on the graph. Maintenance data showed an immediate drop in level to across all behaviors. Extended maintenance data are not available for Henry at this time.

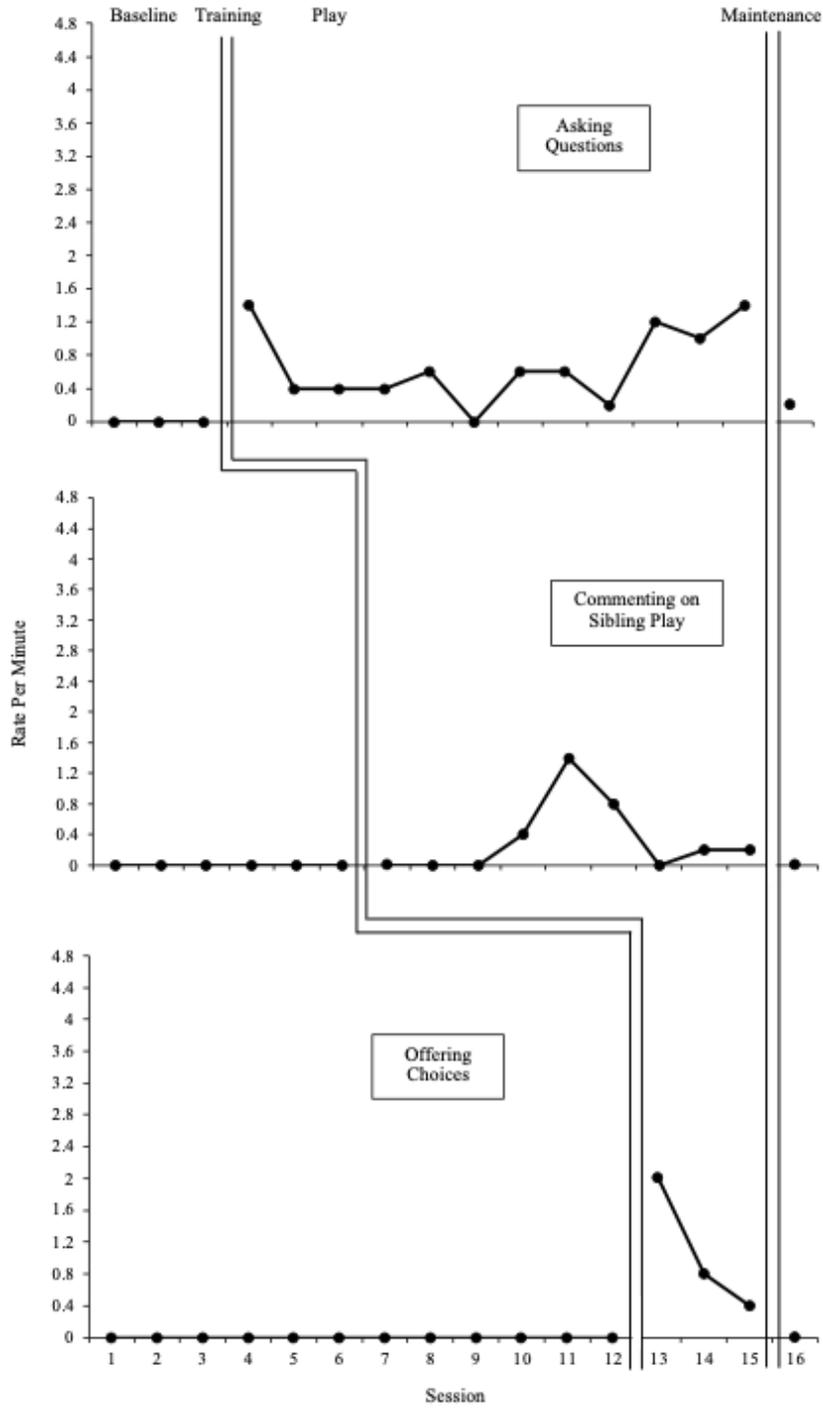


Figure 4. Henry's Rate Per Minute Using Interaction Strategies

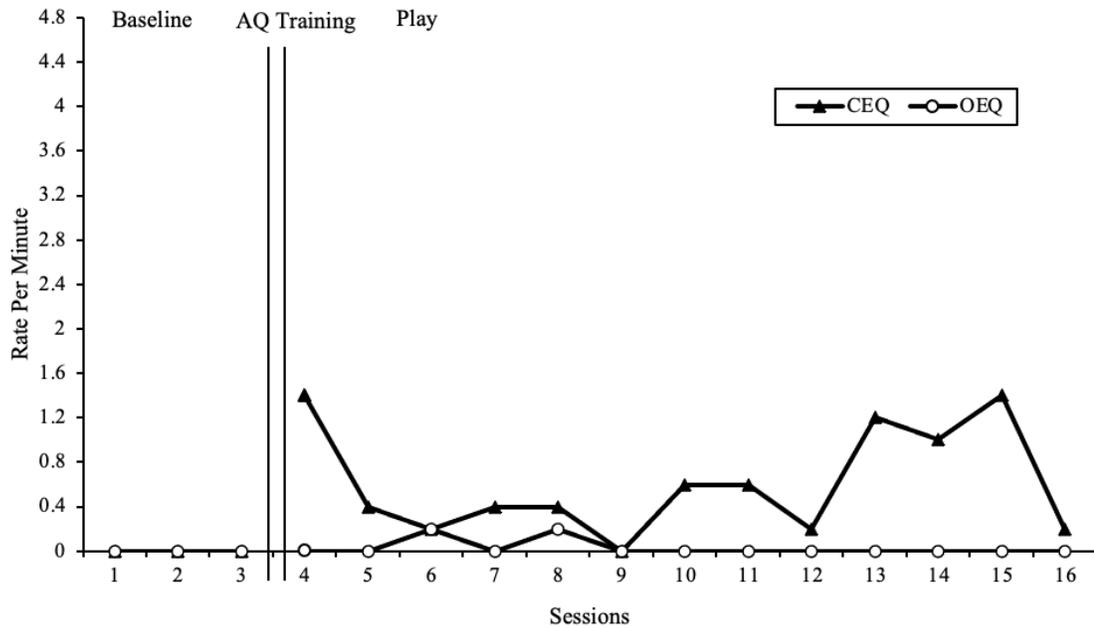


Figure 5. Henry's Rate Per Minute Using Closed- and Open-Ended Questions

Younger Sibling. Noah engaged in a moderate level of initiations (0.4 uses per minute) during baseline and no responses (see Figure 6). His frequency of responses had an immediate change in level, from 0 to 0.8 uses per minute, following intervention. Uses of responses then decelerated in a contra-therapeutic direction back to baseline levels. Noah's use of initiations had no trend, with moderate variability, ranging between 0.2 uses per min and 0.6 uses per min. Similar to James, there is not a sufficient data to make decisions about Noah's communication; any improvements are considered correlational at best.

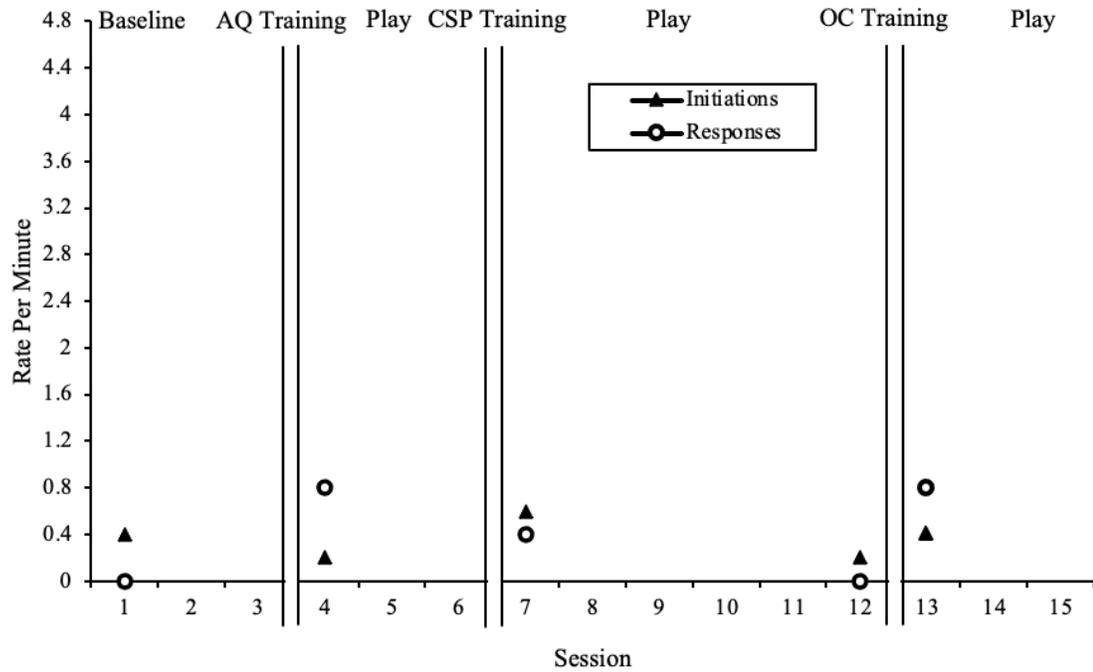


Figure 6. Noah's Communication Across Sessions

Note. AQ Training represents Henry's training on Asking Questions and CSP Training represents Henry's training on Commenting on Sibling Play. Play represents the play sessions following trainings.

Discussion

The purpose of this study was to evaluate an intervention for training older siblings to implement responsive interaction strategies during play designed to promote social communication in their younger siblings with disabilities who were also minimally verbal. Their correct and independent implementation of strategies were monitored during the course of the study. At this time, the study is ongoing and, as such, presence or absence of a functional relation cannot be determined. Thus far, both older siblings displayed improvements in responsive behaviors, but modifications were needed. The modification included providing Will with a token board, in which completing a training session and three play sessions resulted in a larger reward (i.e., a treasure box with reinforcer options to choose from) In addition, increases in responses and initiations in younger siblings were monitored during the study during probe sessions. Currently, the data produced mixed results with one younger sibling displaying improvements in target behaviors relative to baseline and the other displaying variable responding. At this time a functional relation cannot be evaluate based on the data collected, therefore the discussed findings are correlation.

Limitations and Challenges

This study has multiple limitations that warrant attention. Differences in each dyad's home environment posed difficulties in throughout the study. The presence of pets, other siblings, nannies, neighbors, and parents entering and leaving the house caused unintended distractions during sessions. There were also difficulties when considering the different layout of each dyad's home. For example, one dyad had a playroom that was closed off, which encouraged them to stay in the room and play during

sessions. The other dyads' play area was an open space that had access to multiple other rooms. This made facilitating play and remaining in the area less feasible. Along with this, the weather was getting warmer as sessions continued, which led to participants wanting to do sessions outside. The implementor allowed outdoor sessions, as outside play does occur naturally, but it was difficult to encourage communicative play in that setting (i.e., participants wanted to run around independently rather than sit down with a few toys). Some toys also encouraged communication during play more than others. While the implementor attempted to control for this by not allowing technology-based toys during sessions, there were still certain items and activities that resulted in more independent play (e.g., basketball hoop only allowed for one student to shoot at a time).

While the procedures listed in the study were very general for use across multiple participants, each dyad needed more individualization in practice. As expressed in the modifications section, some participants required more motivation to continue sessions while others were motivated by praise from their parent or the implementor. This resulted in the need for additional tangible reinforcers to be used following sessions. The need for these extra motivators was not discovered in initial sessions, so the data might reflect a stronger will to participate once the items were introduced. The need for these modifications could have been due to differing relationships between sibling dyads. Will's responding indicated that he was not reinforced by James' play and attention, while Henry preferred to be in Noah's presence. Dyads also presented challenges based on their individual differences. For example, James, at times, displayed difficulties with the implementer – he assumed the implementor was a babysitter and that his mom was leaving. This caused problem behaviors such as screaming and eloping that prevented

sessions from running continuously, which were addressed by the older sibling or parent redirecting him back into the designated play area.

Scheduling sessions was another difficult aspect of the study. As the participants are in school, some sessions had to be conducted between school and early bedtimes. Participants tended to be exhausted during this time, based on parent feedback, and were less likely to focus on trainings. Some sessions were able to be conducted on weekends and during weekdays when school was out of session. This could have caused differences in data based on energy levels of the participants at that time of day, and previous activity in the day. There were also deviations from initially planned session dates due to participants being sick, families taking trips, and parents having plans in the evening. In some instances, this resulted in more than a week passing between sessions.

When training on Asking Questions, it was clear that older siblings displayed difficulties understanding the difference between open ended questions and closed ended questions. The definition for Asking Questions initially specified that questions needed to be open ended, as they encourage responding beyond “yes”, “no”, or other short phrases. This was a limitation to the study as behavioral definitions should remain stable once sessions have been conducted. Data and IOA were collected a second time for sessions that had been conducted prior to this change.

Future Research

There are multiple ways in which procedures in this study could be evaluated or modified in future studies. First, the implementor could model the desired behaviors with the younger sibling while the older sibling observes. This could provide a more accurate example of using the interaction strategies with their younger sibling, rather than teaching

them based on general examples. Second, as discussed in the previous section, there were challenges keeping participants motivated during the study. Pairing this intervention with an assessment of participants preferred reinforcers (e.g., preference assessment, concurrent operant analysis) could assist the implementor in motivating both participants to participate in all sessions. This information could be used to facilitate play between both siblings by providing the most reinforcing toys or activities only during play sessions. Third, it was difficult for participants to differentiate between open ended questions and closed ended questions. Research could be done within this area to compare the effectiveness of using both types of questions, only closed-ended questions, or only open-ended questions for increasing communication skills. Research could also explore how the use of questions differ across age groups. While my study participants were both 7 years old, an older age group might find it easier to differentiate the types of questions. This could shed light on the development of communication skills and communicative awareness across ages. Relatedly, regarding age ranges, replicating this study with an older group of participants might yield different results. The age requirement for this study had a wide range (i.e., younger sibling between 5 and 11, older sibling between 6 and 12). Considering the growth in communication that happens within this age range, it can be assumed that a 12-year-old learning these strategies might learn the strategies more quickly and would be more likely to maintain these skills for a longer period following intervention.

To reverse the roles, further research could explore training younger siblings to use interaction strategies with their older sibling that has a communication delay. While older siblings are typically placed in the helper role, this is not the dynamic that all

families experience. Studying the differences of younger siblings and older siblings being put in a helping role could provide information on how different relationships can affect the growth of communication skills (i.e., Will an older sibling be more open to learning communication skills when working with a younger peer or an older peer?). As the younger siblings in this study were at the minimum age requirement, it did not provide an accurate representation of how the same strategies might increase social skills with older children. Having the younger sibling in the trainee role would allow for older participants with communication delays. While early intervention is an important time for communication intervention, it continues to be important for older children and adolescents who continue to struggle with social communication.

In consideration of my participants, both dyads recruited for this study were White, Non-Hispanic males, with sufficient space and materials available at home. Thus, the scope of this study should be expanded to include those from varied backgrounds, including socioeconomic status, race, and ethnicity. This would allow results to be generalized to across a larger population. In conclusion, this study could potentially address a gap in the research related to sibling-led communication interventions. Given responding thus far in the study, the results may ultimately indicate that children can reliably be trained to implement these strategies with fidelity.

Appendix B. Training Procedural Fidelity

Procedural Fidelity Training Data Sheet

Implementor: _____

Data Collector: _____

Date: _____

Child Initials: _____

Step Description	Correct (+) or Incorrect (-)			
1. Implementor introduces the correct interaction strategy				
2. Implementor provides a clear explanation of how to engage in the behavior				
3. Implementor provides a rationale for why the behavior is important				
4. Implementor plays a short video that models the given interaction strategy				
5. Implementor asks questions to ensure the child’s understanding of the strategy				
6. Implementor gives the child opportunity to ask questions by saying “What questions do you have?” or a similar phrase				
7. Implementor answers any questions asked				
8. Implementor explains that they will practice now with the child using the strategies and the implementor acting as the younger sibling				
9. Implementor begins the Countee app timer for rehearsal phase				
10. Implementor ends the rehearsal within a 5 second deviation of 2 minutes				
11. Implementor repeats steps 8-11 until the child reaches mastery criteria or the 45-minute time period ends				
Score	/11	/4	/4	/4

Appendix C. Play Session Procedural Fidelity

Procedural Fidelity Play Sessions Data Sheet

Implementor: _____

Data Collector: _____

Date: _____

Child Initials: _____

Step Description	Correct (+) or Incorrect (-)							
1. Implementor sets up play area with at least five age-appropriate toys								
2. Implementor gives cue to begin session such as, "Let's go play in the living room!" or a similar phrase								
3. Implementor begins timer on Countee app								
4. Implementor stops timer and redirects children to play area when necessary								
5. Implementor continues play session until there have been at least 5-minutes (nonconsecutive) of siblings in the same room, not interacting with others								
6. Implementor ends sessions by saying, "All done!" or a similar phrase								
Score	/6	/1	/1	/1				

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