11-16-2018

SocialSibs: Effects of Hybrid Sibling-Mediated Intervention on Joint Attention for Children with ASD and their Neurotypical Siblings

Kali E. McCafferty
Portland State University

SocialSibs: Effects of Hybrid Sibling-Mediated Intervention on Joint Attention for Children with ASD and their Neurotypical Siblings

by

Kali McCafferty

An undergraduate honors thesis submitted in partial fulfillment of the

requirements for the degree of

Bachelor of Arts

in

University Honors

and

Speech and Hearing Sciences

Thesis Adviser

Amy Donaldson, Ph.D., CCC-SLP

Portland State University

2018

Abstract

Joint attention (JA) is an individual's ability to share attention on an object or event with another person. JA has been identified as a core deficit for individuals with autism spectrum disorder (ASD). Prior research has begun to explore how social communication interventions can affect joint attention skills for school aged children with ASD. The study at hand aimed to expand upon this area of scholarship by examining the effects of a social communication intervention, SocialSibs, that combined two evidence-based methods: video modeling (VM); and sibling-mediation; within the framework of Pivotal Response Teaching (PRT). Nineteen sibling dyads underwent the ten-week social communication intervention. Social communication behavior data was collected pre-treatment, post-treatment, and one month after intervention concluded. We found a decline in the frequency of JA behaviors from the end of treatment to the one-month follow up, but no significant change from the pre-treatment assessment to either the post-treatment assessment nor the one-month follow up. The implications for these findings are discussed.

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by deficits in social communication skills and restricted, repetitive behaviors (CDC, 2017; APA, 2013). Deficits in social communication can affect verbal and non-verbal communication, including difficulty initiating interactions, failure to respond to communication bids made by communication partners, and deficits in joint attention (Ferrailli & Harris, 2011; Kasari et al, 2010).

Social Communication

As social communication is one of the most prominent deficits experienced by people with autism, many early interventions for ASD focus on developing skills in this area. These interventions can focus on comprehensive skills (i.e., across developmental domains as in intervention such as Pivotal Response Teaching; Koegel et al, 1989) or isolated social communication skills (e.g., responding to communication bids, requesting action/object) and place emphasis on opportunities to establish social connection and generalizability of skills to a natural environment for people with ASD (Prelock & McCauley, 2012).

Joint Attention

Joint attention (JA) has been the focus of many early interventions for children with ASD (Kasari et al, 2010; Franchini et al, 2017). Joint attention is the "development of specific skills that involve sharing attention with others through pointing, showing, and coordinating looks between objects and people, as well as the development of attention states that involve mutually sustained joint engagement with others" (Kasari et al, 2010, 1045). Children with ASD have consistently shown decreased initiation and response to joint attention bids as compared to neurotypical peers (Adamson et al., 2001; Kasari et al., 2010).

JA is one of the three early emerging communicative functions identified by Bruner (1981) along with behavior regulation, which is behavior that regulates the behavior of another person, and social interaction, which is behavior that draws attention to oneself. Joint attention behaviors are the last to emerge, while behavior regulation and social interaction develop earlier (Crais et al, 2004).

Joint attention behaviors can be observed in verbal or nonverbal forms. While many early social communication behaviors begin to develop with clear intentionality early on, such as the behavior regulation skills of protesting by pushing something away or requesting an object by reaching toward the object, children begin to demonstrate gestures accompanied by an increasing number of vocalizations over time (Crais et al, 2004). For example, around 15 months of age, neurotypical children tend to use a combination of both vocalizations and gestures to express a variety of social communicative functions (Crais et al, 2004). As such, older children are more likely to demonstrate use of either verbal and/or verbal with gesture social communication behaviors.

Two commonly observed joint attention behaviors that can be demonstrated as both nonverbal and verbal behaviors include commenting on objects or events and requesting information. These are some of the first joint attention skill to emerge in neurotypical children (Bruinsma et al, 2004).

Commenting

Commenting is the joint attention skill of nonverbally or verbally commenting on an object or event. As a verbal behavior, this can look like a child expressing their opinion on an object or event. For example, a child could say that a certain toy is their favorite. An expression such as this serves to share information about the child's opinion of a toy with another person.

As a nonverbal behavior, commenting can include showing an object. A child may hold out an object for another to see in order for the other person to look at the object. This behavior serves to share an object of interest with another person.

Joint attention commenting is an early developing social communication behavior (Bruner, 1981; Crais et al, 2004). JA commenting skills such as coordinating eye gaze and giving objects emerge fairly early, at around 7 and 9 months respectively in neurotypical children; whereas, more complex commenting gestures, such as nonverbally showing an object, develop around nine months to one year of age (Crais et al, 2004). However, older school aged children with verbal skills are more likely to demonstrate verbal commenting behaviors.

Requests for Information

Requests for information (RI) are a vital way for children to learn and to acquire knowledge about their environment (Donaldson & Olswang, 2007). Requests have been a topic of interest of several studies, however this term may easily be confused, as there are two types of communicative functions that include requesting: request for information and request for action/object/assistance. Requests for information are joint attention behaviors. Requests for action/object/assistance are behavior regulation behaviors. The important difference between the two types of requests is the function associated with the request. A question such as "have you seen my pencil?" may seem like it is meant to obtain information, but the true function or intent is to acquire an object. However, a question such as "do you like my drawing?" is meant to obtain information, specifically information about the other person's opinion. The primary difference between these questions is the function. The second example shows that RIs are meant to draw attention to an object or event in order to share or exchange information. While they both have the grammatical form of questions, the intention and function is different.

Few studies have made this distinction to investigate the joint attention behavior of requesting information separately from the behavior regulation function of requesting objects/actions/assistance. However, some have addressed RI as a JA behavior. Koegel & Koegel (2012) demonstrated that teaching the use of a simple RI ("What is that?") resulted in an increase in children with ASD's vocabularies. Further, within an assessment investigation, Donaldson and Olswang (2007) found that by providing highly preferred objects and activities within the school environment children with ASD who demonstrated a low frequency of RI increased their use of RI to levels comparable to neurotypical peers.

Interventions

As social communication is a primary area of focus for children on the autism spectrum, interventions focusing on these skills have been widely examined. For the purposes of the current investigation, the following interventions are of interest.

Pivotal Response Treatment

Pivotal Response Treatment (PRT) is an established comprehensive naturalistic developmental behavioral intervention that focuses on taking advantage of pivotal areas of growth (Koegel et al, 1989). Key principles of PRT include: teaching within a natural context, targeting both acquisition and maintenance, focus on reciprocity and social interaction, providing choices, responding to all communication and social bids (Koegel et al, 1989). Pivotal areas are key domains of behavior that are shown to have a positive effect on all other aspects of behavior (Koegel & Koegel, 2012). These four key pivotal behaviors are motivation, responsivity to multiple cues, self-initiations, and self-management with a primary goal of increasing functional social communication for the individual (Koegel et al., 1999). PRT is a highly flexible intervention that can be conducted in a variety of environments and can be incorporated by any

communication partner, including parents, teachers, peers, and siblings (Bruinsma & McNerney, 2012; Koegel et al., 1989).

Video modeling

Video modeling (VM) is an established behavioral intervention in which an individual can be taught a new skill or behavior, improve upon a skill or behavior, or replace or extinguish a behavior by viewing images of someone demonstrating that skill or behavior (Buggey, 2012). VM is a method of instruction that teaches a variety of skills and behaviors by using peers, adults, or the viewer themselves to demonstrate examples of a targeted behavior that is then video recorded (Buggey, 2012; Haydon et al., 2017; Lee et al., 2017; Shepley, 2016). The person receiving intervention then reviews the video with a clinician to understand an practice the behavior (Buggey, 2012). VM can either be used to supplement another intervention or as the main form of intervention (Buggey, 2012).

As VM is primarily a delivery model of intervention, it can be tailored for each individual using it. VM has been shown to be efficacious in many different situations for many different age groups from young children to adults (Buggey, 2012; Haydon et al., 2017; Lee et al., 2017; Shepley, 2016). It can also be used to teach skills and behaviors ranging from social skills to pretend play (Buggey, 2012; Haydon et al, 2017; Shepley et al., 2016).

Peer-mediated intervention

Peer-mediated intervention focuses on coaching one or more neurotypical peers to facilitate the skills of the individual with ASD (Belchic & Harris, 1994; Carter et al., 2012; Carter et al., 2017; Dillenburg et al., 2017). For school aged children, these supports can be an effective alternative to one-on-one adult support in school environments to support the individual in general classroom environments as well as extracurricular activities (Carter et al., 2012).

Peers can be coached to change their own behaviors by clinicians to facilitate the success of a social interaction (Donaldson et al., 2018). Peer mediation may aim to support individuals in multiple aspects of social communication ranging from initiation of social interactions to maintaining interactions with peers (Belchic & Harris, 1994; Carter et al., 2012; Carter et al., 2017). Peer-mediated interventions are very flexible and can be adopted for different environments (Belchic & Harris, 1994; Carter et al., 2012). It has been found to be effective for multiple age groups from elementary school children all the way through high school (Carter et al., 2012; Carter et al., 2017; Dillenburg et al., 2017).

Building off the success of peer mediated interventions, recent scholarship has investigated the efficacy of siblings as mediators to support children with ASD due to the idea that siblings are likely to be the most familiar peers to a child with ASD (Ferraioli & Harris, 2011; Tsao & Odom, 2006; Walton & Ingersoll, 2012). Sibling-mediated interventions have shown positive effects on various aspects of joint attention such as initiations and responses (Ferraili & Harris, 2011; Tsao & Odom, 2006).

Given these factors, the current study aims to examine the effects of a social communication intervention on the joint attention behaviors of commenting and requests for information by children on the spectrum and their neurotypical siblings within natural play interactions.

The social communication intervention, SocialSibs, combines VM and sibling mediation under the overarching philosophy of PRT to facilitate the social communication interaction of siblings on the spectrum and their neurotypical siblings. This study investigates the JA behaviors of children on the spectrum following intervention. The data are taken from part of a larger data set; as such, we will be examining the use of these behaviors within the context of other social

communication behaviors and use of other social communication strategies (e.g., peer mediation strategies and social interaction behaviors). We hypothesize that the sibling dyads will demonstrate gains in joint attention following treatment.

Methods

As indicated, the current study is a part of a larger project. Prior to my own research, the research team in the Autism and Social Communication Lab at Portland State University conducted the study and collected the data that I have analyzed. All methods and procedures were designed according to and approved by the Portland State University Institutional Review Board.

Participants

Participants included 19 sibling dyads (n=19). Each dyad included a child with ASD aged 3:11 to 7:11 ($\bar{x}$=6:4) years old and their neurotypical sibling, aged 4:11 to 11:6 years old ($\bar{x}$=7:3). Age difference between the two siblings ranged from 0 months to 4 years and 2 months ($\bar{x}$=2:1). Six of the participants with ASD were pre-school aged, two were in kindergarten, seven were in 1st grade, three were in 2nd grad, and one was in 3rd grade. 68.42% of participants were receiving SLP services at the same time as treatment (see Table 1 for complete participant demographics).

For the child with ASD to meet inclusion criteria, they were required to be between the ages of 4-7 years old at the time of intervention and have either an educational or medical diagnosis of autism according to the Diagnostic and Statistical Manual of Mental Disorders-IV (APA, 2000) as well as an MLU of 3.0 or greater as determined by a language sample. Participants were excluded if they had a previous diagnosis of known genetic syndromes; report of serious medical or neurological conditions such as encephalitis, concussion, seizure disorder,

diabetes, or congenital heart disease; sensory impairments such as vision or hearing loss; serious motor impairment; birth weight of less than 200 grams and/or gestational age of less than 37 weeks; and performance on measure of nonverbal ability less than 1.5 SD from mean.

For the neurotypical sibling to meet inclusion criteria, they had to be between the ages of 5 and 12, live with the child with ASD. The neurotypical siblings were excluded if they were more than 4 years older or younger than the child with ASD; if they had any history of communication, social, and or developmental deficits or delays; or if they had any history of special needs services such as IFSP or IEP.

Study Design

Twenty-five sibling dyads were recruited for the study. Upon entering into the study, dyads were randomly assigned to either the immediate treatment (IT) group or the waitlist control (WLC) group. The WLC group received intervention upon the IT group completing intervention. Two dyads failed to meet inclusion criteria and three dyads withdrew from the study following randomization into the WLC group. (Please note: the data from one dyad were not included in the current analysis as they had not yet been translated at the time of analysis; the children's primary language was Spanish) After randomization and accounting for dyads that were not included in the study, the IT group included 14 dyads (n=14) and the WLC group included 5 dyads (n=5).

Pre-Intervention Assessment

After dyads were randomized into either the IT or WLC group, each child with ASD from both the IT and WLC groups completed pre-treatment assessment measures to examine language, social communication skills, social responsiveness, and engagement. Parents completed several parent report measures relating to communication, parental stress, and social

competence. Those measures are not related to the current study and as such will not be discussed here.

Pertinent to the current study was the collection of 10-minute social interaction samples between the child with ASD and their sibling. The sibling dyad was provided with a standardized set of play materials appropriate for their age and developmental level. Clinicians prompted the dyad that they could play with the materials together for ten minutes and gave no other support or instruction. The interaction was video and audio recorded for further data coding and analysis of social communication behaviors. For children in the IT group, these data were collected at pre-intervention (T1), post-intervention (T2), and at one-month follow-up (T3). For children in the WLC group, these data were collected prior 10 weeks prior to treatment (PT1), pre-intervention (T1), post-intervention (T2), and one-month follow-up (T3).

Intervention

Following the pre-intervention assessment, children in the IT group began intervention. The IT dyads received intervention twice a week for a 10-week period. SocialSibs combined sibling-mediated intervention and the use of VM intervention. Following the Pierce and Schriebman's (1995; 1997) model, the intervention was implemented by training the neurotypical siblings to implement the use of five sibling mediation strategies under the framework of PRT in their interactions with children with ASD (Koegel et al, 1989). These strategies included gaining attention, providing child choice, responding to all communication and social bids, encouraging communication, and expanding on communication.

In intervention, siblings received individual training for the first sibling-mediation strategy using didactic teaching, role-play, and discussion of sibling-mediation concepts to ensure understanding. They then used the sibling-mediation strategy directly with their sibling

on the spectrum with facilitation and feedback from the clinician until they demonstrate 80% accuracy in use of the strategy. Once 80% accuracy was achieved, a new strategy was introduced until all 5 strategies were implemented independently by the neurotypical sibling.

VM intervention targeted areas of social communication identified by the initial and pre-intervention assessments and by the family as areas of need (e.g., initiating social and communication interaction, turn-taking, commenting, requesting information, greeting, conflict negotiation, etc.) The procedure for VM included video recording of the target behavior as demonstrated by the sibling during an interaction with the clinician. This video was then played back for the child with ASD in order to discuss the target behavior. The child with ASD was then provided an opportunity to practice target behavior using the same play materials as used in the video. The clinician then provided feedback and facilitation during this process (Shukla-Mehta, Miller, & Callahan, 2010).

The use of sibling mediation and VM was alternated across sessions and counterbalanced across participants to limit sequencing effects. Throughout intervention, graduate student clinicians used treatment data of individual performance to modify the level of support and reinforcement as needed for each dyad.

Coding

Coders blind to the treatment methods were trained to reliably code the data for social communication behaviors. One coder was trained to be the master coder by the supervising clinician to be 80% reliable with the clinician. The master coder then trained a team of coders to the same reliability level by using a four-stage training course.

Stage one consisted of the master coder instructing the coders of the operational definitions for the codes and providing examples of how codes may present in the data. The

coding team then viewed early probes with the master coder and discussed how to identify codes in the data between each other before marking a code. The coders passed stage one once they successfully coded three probes with at least 80% reliability between themselves and the master coder.

Stage two consisted of a similar method of viewing probe data. Rather than discussing each code before recording, the master coder instructed the trainees to record their codes before discussing them with the team. The coders passed stage two once they successfully coded three probes with at least 80% reliability between themselves and the master coder.

For stage three, the trainee coders continued to view probe videos with the master coder. After the master coder reached a set number of codes, codes were compared between the trainee coders and the master coder. Again, the coders passed this stage once they had successfully coded three probes with at least 80% reliability between themselves and the master coder.

In stage four of the training process, trainee coders were tasked with coding probe videos independently using The Observer XT video coding software. Once each trainee coder had completed coding the probe data independently, the master coder compared each trainee's code to their own to test reliability. The coders passed stage four and completed training once they successfully coded three probes with at least 80% reliability between themselves and the master coder.

For the IT group, only the pre-treatment (T1), post-treatment (T2), and one-month follow up (T3) data was coded for social communication behaviors. For the WLC group, the additional data point of 10 weeks prior to intervention (PT1) was coded.

Reliability

Reliability was checked using 19.5% of the total corpus of coded data by investigating interobserver agreement for all coded social communication behaviors. Overall the coding was found to be 72.98% reliable with the master coder. Individually, each coder was found to be 82.4% reliable with a range for 68% to 91% (s=9.11), 60.8% reliable with a range of 21% to 80% (s=23.8), and 75.93% reliable with a range of 57% to 93% (s=14.66). Coder disagreement was resolved through consensus discussion between the primary coder and the master coder.

Statistical Analysis

As several families withdrew from treatment after group assignment, the WLC and IT groups had uneven sample sizes where the WLC group included a sample size of 5 dyads and the IT group included 14 dyads. In the WLC group, no significant difference in the frequency of joint attention behaviors was found between PT1 (10 weeks prior to intervention) and T1 (pre-treatment) (t=1.20, p=.277). Therefore, data for JA behaviors during the delayed treatment for the WLC group was combined with that of the IT group for further analysis.

A generalized linear model was conducted to examine how participants changed over time (fixed effect) on the use of social communication behaviors by participants at each time point. For the predicted variable, we assumed a Poisson distribution with a log link.

Results

This study investigated the possible effects of the Socialsibs intervention on the JA behaviors children on the spectrum and their neurotypical siblings. An omnibus test using chi-square (χ^2=28.674; df=2; p=.000) compared the fitted model against the intercept only model (see Table 2 and 3 for complete GLM test statistics).

A statistically significant decrease in JA behaviors was demonstrated between the T2 (post-treatment) and T3 (one-month follow-up) (p=.000). No significant difference was observed from T1 (pre-treatment) to T2 (post-treatment) (p=0.393) (see Figure 1 for data for each dyad)

Discussion & Conclusions

We investigated how a hybrid social communication intervention would affect how frequently children with ASD and their neurotypical sibling demonstrated JA behaviors. We found a decline in the frequency of JA behaviors from the end of treatment to the one-month follow up, but no significant change from the beginning of treatment to the end, nor from the beginning of treatment to the one-month follow up.

Based on this, we cannot definitively say that significant gains were made in JA behaviors over the course of intervention. However, we can say that any gains that were made were not maintained once treatment concluded.

It is important to consider that JA was not the specific focus of the intervention. However, PRT was the overarching principle of the Socialsibs intervention, which includes strategies such as gaining attention, providing choices, responding to all communication and social bids, encouraging communication, and expanding on communication (Koegel et al, 1989). JA often follows as a collateral benefit of PRT, however it is not the primary focus (Paparella & Freeman, 2015).

Maintenance of skills is obviously a goal of intervention, however it is not an easy goal to reach. Previous research suggests that direct, targeted instruction may be needed to make meaningful change in any given skill, especially JA behaviors (Paparella & Freeman, 2015). Furthermore, interventions that directly target JA may only see short-term improvements for the targeted goals if they see skills maintained at all (Paparella & Freeman, 2015). As such, should

future research hope to see more gains in the frequency of JA behaviors made by the sibling dyads it would be beneficial to place more focus on JA behaviors over the course of treatment.

While previous scholarship focused on interventions that included sibling-mediation indicated that JA skills were maintained after the conclusion of treatment, these studies also include fairly low sample sizes (Ferraioli & Harris, 2011; Tsao & Odom, 2006). Both the study by Ferraioli & Harris (2011) and by Tsao & Odom (2006) had a sample size of three dyads (n=3). It is possible that the wide variance in the larger sample size of this study (n=19) played a part in why different outcomes were observed.

Prior studies of interventions involving siblings indicated that the sibling dyads maintained skills after treatment, but acknowledge that this may be because the siblings are continuing to use the skills they learned over the course of treatment with their siblings (Ferraioli & Harris, 2011; Tsao & Odom, 2006). We can neither confirm nor disprove that neurotypical siblings continued to use the strategies they were taught after intervention concluded. If the neurotypical siblings no longer used the intervention strategies after treatment ended, this could have affected the results we found.

Limitation and Directions for Future Studies

One aspect that may be a limit to the study is the reliability of the coded data. While we found the coded data to be 72.98% reliable over all, there was large range in the reliability of each individual coder. Moreover, the coding team aimed to be 80% reliable, so the final reliability fell short of this goal despite meeting research standards. Future research could recode the data from this study for greater reliability.

Over the course of treatment, data was collected at five different time points: before treatment, four weeks into treatment, eight weeks into treatment, end of treatment, and at a one-

month follow up. However, only the pre-treatment, post-treatment, and one-month follow up data was coded. Coding this extra data could reveal more trends in how JA behaviors changed over time.

The sample size for this study was fairly small as well (n=19) due to dyads withdrawing from the study. A larger sample size could help control for variance within the treatment group.

Other considerations about the dosage of treatment should be considered as well. The study at hand delivered intervention twice a week for 45-minute periods over the course of 10 weeks. More intensive dosage could yield different results for the frequency of JA behaviors.

Acknowledgements

The author would like to thank the Portland State University Department of Speech and Hearing Sciences, the Autism and Social Communication Lab at Portland State University, the coders Rasena Wager and Libby Richardson, and project manager and master coder Marissa Montejano for her efforts in training the coders and organizing the data analysis. The author also thanks Gerasimos Fergadiotis for his assistance with the statistical analysis.

Works Cited

Adamson, L. B., McArthur, D., Markov, Y., Dunbar, B, & Bakeman, R. (2001). Autism and joint attention: Young children's responses to maternal bids. *Applied Developmental Psychology, 22*(4), 439-453. doi: 10.1016/S0193-3973(01)00089-2

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing

Belchic, J. K., & Harris, S. L. (1994). The use of multiple peer exemplars to enhance the generalization of play skill to the siblings of children with autism. *Child and Family Behavior Therapy, 16*(2), 1-25. doi: 10.1300/J019v1602_01

Bruinsma, Y., Koegel, R. L., Koegel, L. K. (2004). Joint attention and children with autism: A review of the literature. *Mental Retardation and Developmental Disabilities, 10*(3), 169-175. doi: 10.1002/mrdd.20036

Bruinsma, Y., & McNerney, E. K. (2012). Pivotal response training. In P. A. Prelock & R. J. McCauley (Eds.), *Treatment of Autism Spectrum Disorders* (pp. 281-312). Baltimore, MD: Paul H. Brookes.

Bruner, J. (1981). The social context of language acquisition. *Language and Communication, 1*(2), 155-178. doi:10.1016/0271-5309(81)90010-0

Buggey, T. (2012). Video modeling applications for persons with autism. In P. A. Prelock & R. J. McCauley (Eds.), *Treatment of Autism Spectrum Disorders* (pp. 345-369). Baltimore, MD: Paul H. Brookes.

Carter, E. W., Sisco, L. G., Chung, Y. (2012). Peer-mediated support interventions. In P. A. Prelock & R. J. McCauley (Eds.), *Treatment of Autism Spectrum Disorders* (pp. 221-254). Baltimore, MD: Paul H. Brookes.

Crais, E., Douglas, D., D., & Campbell, C. C. (2004). The intersection of the development of gestures and intentionality. *Journal of Speech, Language, and Hearing Research, 47*(3), 678-694). doi:10.1044/1092-4388

Donaldson, A. L., & Olswang, L. B. (2007). Investigating requests for information in children with autism spectrum disorders: Static versus dynamic assessment. *Advances in Speech-Language Pathology, 9*(4), 297-311. doi: 10.1080/14417040701413720

Carter, E. W., Gustafson, J. R., Sreckovic, M. A., Dykstra Steinbrenner, J. R., Pierce, N. P., Bord, A., Stabel, A., Rogers, S., Czerw, A., & Mullins, T. (2017). Efficacy of peer support interventions in general education classrooms for high school students with autism spectrum disorder. *Remedial and Special Education, 38*(4), 207-221. doi: 10.1177/0741932516672067

Dillenburger, K., Jordan, J. A., McKerr, L., Lloyd, K., Schubotz, D. (2017). Autism awareness in children and young people: Surveys of two populations. *Journal of Intellectual Disability Research, 61*(8). 766-777. doi: 10.1111/jir.12389

Ferraioli, S. J., & Harris, S. L. (2011) Teaching joint attention to children with autism through a sibling-mediated behavioral intervention. *Behavioral Interventions, 26*(4), 261-281. doi: 10.1002/bin.336

Franchini, M., Glaser, B., Gentaz, E., Wood, H., Eliez, S., Schaer, M. (2016) The effect of emotional intensity on responses to joint attention in preschoolers with an autism spectrum disorder. *Research in Autism Spectrum Disorders*, *35*, 13-24. doi: 10.1016/j.rasd.2016.11.010

Haydon, T., Musti-Rao, S., McCune, A., Clouse, D. E., McCoy, D. M., Kalra, H. D., Hawkins, R. O. (2017). Using video modeling and mobile technology to teach social skills. *Intervention in School and Clinic, 52*(3), 154-162. doi: 10.1177/1053451216644828

Koegel, R. L., Schreibman, L., Good, A., Cerniglia, L., Murphy, C., & Koegel, L. K. (1989). *How to Teach Pivotal Behaviors to Children with Autism: A Training Manual*. Santa Barbara, CA: University of California.

Koegel, L. K., Koegel, R. L., Harrower, J. K., Carter, C. M. (1999). Pivotal response intervention I: Overview of approach. *Journal of the Association for Persons with Severe Handicaps, 24*(3), 174-185. doi: 10.2511/rpsd.24.3.174

Koegel, R. L., & Koegel L. K. (2012). *The PRT Pocket Guide: Pivotal Response Treatment for Autism Spectrum Disorders.* Baltimore, MD: Paul H. Brookes.

Kasari, C., Gulsrud, A. C., Wong, S., Locke, J. (2010). Randomized controlled caregiver mediated joint engagement intervention for toddlers with autism. *Journal of Autism and Developmental Disorders, 40*(9), 1045-1056. doi: 10.1007/s10803-010-0955-5

Lee, S. Y., Lo, Y., Lo, Y. (2017). Teaching functional play skills to a young child with autism spectrum disorder through video self-modeling. *Journal of Autism and Developmental Disorders, 47*(8), 2295-2306. doi: 10.1007/s10803-017-3147-8

Mundy, P. C. (2016). *Autism and Joint Attention: Development, Neuroscience, and Clinical Fundamentals*. New York, NY: Guilford Press.

Paparella, T., & Freeman, S. F. N. (2015). Methods to improve joint attention in young children with autism: A review. Pediatric Health, Medicine, and Therapeutics, 2015(6), 65-78. doi: 10.2147/PHMT.S41921

Pierce, K., & Schreibman, L. (1995). Increasing complex social behaviors in children with autism: effects of peer-implemented pivotal response training. *Journal of Applied Behavior Analysis, 28*(3), 285-295. doi: 10.1901/jaba.1995.28-295

Pierce, K., & Schreibman, L. (1995). Multiple peer use of pivotal response training to increase social behaviors of classmates with autism: Results from trained and untrained peers. *Journal of Applied Behavior Analysis, 30*(1), 157-160. doi: 10.1901/jaba.1997.30-157

Prelock, P. A. & McCauley, R. J. (2012). Introduction to *Treatment of Autism Spectrum Disorders*. In P. A. Prelock & R. J. McCauley (Eds.), *Treatment of Autism Spectrum Disorders* (pp. 1-12). Baltimore, MD: Paul H. Brookes.

Shepley, C., Lane, J. D., Shepley, S. B. (2016). Teaching young children with social-communication delays to label actions using videos and language expansion models: A pilot study. *Focus on Autism and Other Developmental Disabilities, 31*(4), 243-253. doi: 10.1177/1088357614552189

Shuka-Mehta, S., Miller, T., & Callahan, K. J. (2010). Evaluating the effectiveness of video instruction on social and communication skills training for children with autism spectrum disorders: A review of the literature. Focus on Autism and Other Developmental Disabilities, 25(1), 23-36. doi: 10.1177/1088357609352901

Tsao, L., & Odom, S. L. (2006). Sibling-mediated social interaction intervention for young children with autism. *Topics in Early Childhood Special Education, 26*(2), 106-123. doi: 10.1177/02711214060260020101

Walton, K. M., & Ingersoll, B. R. (2012). Evaluation of a sibling-mediated imitation intervention for young children with autism. *Journal of Positive Behavior Interventions, 14*(4), 241-253. doi: 10.1177/1098300712437044

Table 1
Demographics of Participants

		Child with ASD			Neurotypical Sibling	
Dyad	Condition	Age	Grade	Receiving SLP Services?	Age	Difference in Age
1	IT	6:4	Kindergarten	Y	10:6	4:2
2	IT	7:3	1st Grade	Y	5:4	-1:11
3	IT	7:5	1st Grade	Y	5:4	-2:1
4	IT	4:11	Preschool	Y	7:3	2:4
5	IT	7:9	1st Grade	Y	5:2	-2:7
6	IT	6:11	1st Grade	N	5:7	-1:4
7	IT	5:1	Preschool	N	7:7	2:6
8	IT	7:6	2nd Grade	Y	11:6	4:0
9	IT	4:6	Preschool	Y	6:6	2:0
10	IT	7:11	3rd Grade	Y	10:2	2:3
11	IT	6:9	1st Grade	N	5:0	-1:9
12	IT	7:11	1st Grade	Y	10:11	3:0
13	IT	5:10	Kindergarten	N	5:10	0
14	IT	4:1	Preschool	Y	6:1	2:0
15	WLC	6:11	2nd Grade	Y	9:3	2:4
16	WLC	3:11	Preschool	Y	6:1	2:2
17	WLC	7:10	2nd Grade	Y	6:2	-1:8
18	WLC	6:10	1st Grade	N	8:10	2:0
19	WLC	4:11	Preschool	N	4:11	0

Note: Difference in age calculated as how much older Neurotypical Sibling is than Child with ASD.

Table 2

Goodness of Fit

	Value	df	Value/df
Pearson χ^2	1083.083	54	20.057
Log Likelihood	-746.063		

Table 3

Parameter Estimates

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald χ^2	Df	Sig.
(Intercept)	4.274	.0271	4.221	4.328	24940.052	1	.000
[Time=T1]	.032	.0380	-.042	.107	.730	1	.393
[Time=T2]	.182	.0366	.110	.254	24.750	1	.000
[Time=T3]	0[a]						
(Scale)	1[b]						

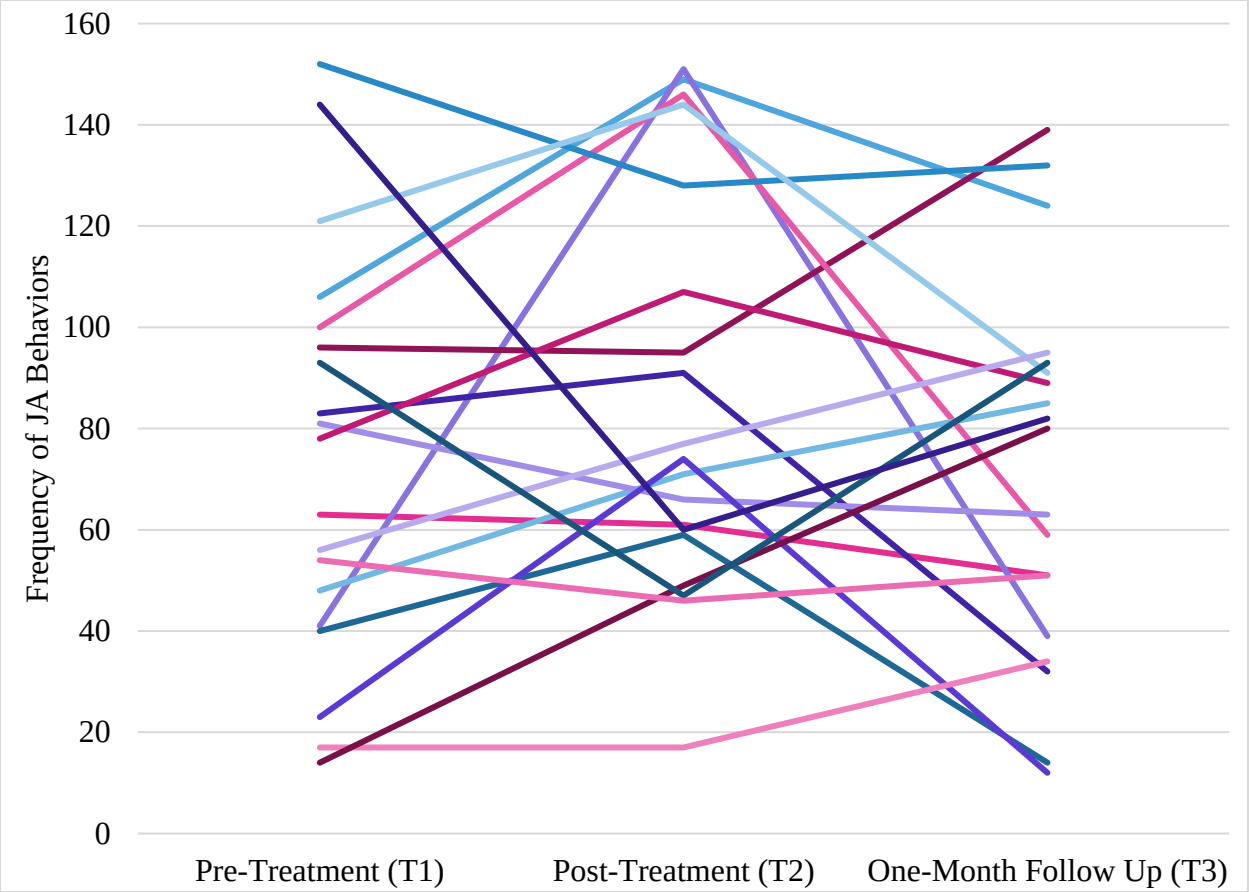

Figure 1. Frequency of JA behaviors over the course of treatment. This figure shows the frequency of JA behaviors for each dyad at each time point.