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TELEPRACTICE-BASED LANGUAGE INTERVENTION TRAINING FOR  
PARENTS OF CHILDREN WITH AUTISM SPECTRUM DISORDERS

by Sarah Bryan

A thesis submitted to the faculty of the University of Mississippi in partial fulfillment of  
the requirements of the Sally McDonnell Barksdale Honors College

Oxford, MS  
May 2023

Approved by

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## ACKNOWLEDGEMENTS

I must begin by acknowledging Dr. Ying Hao Ph.D. CCC-SLP and Dr. Toshikazu Ikuta Ph.D., to whom I owe the successes of this thesis. As my principal investigator, Dr. Hao was the backbone of this study from the very beginning to the day of my defense, even after she moved to China. Dr. Hao has gone above and beyond to support me in this journey and truly exemplifies what it means to be a mentor. After she left the University, Dr. Ikuta graciously offered his guidance to Dr. Hao's thesis students for all of our research-related needs, for which I am very grateful. Next, I would like to thank my family (and Jack) for boosting morale when needed and seeking to listen and learn about each step of this process. I would never have made it to the finish line without you all!

## ABSTRACT

This study closely examined the progression and fidelity of strategy implementation of parents undergoing an ASD language intervention training program. This instructional, interactive program was designed for parents of children with autism, thus catering to the needs of participants involved. This study assessed the use of parent comments and redirects, two kinds of parent strategies, during each parent-child interaction to provide more information about the impact of training sessions. The researchers hypothesized that by the end of training, parent participants would increase their fidelity of strategy implementation, increase their use of comments rather than redirects, and employ more open-ended questions than closed-ended questions.

The two parent-child dyads participating in this study attended pretest meetings followed by the intervention stage, during which the primary researcher provided strategies to help parents elicit language from their child. The follow-up phase took place one week later in order to promote maintenance of learned strategies. A ten-minute parent-child play sample was recorded during each meeting, each of which were scored based on strategy implementation and analyzed by the researchers with a behavior coding software. All meetings were held via *Zoom* and coded via a behavior analyzing software, *Mangold Interact*.

Parents from both participating dyads improved their strategy implementation frequency and increased their usage of comments and open-ended questions throughout the course of the program, as hypothesized. Overall, this study successfully allowed for a more effective examination of the parents' actions within child play, and allowed researchers to assist parents in the way they interact with their child.

## PREFACE

The research that contributed to the composition of this thesis took place over three of my four years as a member of the Sally McDonnell Barksdale Honors College. When coordinating with faculty members in the CSD department in search of an advisor, the research Dr. Hao would soon begin appeared to be a hands-on experience that would be a meaningful topic for my undergraduate research. She was welcoming and willing to train me for a clinician position in her study.

In the process of gaining background knowledge on telepractice and language intervention programs, I noticed that there was little to no discussion of intervention effects based on autism-level severity. The families I would work with via telepractice both had sons with autism and low language abilities, which would allow me to contribute details about intervention with this specific population to CSD research.

When reflecting on the process leading me to this point, I have nothing but gratitude for my advisors, research assistants, and the families that participated in the training. Their efforts and eagerness to learn made for a seamless process. I would also like to address my audience: thank you for your time and interest in this research. I hope to provide you with a newfound understanding and appreciation for virtual language services and the benefits they offer to families such as these.

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## LIST OF ABBREVIATIONS

ASD.....	Autism Spectrum Disorder(s)
ASHA.....	American Speech-Language-Hearing Association
SLI.....	Specific Language Impairments
CARS 2-QPC...	Childhood Autism Rating Scale- Questionnaire for Parents or Caregivers
CARS 2-ST .....	Childhood Autism Rating Scale- Standard
CDC .....	Centers for Disease Control and Prevention
CITI .....	Collaborative Institutional Training Initiative
FII .....	Parent Fidelity of Intervention Implementation
ImPACT.....	Improving Parents as Communication Teachers
IRB .....	Institutional Review Board
SLP .....	Speech-Language Pathologist

## **Chapter I**

### **INTRODUCTION**

#### **Autism Spectrum Disorder and its Prevalence**

The CDC describes autism spectrum disorder, otherwise known as ASD, as a developmental disability that can cause challenges in social interactions, communication, and general behavior (CDC, 2021). The DSM-5 also denotes that autism is characterized by the occurrence of persistent impairments in social interaction and the presence of restricted, repetitive patterns of behaviors, interests, or activities (American Psychiatric Association, 2013). It may be the cause for restricted and repetitive interests and behaviors, and the ability to engage in joint attention may be impaired. Those with ASD generally experience extreme sensitivity towards sensory input, either seeking out such input or avoiding its incidence. ASHA highlights that in the same way neurotypical individuals desire friendships and positive social dynamics with others, those with autism do as well (ASHA, n.d.). Despite their difficulty to cultivate such relationships due to social communication challenges, the innate urge to do so is consistent among those with ASD and the neurotypical.

In regards to the prevalence of autism, the United States has seen a significant increase in recent years. Upon becoming authorized to create the Autism and Developmental Disabilities Monitoring Network, the CDC had researchers track the increasing prevalence of ASD in various communities in the US biennially since 2000 (Maenner et al., 2018). The researchers found that the number of children aged eight with

autism had increased from 1 in 150 in 2002 to 1 in 54 in 2016. This statistic has continued to increase according to the CDC's more recent statement that 1 in every 44 people are diagnosed with ASD, with a male to female ratio of 4:1. Maenner et al. (2018) continued to examine the prevalence of autism in children aged eight as had been done since 2000, but among a wider range of states for this study's purposes. They strategically censused Arizona, Arkansas, California, Georgia, Maryland, Minnesota, Missouri, New Jersey, Tennessee, Utah, and Wisconsin, collecting data through evaluations and sourcing informative school records in each site. The overall male-to-female prevalence ratio from this 2018 census was 4.2:1, with ratios ranging from 3.3:1 to 5.2:1 in various sites. The authors also found that autism is present in children of all racial, ethnic, and socioeconomic groups. The prevalence of ASD in those surveyed was highly similar among White, Black, Asian/PI, and Hispanic children (Maenner et al., 2018).

While the incidence of autism is consistent among races, the specific deficits children experience vary among children based on their genes. In their study exploring potential links between ASD and specific language impairments (SLI) in children and their immediate relatives, Lindgren et al. (2009) presume that language deficits are not hereditary, but instead result from the ASD phenotype and its effects on development. In addition, studies that have employed questionnaires have revealed that there are in fact similar communication deficits in some immediate family members of children with autism, when compared to families of neurotypical children. When collecting data, the authors also found that compared to parents of children without autism, parents of children with autism presented more pragmatic language impairments and a higher incidence of poor narrative skills (Lindgren et al., 2009).

The deficits in social communication shown by those with ASD are often characterized by difficulty with social reciprocity, social interaction, and engaging in joint attention. In addition, there is typically a lack of both verbal and nonverbal communication skills (ASHA, n.d.). Wetherby et al. provide a similar description of such deficits, explaining that children with autism may only develop a limited set of communicative functions and follow an unconventional language development track. For example, children with ASD often do not partake in pretend play, shared positive affect, or eye contact in communicative instances, thus hindering their social communication abilities (Wetherby et al., 1998).

### **Telepractice and its Potential Advantages**

Due to the high prevalence of autism in the US in populous and rural areas alike, it is important that there are language intervention resources for those in underserved regions, and telepractice serves as a vital tool to fulfill this purpose. “Telepractice” in this case refers to speech and language services offered virtually. ASHA describes their reasoning behind using the term “telepractice” in lieu of terms such as “telehealth” or “telemedicine” in order to prevent misconception of its ideals (n.d). Telepractice does not seek to only provide health care services as “telemedicine” and “telehealth” might insinuate. Common forms of telepractice according to ASHA can be categorized as synchronous, asynchronous, and hybrid, indicating how the sessions are carried out (n.d.).

Cherney et al. (2012) found that virtual methods can be used to effectively assess and treat communication disorders in their studies. In particular, their research has found success in supporting clients with dysarthria, aphasia, and apraxia of speech. The authors

show that speech-language pathologists (SLPs) working virtually with clients synchronously and asynchronously is a valid and reliable means for delivering speech-language services (Cherney et al., 2012). This socially-distanced therapy option is certainly a timely solution considering the many traditionally face-to-face meetings that were transposed to an online setting due to the pandemic.

However, even before the COVID-19 era began, researchers expressed rural communities' need for an increase in such virtually-mediated speech-language therapy. Meadan et al. (2016) conducted a study whose participants directly exemplified this need: two of the three families participating lived in rural areas without access to a nearby clinic that could provide face-to-face therapies, but were able to receive telepractice services.

In a similar study, Douglas et al. (2021) provided remote SLP services to a family seeking to support their daughter's communicative growth, but would not have had such success with face-to-face services. According to their research, this is because of barriers that generally inhibit attendance of in-person therapy sessions including demanding schedules, residing in an underserved area, and costs that come with transportation or having to miss work to commute to sessions. As a family of six, the participants in this study would likely experience these barriers, demonstrating a need for telepractice. The authors found an unmistakable increase in each participating family member's high-fidelity behaviors with the child after receiving coaching. This aligns with the notion that their study, though based on a single family's experience, was able to provide language support and obtain insight about telepractice (Douglas et al., 2021).

Another advantage telepractice provides is the parent's involvement in the child's language development. Hao et al. (2020) explained that evidence-based intervention strategies offer unique benefits when administered by parents during everyday affairs that may not be achievable by clinicians. Parent-implemented strategies are cost-effective, offer a natural learning environment for the child, and can be reinforced frequently. The authors also note that after such interventions, parents have shown improved competence in regards to their child's language growth. These advantages reveal the efficacy of those carried out in the past as well as the potential for successful parent intervention programs in the future (Hao et al., 2020).

### **Existing Telepractice Studies and Their Findings**

Literature not only supports the need for virtual communicative intervention, but also the viability of it in multiple cases (D'Agostino et al., 2019; Ingersoll et al., 2017; Vismara et al., 2013). After training preschool practitioners on how to implement strategies that would help broaden their autistic students' social communication skills, D'Agostino et al. (2019) found that each practitioner's maintenance of skills were within the 98-100% range after completing the intervention. The practitioners gave the online forum an overall rating of 45.16 out of 48 in a post-experimental survey, and all noted that they grew in confidence as practitioners.

Moreover, Ingersoll et al. (2017) conducted a study in which parents of children with autism completed an online intervention program. The authors found a strong association between program engagement and the amount of intervention knowledge parent participants gained. Similarly to Ingersoll et al., Vismara et al. (2013) recruited eight parents with children with ASD to meet with a designated therapist via video

conference that would assess play sessions and provide one new skill each week. All eight parents reported that their child's production and comprehension improved during the program, which paralleled the data: all eight children produced an average of 100 more words and understood an average of 90 more words than they did beforehand (Vismara et al., 2013).

### **Comments Versus Redirects Within Interactive Play**

One way to examine the efficacy of telepractice intervention is by looking at parents' use of targeted strategies. Child-directed redirects within parent-child play have been examined in intervention studies in the past and are a focus of this study as well. In Haebig et al.'s 2013 study, the definition of a redirect is as follows: a directive that seeks to change the child's focus of attention to correspond to that of the adult. The only relationship between redirects and later language from the child of focus has shown to be negative or non-significant. There was little to no association observed between parent redirects and child language production (Haebig et al., 2013). This study classifies remarks as redirects based on this definition and seeks to further explore the direct consequences of parent redirects. The authors found that follow-in style comments are predictive of a child with ASD's later language. Through their series of analyses, Haebig et al. (2013) discovered that parent comments that follow into their child's current area of focus can be indicative of unique language comprehension and production later in the child's development. Based on these findings, comments are more encouraged than redirects in child play. They allow the caregiver to follow-in to a child's area of focus and expand on the child's thoughts, thus improving joint attention.

While redirecting the child is a common, natural response from parents, the purpose of this program is to balance the redirect and comment usage of each parent participant in order to promote more child-led interactions. Clinicians were trained to use more comment tactics (i.e. mapping and modeling) than directives, so parents were encouraged to do the same. Because the results of the current study will be produced by two minimally-verbal children with low language skills, parent participants may frequently redirect the children with commands and yes-no questions in order to initiate interactions. In response to this tendency, the current study seeks to even parent participants' comment-to-redirect ratio across sessions to promote child initiation, as commenting will be the most effective mode of parent input.

### **Gaps in Research**

While extant literature provides valuable information in regards to language intervention programs for those with autism, there is little incorporation of a client's level of language skills into those programs. Language level is based on an individual's communication skills that emerge among the repetitive, restricted, behaviors they experience. This study seeks to help fill this gap in literature by providing strategies that are catered to each participant's language level by supporting parents in most effectively engaging with their child.

In addition to the level-specific reports, previous research rarely incorporates highly specific language data from software programs. The current study fills this gap by reporting the results from *Mangold Interact* software program. Mangold has served as an avenue for this study's researchers to identify the nature of parents' strategy use and helped organize the categorizations of each comment or redirect. For the purposes of



Mangold, any form of prompt or question is classified as a redirect. This study also identifies the use of open-ended and closed-ended questions throughout the intervention period. Open-ended questions warrant a more thoughtful response, while closed-ended, otherwise known as “yes-no” questions, require a simple “yes” or “no” response. Thus, it is important to compare the use of these redirects. Reporting these measures that have not been included in previous studies helps fill the gap of information and provides further insight into effective parent-led language intervention programs.

Another aspect of this study that sets it apart from prior research is its focus on participants that reside in rural areas. Most pilot telepractice studies are conducted in non-rural cities, which could lead to findings that are unrepresentative of the wide range of need (Hao 2020). In order to obtain results from an underserved area, the current study provides services to families in rural North Mississippi.

### **Research Questions and Hypotheses**

Prior studies indicate there is potential for effective language therapy when administered remotely, and that telepractice may be a viable cost-effective option as previously illustrated. In light of this, the current study seeks to answer three main questions:

1. Is this telepractice-based parent training program effective in improving parents’ Fidelity of Intervention Implementation (FII)?

Based on these extant findings and the adaptable nature of the ImPACT training program, we, the participating researchers, predict that each parent’s FII scores will increase by the end of the program.

2. How will the parent participants' use of comments and redirects shift throughout the training period?

We hypothesize that each parent's use of comments will increase and the use of redirects will decrease throughout the intervention.

3. How will the parents' use of open and closed-ended questions shift throughout the training period?

Although parents commonly present yes-no questions to their child as previously noted, a more engaging tactic is to stimulate a more thoughtful response via an open-ended question. Within redirect usage, we expect to see a higher incidence of open-ended questions and a lower incidence of yes-no questions as sessions progress.

## **Chapter II**

### **METHODOLOGY**

#### **Overview**

This study examined the progress of two mother-son dyads, both of whom had received autism spectrum disorder diagnoses prior to the intervention program. Pretest, intervention, post-test, and follow-up phases were conducted over the course of approximately four months per client. The data analyzed within this study was collected via parent questionnaires, standardized tests, and language samples. The language sample data was then coded using *Mangold*, a behavior analysis software, and scored for parent strategy implementation by the research team.

#### **Study Design**

This study implemented a single-subject design. The content of the intervention materials via telepractice acted as the independent variable. Multiple measures of parent and child skills served as the dependent variables. The parent participants' Fidelity of Intervention Implementation (FII) scores and targeted intervention strategy use acted as the dependent variables. Before beginning, the researchers serving as clinicians completed the Collaborative Institutional Training Initiative (CITI) research, ethics, and compliance training program. This study design has been reviewed by The University of Mississippi's Institutional Review Board (IRB). The IRB has determined that this study fulfills the human research subject protections obligations required by state and federal law and University policies. Parents were given the study's IRB approval status, and

researchers explained to the participants that if there were any questions or concerns, they could contact the University's IRB. The IRB's contact information was also given to participants.

### **Areas of Risk**

There were no anticipated risks from attending the study. However, certain interview questions, such as those regarding child-related stress and education level, had the potential to be sensitive for parents. Clinicians explained to each parent participant that they had the choice to abstain from answering such questions. Additionally, in light of the upcoming onset of weekly meetings and influx of information, clinicians informed each parent that the meeting times were flexible and could be adjusted as needed.

### **Participants**

The target population for this study included families with an autistic child between the ages of one and eight seeking language support. Participants were recruited through various mediums. Flyers were distributed to University of Mississippi Speech and Hearing Clinic (UMSHC) staff and parents of children in the HILL program at the UMSHC. Virtual flyers were sent to speech-language pathology (SLP) Facebook groups and American Speech-Language-Hearing Association (ASHA) community directory clinicians. The inclusion criteria for participating in this study required child candidates to have a clinical diagnosis of ASD.

The participants for this study consisted of two mother-son dyads, both of which included autistic male children with low language abilities. Dyad 1 included a boy (JG) aged four at the beginning of the study. It is noted that JG was carried full-term, received an ASD diagnosis at 22 months, and was nonverbal. He also has diagnoses for a language

disorder and sensory integration disorder. After administering the Childhood Autism Rating Scale- Questionnaire for Parents or Caregivers (CARS-QPC) to his mother, researchers then completed the Childhood Autism Rating Scale- Standard (CARS-ST) in which JG produced a raw score of 46.5, indicating severe symptoms of ASD. \*(More details about this test are specified in the following section of measures.) At the time of examination, JG attended speech therapy twice weekly, occupational therapy once weekly, and physical therapy twice weekly, each for 45-minute sessions. In addition, he received four hours of applied behavior analysis (ABA) therapy five days each week.

The second member of Dyad 1 was the child's mother, AG, who believed that her son needed to improve his patience and better understand his family members. She sought to engage in more meaningful, appropriate, intentional play with JG. AG explained that her son needed to learn to express his needs verbally rather than simply gesturing or tugging on a parent. AG's participant profile includes the following: she is a 29-year-old non-Hispanic White woman, earned a college degree, and is employed as a flight nurse. AG's husband, the father of JG, is classified as non-Hispanic White male, earned a college degree, and works as a flight paramedic. Their yearly household income exceeds \$100,000.

Dyad 2 included a child (DF), aged three upon beginning the program. DF was carried full-term and was diagnosed with ASD at age two. After presenting questions from the CARS-QPC to his mother, researchers again administered the CARS-ST. DF produced a raw score of 27.5, indicating that he experiences minimal symptoms of autism. However, this score may be unrepresentative of the child's language performance due to the fact the test is comprehensive to measure behaviors, language, motor skills and

other aspects. The child possesses little-to-no language which would not be assumed based on this score. At the time of examination, DF was enrolled in speech therapy twice weekly for 30 and 45 minute sessions, occupational therapy twice weekly for 30 minute sessions, and comprehensive ASD therapy in a group setting twice each week for three hour sessions.

The child's mother, NF, was the second member of Dyad 2. She noted that her son experienced a speech regression at six months of age and only recently began talking again. Much of his speech is repeated from a parent or the television, so more effectively aiding his initiation of unique words and phrases is a goal of hers. NF identified as a non-Hispanic White female aged 34 who earned a college degree and now works as a nurse manager. She is married to the child's father who is also a non-Hispanic white male that earned a college degree. Their annual household income exceeds \$100,000.

### **Procedure**

Each client's training program was divided into four phases that were followed over a period of approximately four months. The baseline phase came first and consisted of a consent meeting and two pretest meetings. During the consent meeting, clinicians introduced themselves and displayed a slideshow to give more details about the project. Parents then gave oral consent after being read their rights; there were no child participants over the age of seven, so child assent was not necessary. After gaining consent, clinicians and parents jointly completed a case history form for the child, and parent contact information was obtained. The parents gave their email addresses for meeting confirmations and primary communication, their phone numbers for communication in case of internet malfunctions during telepractice meetings, and their

address to send the instruction booklet. Before beginning the intervention, researchers mailed the participants an instruction booklet containing all of the necessary information for the study.

Parents received a quick training session on how to set up their homes for telepractice sessions. They were instructed to place the computer/device onto a surface providing a bird's-eye view of the parent-child interaction. Clinicians explained that the child needs to be present for the parent to practice using the intervention skills and for clinicians to give feedback. To avoid technological obstacles, parents were instructed that if any internet disconnection happened, they should check the battery, reconnect the internet, and wait for clinicians to call for further instructions. Once the parents were given all of the information, researchers recorded a ten-minute parent-child play interaction.

Following the consent meeting, researchers held pretest meetings consisting of standardized test administration and a ten-minute parent-child play interaction. Researchers administered the Childhood Autism Rating Scale-2, which allowed the researchers to place each child in the appropriate category for the remainder of the program.. The program's instruction booklet was mailed to the participants in preparation for the intervention phase, and parents were instructed to review the content for the upcoming intervention week.

The first week of the intervention phase consisted of an overview of the Project ImPACT (Improving Parents As Communication Teachers) program, intervention benefits, research findings, and what core skills will be taught. Parents were also given information about setting up the home for successful meetings. Week two objectives

included an introduction to interactive teaching techniques, modeling, and expanding language. The following intervention week continued discussing interactive teaching techniques. Researchers also explained how to create opportunities for the child to engage or communicate through some playful obstruction, balanced turns, and communicative temptations. Week four introduced the direct teaching techniques of prompting, reinforcing, and teaching the child expressive language. The fifth and final week of intervention focused on teaching the child receptive language and combining interactive and direct techniques. Before each intervention session, research clinicians created and distributed videos to explain the upcoming intervention materials. In addition, parents were shown demonstration videos during the sessions to demonstrate the concepts explained in the meetings. The videos shown differed based on the child's verbal communication level in order to create a more personalized experience. After each 10-minute play session, the clinician would provide feedback to the parent in order to foster continuous improvement.

One week after the fifth week of intervention, the post-test phase began. The post-test phase was divided into two meetings. Researchers obtained a ten-minute parent-child interaction in each meeting and proceeded with parent interviews.

One month after the fifth intervention week, the follow-up phase concluded the study. During the follow-up stage, researchers held weekly meetings, in which researchers obtained ten-minute parent-child interaction recordings. After it had been confirmed that the participants finished the program, each family was sent a gift card as a reward for completion.



While this procedure was carried out for both dyads in this study, it must be noted that because Dyad 2's training took place after Dyad 1, researchers decided that fewer sessions would suffice. For example, Dyad 2's consent and standardized testing took place in two pretest sessions rather than three. In addition, there was only one follow-up session rather than three, as there were for Dyad 1. This abridged timeline provided sufficient data for the purposes of this research.

## **Measures**

### *Child Measures*

The Childhood Autism Rating Scale Questionnaire for Parents or Caregivers (CARS 2-QPC) was conducted for each child participant. CARS 2-QPC is a standardized test administered to parents of children with ASD that focuses on the frequency of a child's language and behavioral difficulties. Parents responded with *not a problem*, *mild-to-moderate problem*, *severe problem*, *not a problem now*, or *don't know* to indicate the severity of each phenomenon. Based on the results of this test, researchers then used either CARS 2-HF (high-functioning) or CARS 2-ST (standard) to further test the child and specify the areas of need. CARS scores and results were presented in the previous section in the participant profile descriptions.

In order to include primary information about the child's language abilities in the dataset, natural language samples from play interactions were recorded during each telepractice meeting. Parent-child play samples were approximately ten minutes long, each of whose dialogue was transcribed in case it was needed for further analysis. The telepractice sessions were operated and recorded using the video conferencing application

*Zoom*. This study also offered assistance in helping participants achieve internet access if needed, though neither participating family requested such assistance.

*Parent Measures*

Measures of parent strategy use were gathered from the parent-child interaction samples. The ten-minute samples were input and categorized in a program called *Mangold Interact*, a video-analyzing software for behavior coding. Coders categorized each parent utterance based on the strategies listed in Table 1.

<b>Strategy Category</b>	<b>Specific Strategy</b>	<b>Definition</b>	<b>Example</b>
<b>Responsive Interactions</b>	Contingent imitation	The parent copies the child’s verbal and/or nonverbal communication act	Child says “car” and parent repeats “car”
	Mapping	The parent communicates a word or phrase to give meaning to the child’s action	Child stomps foot and parent responds with “stomp foot”
	Expansion	The parent responds to the child by adding a word or higher-level communication to the child’s verbal and/or nonverbal communication	Child says “ball” and parent responds with “yellow ball”
<b>Modeling</b>	Verbal/gesture routine/model	Verbal, gesture, or routine models that the parent performs and/or communicates while prompting the child’s imitation	Parent points to the ball and picks it up while saying “ball”
<b>Prompting</b>	Physical Prompt (hand-over-hand)	The parent guides the child’s body movements with their hands	Parent grabs the child’s hand to physically guide them to point their finger
	Gesture Prompt	The parent uses some sort of nonverbal gesture to prompt the child’s language and/or action	Parent models pointing by pointing their own finger

<b>Prompting</b>	Choice	The parent presents the child with various options for objects, actions, and activities	Parent gives the child a choice between two objects or activities
	Cloze	The parent leaves a blank for the child to fill in with words or phrases	Parent says “The ball is ___” and waits for the child to say “yellow”
	Open-ended Question	Questions that elicit answers other than yes or no	Parent asks the child how school went
	Direct Request	The parent tells the child to produce a word, phrase, or use a gesture	Parent tells the child to pick up the ball
	Time Delay	The parent waiting for the child’s response with an expectant look and anticipatory body language	Parent sees that the child wants the ball but waits until the child says “ball” to give it to them
<b>Reinforcement</b>		Strategies provide verbal praise to children for correctly using language and/or gestures	Parent says “Good job putting your toys away!”
<b>Other</b>		Strategies that do not fit into any of the categories, such as rhetorical or yes/no questions	Parent asks the child if they like playing with the ball
<b>Combined</b>		The parent uses any blend of the strategies	The parent points at a truck and asks “Where is the truck going?”

Table 1: Parent Strategies, Levels, Definitions, and Examples

Based on each 10-minute play sample, researchers administered another parent measure, the Fidelity of Intervention Implementation (FII,) to gather data about the parents’ frequency of implementing the direct and indirect teaching techniques. The FII is established by researchers based on scores 1-5, with 1 being the lowest fidelity of strategy implementation and 5 being the highest fidelity. The scores are as follows: 1 (*Adult does not implement during session*), 2 (*Adult implements occasionally, but misses major opportunities*), 3 (*Adult implements half of the time, but misses many*

*opportunities*), 4 (*Adult implements more than half of the time, but misses some opportunities*), and 5 (*Adult implements throughout the session*).

## **Analysis**

In order to ensure rater reliability, parent-child interactions were coded and scored by the main researcher and a research assistant. The meeting recordings were randomized before beginning data analysis to blind the main coder and the reliability scorers. The randomized videos were used for the following analyses.

When analyzing behavior with Mangold, parent strategy categories included responsive interactions (e.g., contingent imitation, mapping, and expansion), modeling (e.g., verbal, gesture routine, and model), prompting (e.g., gesture prompt, choice, cloze, open-ended question, direct request, and time delay), reinforcement, and use of combined strategies, as detailed in Table 1. However, the measures of focus for the purposes of this study include comments, redirects, open-ended questions, and closed-ended questions (coded as “redirect → other.”) A reliability coder then coded 20% of the samples using Mangold independently. The agreement between the reliability coder and the author (main coder) produced Kappa scores of over 60%, at which point substantial agreement in single-subject research is achieved according to Brown and Woods (2015). The two coders reached 71.3% strategy agreement, 74.2% comment/ redirect agreement, and 78.7% prompting agreement.

While the main coder scored each parent’s FII, a reliability coder scored 20% of the samples independently. The agreement between the reliability coder and the author (the main coder) for Dyad 1 was 90% and Dyad 2 was 100% for all samples that were collected.

## Chapter III

### RESULTS

#### Dyad 1

##### *FII*

	Consent	Pretest 1	Pretest 2	Int. 1	Int. 2	Int. 3	Int. 4	Int. 5	Post-test	Follow-up 1	Follow-up 2	Follow-up 3
Adult uses follow your child's lead	3	3	3	3	3	5	4	4	3	5	4	5
Adult models and expands child's language or play	4	4	3	3	4	4	4	4	4	5	4	5
Adult creates opportunities for child to communicate	3	3	4	4	4	5	5	5	4	5	5	5
Adult helps child increase Complexity of language, imitation, or play	2	3	3	3	3	4	4	4	4	4	4	5
Adult paces interaction to keep child engaged and learning	3	4	3	4	4	4	4	4	4	4	5	5
Average FII Rating/ Session	<b>3.0</b>	<b>3.4</b>	<b>3.2</b>	<b>3.4</b>	<b>3.6</b>	<b>4.4</b>	<b>4.2</b>	<b>4.2</b>	<b>3.8</b>	<b>4.6</b>	<b>4.4</b>	<b>5.0</b>

Figure 1. AG's FII ratings for each parent-child play sample: strategy-specific

Figure 1 details the individual scores AG received during each telepractice session, specific to each target strategy. The following chart illustrates the progression of each session's average rating, as listed in the last row of the table.

Figure 2. Average FII Rating for Each Session: AG

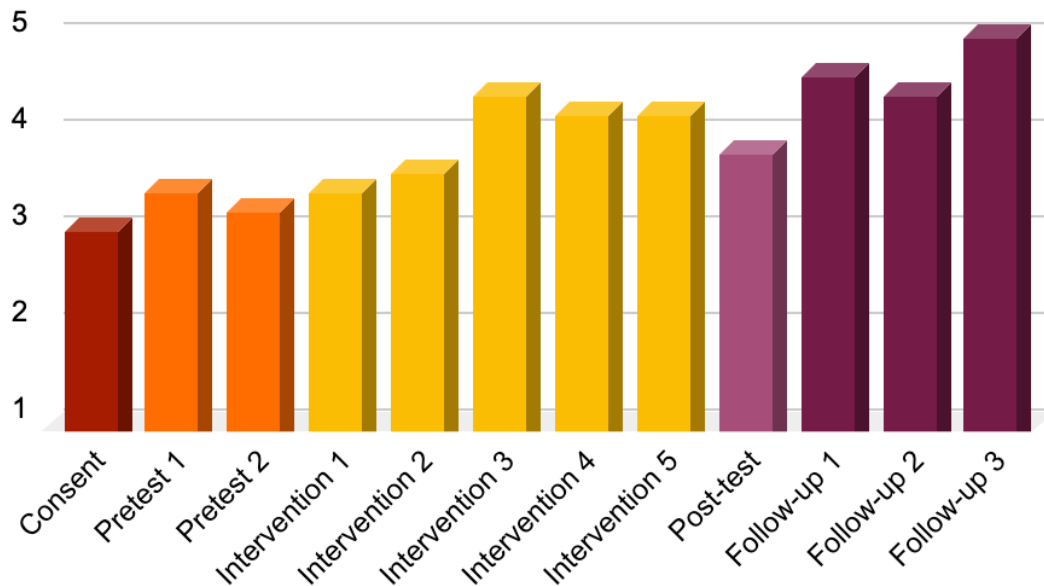


Figure 2. AG's Average FII Rating for Each Session

The measures presented in Figure 1 were consolidated into a single score-per-session, as seen in Figure 2, to produce a more effective summary of the data. AG received an FII rating of 3.0 during the consent session, which slightly increased during the pre-test phase. The intervention phase increased from 3.4 in the first week to 4.2 in the fifth week, and peaked during the third intervention. The post-test play session decreased slightly from the intervention, but increased greatly in the follow-up phase, achieving a perfect average of 5.0 during the final play session. The overall FII ratings increased by 2.0 from the first meeting to the last, as shown in Figure 1.

*Comments vs. Redirects*

Figure 3. AG's Comment/ Redirect Usage

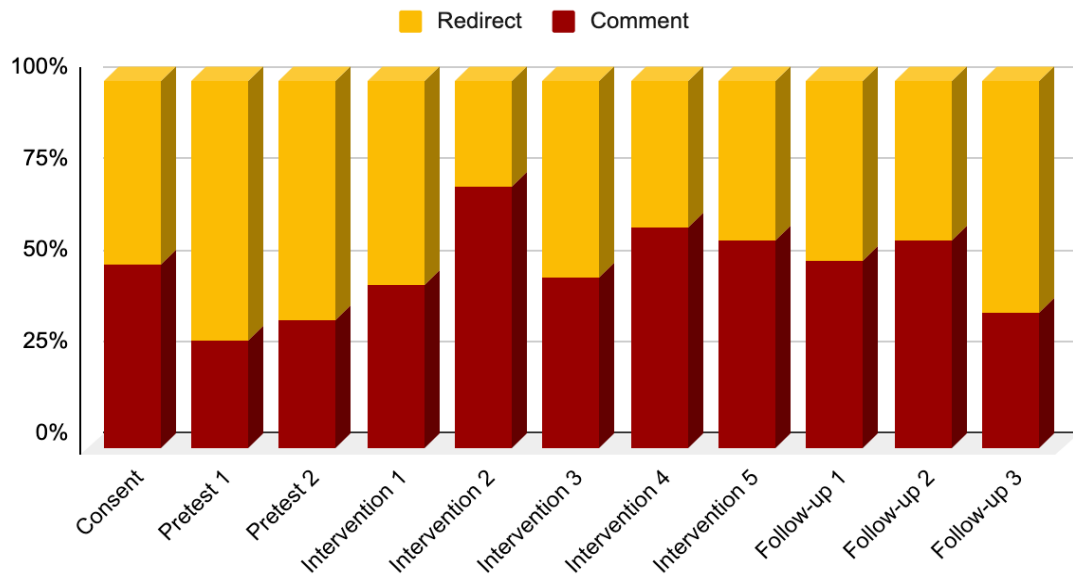


Figure 3. AG's Comment/ Redirect Usage

Figure 3 presents the percentage of comments and redirects that AG used during each session. The pre-tests exhibit a higher use of redirects while the two begin to level off in the last five sessions. More details regarding the nature of questions included within AG's redirects are provided below.

*Open-Ended Questions vs. Yes-No Questions*

Figure 4. AG's Usage of Open-Ended and Yes-No Questions

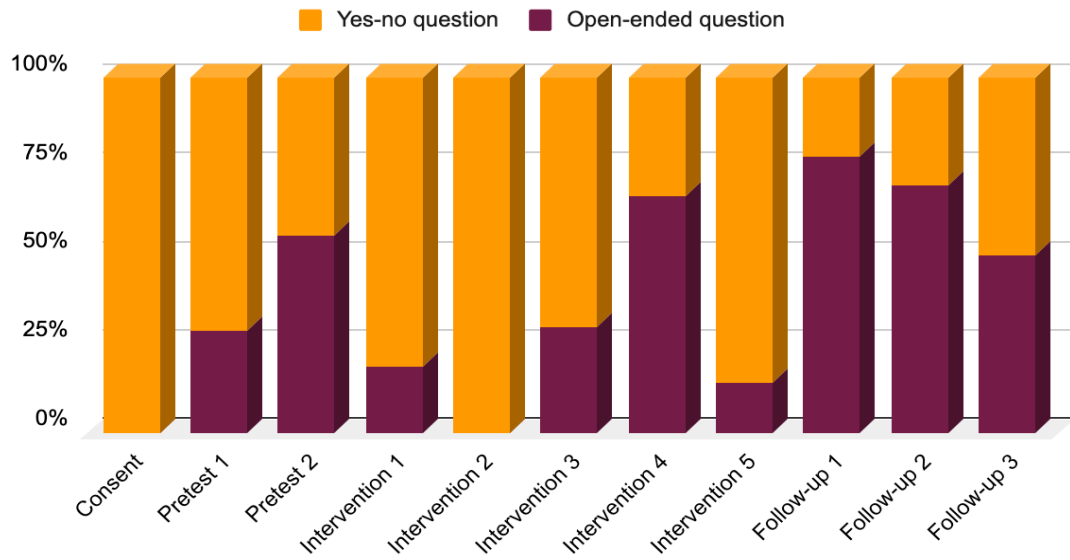


Figure 4. AG's Usage of Open-Ended and Yes-No Questions

The measures in Figure 4 provide more insight into the types of questions within AG's redirects during play by comparing her use of open-ended and yes-no, otherwise known as closed-ended, questions. While the graph reveals no distinguishable pattern, it is notable that AG's yes-no to open-ended question ratio is much higher during the initial phase of training than the follow-up phase, in accordance with a goal of the study.



## Dyad 2

### *FII*

	Pre-test 1	Pre-test 2	Int. 1	Int. 2	Int. 3	Int. 4	Int. 5	Post-test	Follow-up 1
Adult uses follow your child's lead	4	3	2	2	3	5	4	5	4
Adult models and expands child's language or play	2	3	3	4	4	4	5	5	5
Adult creates opportunities for child to communicate	2	1	1	1	3	4	4	4	4
Adult helps child increase Complexity of language, imitation, or play	1	1	1	1	1	2	3	3	2
Adult paces interaction to keep child engaged and learning	1.5	2	1	2	3	4	4	5	5
<b>Average FII Rating/ Session</b>	<b>2.1</b>	<b>2.0</b>	<b>1.6</b>	<b>2</b>	<b>2.8</b>	<b>3.8</b>	<b>4.0</b>	<b>4.4</b>	<b>4.0</b>

Figure 5. NF's FII Ratings for Each Parent-Child Play Sample: Strategy-Specific

The preceding table details the individual scores NF received during each telepractice session, specific to each target strategy. The following chart illustrates the progression of each session's average rating, as listed in the last row of the table.

Figure 6. Average FII Rating for Each Session: NF

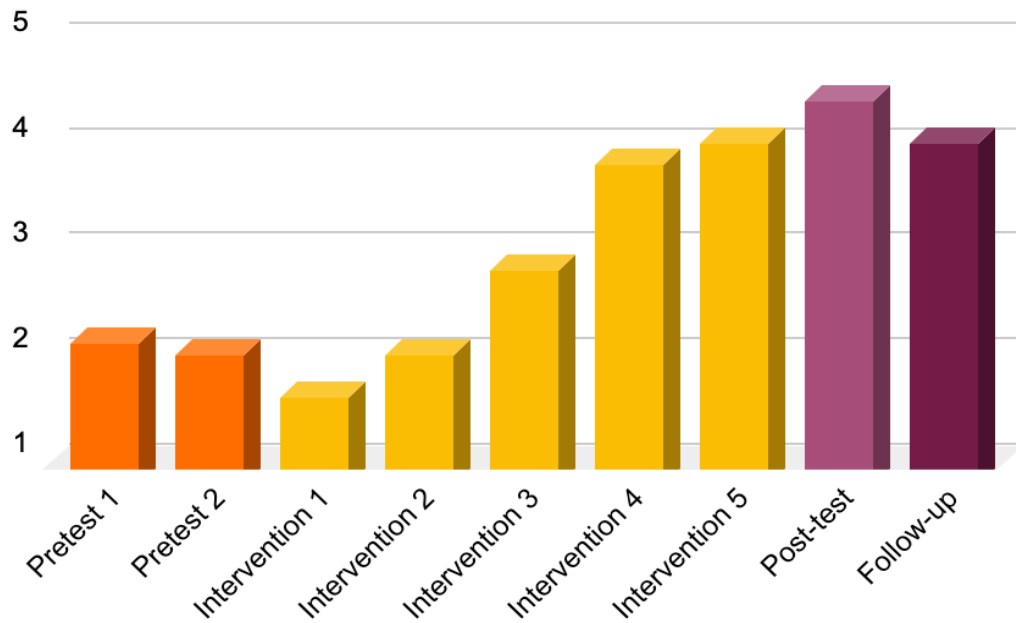


Figure 6. NF's Average FII Rating for Each Session

The rating of individual strategy implementation as seen in Figure 5 was consolidated into the single scores-per-session presented above. During the pre-test phase, NF received overall FII ratings of approximately 2. NF produced a steadily increasing FII score during the intervention phase ranging from 1.6 to 4.0. The FII rating continued to increase during the post-test session and ultimately decrease during the follow-up. From the first meeting to the last, NF's overall FII rating increased by 1.9, as shown in Figure 6.

*Comments vs. Redirects*

Figure 7. NF's Comment/ Redirect Usage

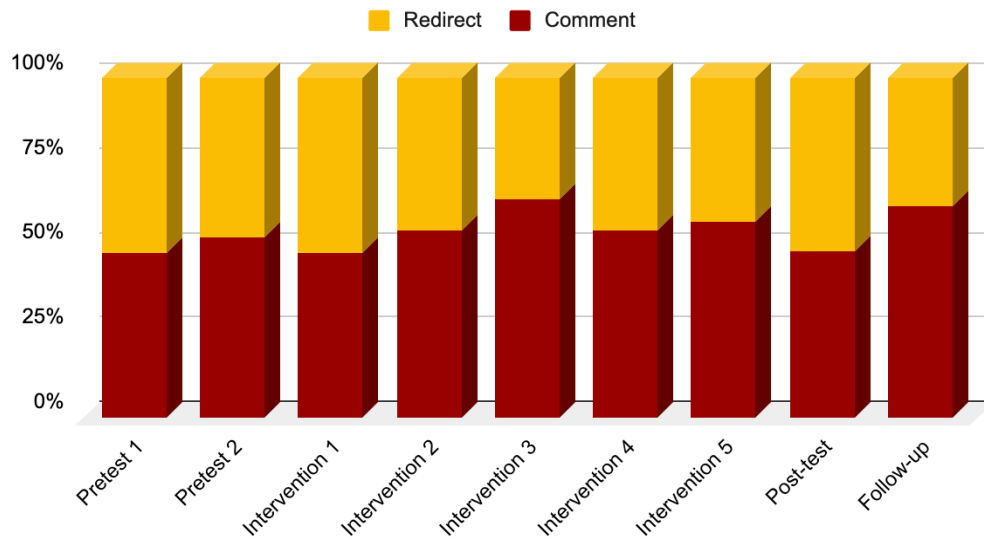


Figure 7. NF's Comment/ Redirect Usage

The data within Figure 7 represents the use of comments and redirects within each play sample. During the first pretest, there were more redirects than comments, but in the final session, NF used significantly more comments than she did redirects, aligning with the goals of this study. More details regarding the nature of questions included within NF's redirects are provided below.

*Open-ended Questions vs. Yes-No Questions*

Figure 8. NF's Usage of Open-Ended and Yes-No Questions

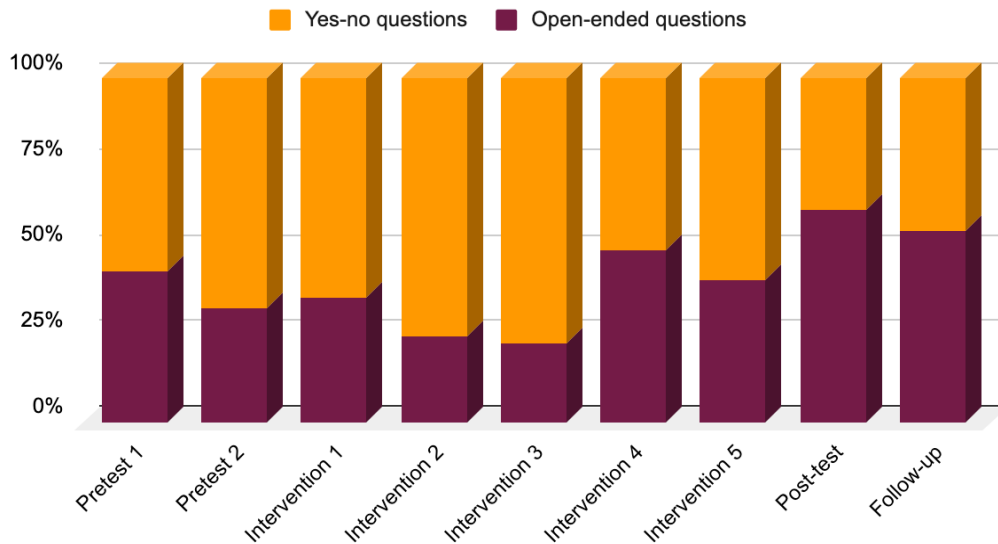


Figure 8. NF's Usage of Open-Ended and Yes-No Questions

The measures in Figure 8 provide more specific information about NF's redirects throughout her training. There was a decrease in open-ended questions during intervention sessions, but a strong increase during the post-test. It presents a more balanced use of open-ended questions and yes-no questions by the end of the program, which also aligns with the goals of this study.

## **Chapter IV**

### **DISCUSSION**

#### **Interpretations**

After collecting and considering the data presented above, the intervention was considered effective in improving the targeted goals. Specifically, both dyads increased their FII scores, exhibited a more balanced use of comments and redirects, and balanced their use of open-ended and yes-no questions. The current study allowed for a closer examination of participating parents' actions within child play and contributes to the body of research that examines telepractice-based ASD language services for those in rural areas, with a focus on children with little to no language skills.

The results gathered from the study support the hypothesis that the program would be effective in improving parents' Fidelity of Intervention Implementation (FII). The researchers can assume this based on the fact that both dyads' frequency of different strategy use increased throughout the training. Within this increase, individual differences can be observed. Dyad 1 produced consistently higher frequencies than Dyad 2 from the beginning of training sessions to the end. The decline in Dyad 2's FII score during the follow-up session could be due to NF's use of the tactic "follow-your-child's-lead" instead of interjecting with strategies as often as she had in the past (Figure 6). She comments on toys her son picks up and expands on his actions, which is encouraged by the researchers, but does not actively employ tactics such as turn-taking or increasing the complexity of play during the follow-up session.

Assessing the parents' comment and redirect usage during each session provided more insight into parent adherence to the clinicians' instruction. After analyzing their use of learned language strategies, the researchers found that while there are fluctuations in Dyad 1's strategy use, there is a slightly more steady increase in Dyad 2's comment usage. Both dyads generally observed the clinicians' instruction to pose fewer demanding prompts and requests throughout the parent training according to their results. Both parent participants used a higher percentage of comments in the later sessions than during the pre-tests, as hypothesized. Such instruction aligned with Haebig et al's (2013) study detailing the importance of emphasizing the usage of comments within child-play.

Next, examining the use of open-ended and yes-no questions helped the researchers understand how the dynamics of the two types of questions during child interactions shifted across sessions. Neither dyads produced a clear pattern across the training period, but both dyads used a higher percentage of open-ended questions during play at the end of the program than at the beginning. Researchers predicted to see this more balanced use of open and closed-ended questions as sessions progressed.

Overall, the apparent effectiveness of this study is consistent with Hao et al. (2020)'s research that demonstrates the unique benefits of evidence-based parent intervention, as the participants in this study improved in multiple areas while utilizing this method. The current findings are also in accordance with research by Meadan et al. (2016), Douglas et al. (2021), and Cherney et al. (2012), all of whom concluded that telepractice is an effective mode of providing language services.

## **Limitations**

Although there were originally five sets of clients to be examined in this cohort, two of the parent-child dyads ceased participation during the pretest phase and the data for one of the participating dyads was not coded or assessed. The results of this study would hold more significance if all five families had completed the program and their outcomes were analyzed. However, due to the intricate nature of this study's data analysis and the limited amount of time to carry out these measures, only two dyads' data were included in the results.

In addition to a small sample size, some play sessions were not carried out for the full ten minutes. Some were as short as six minutes due to child disengagement and occasional tantrums. While there was enough interaction to fully code each sample, the parent participants might have benefited from taking the full ten-minutes to engage and practice the target strategies. Additionally, although it was analyzed, Dyad 1's post-test session behavioral data was not included in the study due to a coding malfunction.

It also must be noted that while the program intended for only one parent to participate in the training program, the father of JG (Dyad 1) joined his wife AG during instruction and the parent-child play for each session. The clinicians paired with this family did not want to hinder familial progress or prohibit both parents from engaging in dynamic, collaborative child-play, so this was permitted. By informing both parents of new techniques each week, the child was able to experience a more immersive environment than children in other dyads might have had. However, as a consequence of the supplemental interaction from the father that remained uncoded, the progression statistics for Dyad 1 were compromised. AG's strategy implementation and comment/

redirect usage results were skewed due to the fact that another parent was equally as interactive during the ten-minute play samples, thus leading AG to participate more sporadically than if engaging one-on-one with the child.

### **Future Directions**

The research carried out for the purposes of this study contributes to the existing database of virtual ASD language intervention upon which future research should expand. In future studies, a larger sample size would be more indicative of the nature of parent-mediated language intervention and commonalities among participants in a rural setting. In addition, a longer period of observation would reveal how a training program such as ImPACT affects an autistic child's communication long-term. Lastly, while the current study examines the outcomes of two mother-son dyads, it would be advisable for future researchers to carry out the training program for an equal number of male and female clients with ASD. In order to continue building the extant research of services effective in aiding language growth in those diagnosed with autism, it is crucial that the pursuit of knowledge in this area does not end here.



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