

THE USE OF TELEPRACTICE FOR COMMUNICATION AND BEHAVIORAL  
CHALLENGES FOR INDIVIDUALS WITH ASD AND ID

A Dissertation

by

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## ABSTRACT

Currently, the rate of individuals with autism spectrum disorder (ASD) is growing and further research is needed to understand what evidence-based practices are effective for this population. To contribute further to the already existing literature, the three studies expand on previous reviews and studies by adding information on whom these intervention best serve. The first review is a meta-analysis, which examines four moderators for individuals with ASD and intellectual disability (ID). The authors evaluated the effects of dosage, feedback, age, and years of training for interventionists on social communication and challenging behavior for individuals with ASD and ID. Although there were no statistically significant differences within the moderators, further inspection is warranted. Findings indicate moderate or small effect on social communication or challenging behavior for individuals with ASD and ID. Limitations and future research is discussed. The second study reviews the quality of single case and group design studies using Standards for Excellence in Education Research (SEER) and an adaptation of What Works Clearinghouse (WWC) for 30 studies. The studies included individuals with ASD or ID who were working towards improving their social communication skills or decreasing challenging behavior. Several implications for practitioners and researchers were expanded on. The third was a single-case study with three parent-child dyads who are from Spanish speaking homes and have ASD as a diagnosis. Parents were taught a multimodal communication intervention using telepractice as a delivery mode in their own natural environment.

## DEDICATION

This dissertation is dedicated to my husband and my son who inspired me to pursue my doctoral degree. For my parents who supported my passion for research and whose values of hard work and discipline have been an example to follow.

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## CHAPTER I

### INTRODUCTION

Individuals with autism spectrum disorder and intellectual disabilities experience a range of behavioral and communication problems. Many studies have highlighted ways to improve social skills for this population and their families (Alkhalifa & Aldhalaan, 2018). However, a vast majority of services are found in urban areas, which leaves families in rural areas in greater need (Antezana, Scarpa, Valdespino, Albright, and Richey, 2017). Rural communities experience challenges regarding geographical distance, diagnostics, treatment, and overall support for caregivers of individuals with autism spectrum disorder (ASD) and intellectual disability (ID) (Antezana, Scarpa, Valdespino, Albright, and Richey, 2017). The outcomes of delayed services, may lead to later diagnosis and later intervention, which results in low quality of life for individuals involved. The use of telepractice services may offer feasible and efficient approach to treatment, diagnosis, training, and education for individuals with ASD and ID, including their natural caregivers (Alkhalifah & Aldhalaan, 2018).

Telepractice is the use of technology to provide services such as assessment, diagnosis, intervention, consultation, supervision, education, and information across distance (Tomlinson & McGill 2018). This can include email, phone calls, video conferencing, or chat rooms so long as feedback has been given through either of those delivery formats. Telepractice has been used in various fields such as speech language therapy, mental support, and medical diagnostic services (Tomlison & McGill, 2018).

This delivery approach has also been proven effective with high fidelity outcomes for parents, educators, and therapists (Neely, Rispoli, Gerow, Hong, Hagan-Burke, 2017).

Some of the benefits of using telepractice for individuals with ASD and ID are the accessibility for parents and educators to receive training. These services can be accessed with high fidelity via smartphone or tablet (Neely, Rispoli, Gerow, Hong, Hagan-Burke, 2017). Other advantages include low costs and less travel time for families compared to in person services (Tomlinson & McGill, 2018). Some disadvantages to using telepractice as a delivery approach include slow internet connections between interventionists and families or coaches (Tomlinson & McGill, 2018). This technical difficulty can have an impact in feedback delivery time and when uploading materials online. Unstable internet may be more common in rural areas than urban areas. Although there are some disadvantages to the use of telepractice, it has proven to be a feasible approach that can reach families from rural communities, including families whose primary language is not English.

Findings from previous reviews addressed the need for cultural practices to be adapted to suit the families, especially when it comes to gender roles in Western Asia (Alkhalifah et al., 2018; Antezana et al., 2017). There is a need for practitioners to identify and use appropriate measures for families from culturally and linguistically diverse (CLD) populations, including when using telepractice (Fitton et al., 2017). Many educators do not feel they have received adequate training working with this population (Fitton et al., 2017). Therefore, CLD families obtain delayed services and early identification. The consequences result in further delays in school and low quality of life for families (Antezana et al., 2017). Cultural awareness while using telepractice further magnifies potential services. Other characteristics of implementation of telepractice may warrant similar outcomes.

Telepractice characteristics such as year implemented, dosage, feedback, and delivery format have been reviewed in the literature with positive outcomes (Tomlinson et al., 2018).

Dosage varied with some researchers providing extended training sessions (Alnemary et al., 2015; Barkaia et al., 2017; Fisher et al., 2014; Gibson et al., 2010). In some instances, studies implemented training through live coaching and other researchers used delayed feedback (Knowles et al., 2017; Neely et al., 2016). In all studies feedback was provided for the improvement of behavioral or communication outcomes for individuals with ASD and ID (Tomlinson et al., 2018). Therefore, it is critical to evaluate whether the use of increased dosage and performance feedback as essential components was linked to increased positive outcomes for individuals with ASD.

Most previous telepractice reviews focused on individuals with ASD and ID (Tomlinson et al., 2018). Furthermore, reviews have primarily evaluated outcomes for children up to 12 years old (Vazquez et al., 2018). Prior reviews have included no information about the participants' primary language or language proficiency or their cultural background. It is critical to determine what types of supports are suitable for what populations. Without investigations that involve diverse participants, it is unknown whether such approaches are broadly applicable.

Interventionists, noted by previous reviews, included ABA therapists, graduate students, educators, and other professionals (Ferguson et al., 2019). Little information was reported on the experience level of the interventionists (Tomlinson et al., 2018). The few that did report this noted limited previous experience in behavior analytic procedures (Tomlinson et al., 2018). No information was given for interventionist primary language, language proficiency, or racial background (Ferguson et al., 2019; Tomlinson et al., 2018). Information was also missing about the coach/trainer who taught the interventionists (Tomlinson et al., 2018). Interventionist characteristics would be helpful to promote the external validity of the literature (Neely et al., 2017). Fine-grained analyses comparing the magnitude of effects for potential moderators related

to characteristics of interventionists have not been conducted; thus, little is known regarding the diversity of participant interventionists/coaches.

Intervention characteristics included behavior support, comprehensive training, preference assessments, naturalistic training, and functional communication training (Ferguson et al., 2019). It is crucial to evaluate this moderator to know if telepractice can be used with all types of interventions (Tomlinson & McGill, 2018). Settings where these interventions took place included clinics and homes (Ferguson et al., 2019).

Most reviews evaluate the quality of studies, which were commonly rated lacking key indicators for meeting methodological quality indicators (Boisvert et al., 2010; Ferguson et al., 2019; Tomlinson et al., 2018). The most common cause of low quality for single- case studies included unstable data in baseline and intervention conditions, insufficient replication of intervention, lack of data to demonstrate effects (Tomlinson et al., 2018). The rubric suggested by Reichow et al. (2011) was used to score the methodological quality of the studies and designate them as evidence based practices for the review of Ferguson (2019). The rubric included information on participant characteristics, independent variable, dependent variable, visual analysis, among others (Reichow, 2011). Quality indicators were low for most reviews (Boisvert, 2010; Ferguson et al., 2019; Tomlinson et al., 2018). Therefore, more information on measures of research quality such as independent variables, experimental control, and participant characteristics are needed to provide essential information to allow for future replication and minimize research bias.

Three papers will make up the whole of this dissertation. The first paper is a meta-analysis of the use of telepractice for individuals with ASD and ID for behavioral and communication outcomes. The second paper is a quality review of the use of telepractice for

individuals with ASD and ID. The third paper is a single case research design including parent coaching for three families from bilingual backgrounds with a child with ASD. The following is a list of research questions for the three papers.

Do effects on implementation skills of interventionists and on child communication and behavior outcomes differ by:

- a. Characteristics of implementation of telepractice (number hours/sessions, live coaching immediate v. delayed feedback)
- b. Participant characteristics (age) for individuals with ASD and ID?
- c. Type and characteristics of intervention implemented by the parent/educator (years of training).

The research questions then follow a) what is the quality of the literature base of studies using telepractice for training parents and educator's implementation of communication and behavioral interventions for individuals with ASD and ID? b) Does the literature meet methodological standards (e.g. procedural integrity, social validity, participant description, setting and material description, interventionist description, baseline, intervention, maintenance, and generalization)?

The research questions are the following a) Is there a functional relation between the culturally responsive parent coaching protocol and the use of prompting components of the multimodal communication intervention for children with ASD? b) Is there improvement in child communication outcomes for children with ASD, influenced by parent coaching protocol? c) Was there a correlation between parent use of multimodal communication interventions and child communication outcomes? d) Did parents find the use of these strategies via telepractice acceptable and useful?

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## CHAPTER II

### USING TELEPRACTICE TO IMPROVE COMMUNICATION AND BEHAVIORAL SKILLS FOR INDIVIDUALS WITH ASD AND ID: A META-ANALYTIC REVIEW

Children with autism spectrum disorder (ASD) and intellectual disabilities (ID) experience difficulty using conventional speech effectively (American Psychiatric Association, 2013). Issues with communication can lead to alternate forms of expression, particularly challenging behavior (Centers for Disease Control and Prevention [CDC], 2018). Challenging behavior and lack of communication skills result in poor quality of life and long-term outcomes for individuals with ASD and ID (Ageranioti-Bélanger et al., 2012; Brown et al. 1998). Such behaviors can cause detrimental effects on the individual and families (Ageranioti-Bélanger et al., 2012). The number of individuals diagnosed with ASD has grown over the recent decades and as the number increases, so does the need for additional professionals that provide services to this population (National Institute of Neurological Disorders and Stroke, 2019; Lund et al., 2017).

Evidence-based communication and behavior interventions have been developed; however, educators and families often have difficulty accessing high-quality treatment, due to geographic access, cost, time, or linguistic diversity (Bulgren et al., 2002; Murphy et al., 2012). Many educators are not equipped to handle challenging behavior and rely on experts willing to travel for training (Rule et al., 2006). Educators with limited resources often receive support from experts who travel long distances, which can negatively influence the provision of services (Barretto et al., 2006). Some drawbacks of limited service providers within driving distances include reduced time with educators, increased costs, and inability to receive support in real time during a crisis (Gibson et al., 2010). For families, without accessible services, they have to travel hours to reach therapy for their children (Ferguson et al., 2019). Additionally, some therapies do

not provide services for parents, only to their children, limiting their potential for reaching goals and generalizing skills (Simacek et al., 2017). This issue is socially relevant for families who are interested in working with their children, but do not have the economic means, time, or available services. Aside from therapies being geographically unavailable to families, these services can be costly to parents. The cost for a child with ASD is about \$40,000 to \$60,000 dollars a year in therapy services and medical expenses (Centers for Disease Control and Prevention, 2019).

Telepractice can help ameliorate these issues.

### **Telepractice-based Access to Treatment**

Telepractice, also referred to as telehealth or telemedicine, is the use of technology to implement health services and interventions to consumers (Ferguson et al., 2019). This form of delivering services has been used in fields such as medicine and psychiatry (Kessler et al., 2009; Klein et al., 2010; Mitchell et al., 2008). The increasing use of the internet has made this option a viable one for practitioners and families. Telepractice can be available at the convenience of their own home or workplace. Additionally, services could be accessed via smart phone, tablet, and laptop. Some of the benefits of using telepractice for training educators are the availability and accessibility of services (Gibson et al., 2010).

Telepractice has been used since the 1990's in various delivery formats in order to improve the behavior and communication outcomes for children with ASD (Lindgren et. al., 2016). Given the need for and the increasing use of telepractice to deliver services to providers of individuals with ASD and ID, it is important to review the literature to evaluate what works, for whom, and under what conditions (Tomlinson et al., 2018). Previous reviews have included some information about the delivery formats, such as video conferencing, and type of feedback (Ferguson et al., 2019; Tomlinson et al., 2018). To our knowledge, only two reviews have

investigated the effect of dosage (Baharav et al., 2010; Tomlinson et al., 2018). Furthermore, prior reviews focused only on participants who were diagnosed with ASD and did not include participants with ID who did not also have ASD. Thus, further analysis is needed comparing relative effectiveness with regard to characteristics of interventions for this population.

A number of studies have found the use of telepractice to be effective with parents and educators of children and individuals with ASD and ID (Alkhalifa et al., 2018; Benson et al., 2018; Lee et al., 2018; Vismara et al., 2012). That said, most of these reviews on telepractice were narrow as they focused primarily only on individuals with ASD (Boisvert, et al. 2010; Neely et al., 2017). To our knowledge, there are two reviews that include individuals with ID and ASD using telepractice (Tomlinson et al., 2018; Vazquez et al., 2018). Prior reviews evaluate the use of telepractice with mostly children, under the age of six, and four reviews focusing on adults with ID and social skills (de Wit et al., 2015; Deverson et al., 2015; Sheehan et al., 2017; Vazquez et al., 2018). None of the reviews included information about primary language or language deficiencies of interventionists or coaches. These are important variables to report, as they will be the ones providing training to parents, educators, and other professionals. A meta-analysis that considers both individuals with ASD and ID is needed to determine for whom telepractice is most effective and whether effects differ by participant characteristics (i.e., diagnosis, age, years of training) for individuals with ASD and ID to improve behavioral and communication outcomes.

Coaches, who provide instruction to individuals with ASD and ID to their parents or educators, serve as essential components of telepractice (Ferguson et al., 2019). The importance of working with coaches has been reflected in implementation fidelity and positive child outcomes (Ferguson et al., 2019). Unfortunately, not all studies report characteristics of coaches

who train interventionists to work with children with ASD or ID (Neely et al., 2017; Tomlinson et al., 2018). These reviews infrequently report previous training, racial background, or primary language (Ferguson et al., 2019; Neely et al., 2017). These characteristics are crucial to evaluate to understand which components might be affecting behavior change in caregivers and individuals with ASD and ID.

Due to the importance of early intervention, finding effective evidence based practices can have positive long-term effects for families (Office of Communications, NIH, 2017). By evaluating the effects of interventions, educators or parents can spend time on more effective treatments to help the child's communication or behavioral skills before they worsen (Benson et al., 2018). Previous studies published on the use of telepractice for interventions for individuals with ASD include a specific focus on only applied behavior analytic strategies (Ferguson et al., 2019; Tomlinson et al., 2018). Other telepractice-implemented interventions should be systematically reviewed to determine if they are both effective and feasible (Ferguson et al., 2019). Thus, evaluation of the literature is needed to differentiate the effectiveness between different types of intervention implemented by the parent/educator, including a range of frequently implemented interventions (e.g., feedback).

### **Purpose and Research Questions**

The purpose of this study was to conduct two separate meta-analyses, one on communication outcomes and another on challenging behavior outcomes, to address the following questions:

Do effects on implementation skills of interventionists and on child communication and behavior outcomes differ by:

- a. Participant age for individuals with ASD and ID?

- b. Characteristics of implementation of telepractice (number hours/sessions, live coaching v. delayed feedback)?
- c. Telepractice coach/trainer characteristics (e.g. years of previous training)?

Separate analyses were created due to the difference in dependent variables. Researchers were not able to combine both as these dependent variables were expecting different outcomes. For communication, it was expected to have an upward trend as we see more communication with an intervention and challenging behavior was expected to have a downward trend. We hypothesize a positive effect size for communication and a negative effect size for challenging behaviors.

## **Method**

### **Search Procedures**

The initial search was conducted by a systematic review librarian from Texas A&M University in December 2019 through six databases (see Table 2.1 for databases and search terms); and was repeated in September 2020 with the five original databases and an additional Spanish database included. Publication year was not restricted to allow for more inclusion of studies to be analyzed. Following the title/abstract and full text review, the first author conducted an ancestral search of the articles referenced by the documents included at that stage. There were 521 documents found because of these combined search procedures; when duplicates were resolved, this resulted in a pool of 375 studies that proceeded to title/abstract review. See Figure 2.1 for a flow diagram of the search and review procedures.

### **Inclusion/Exclusion Review of Titles and Abstracts**

Empirical studies were included to progress to the full text review stage if they were peer reviewed and included the following: a) participants had a diagnosis of autism spectrum disorder,

autistic disorder, Asperger disorder, pervasive developmental disorder, and ID; b) at least one dependent variable involving social-communication skills or behavioral outcomes; c) include a single-case experimental design (SCED); d) the study was published in a peer-reviewed journal; e) the study was published in English or Spanish; f) include telehealth, tele practice, or remote training. The first author reviewed the title and abstract of each of the 375 studies to determine whether they met all of the criteria. Two secondary blind coders also indicated an overall yes/no to include based on the inclusion criteria via review of the title and abstract of each document. When inclusion or exclusion was not clear in the title and abstract review stage, coders would include the study in the full text review. Next, the 110 articles that were scored as “yes” progressed to the full-text review stage.

### **First author, ancestral, and forward searches**

To obtain more information from additional sources the author conducted a first author, ancestral and forward searches with the 15 studies that met full-text inclusion. Using Scopus, first author, ancestral and forward searches were conducted after identifying the included studies. Each study was searched for a) other studies that the first author contributed to or first authored in (i.e. first author search); b) studies in the reference list of the included studies that had keywords from the inclusion criteria (i.e. ancestral search); c) searching articles that cite a specific study (i.e. forward search). Upon conducting the first author, ancestral, and forward search there were an additional four studies found and included in the meta-analysis, after going through all stages of review.

### **Inclusion/Exclusion Criteria for Full-Text**

The full text of the remaining articles were also reviewed for the same criteria as in title/abstract review to ensure they were met in the case that insufficient information was

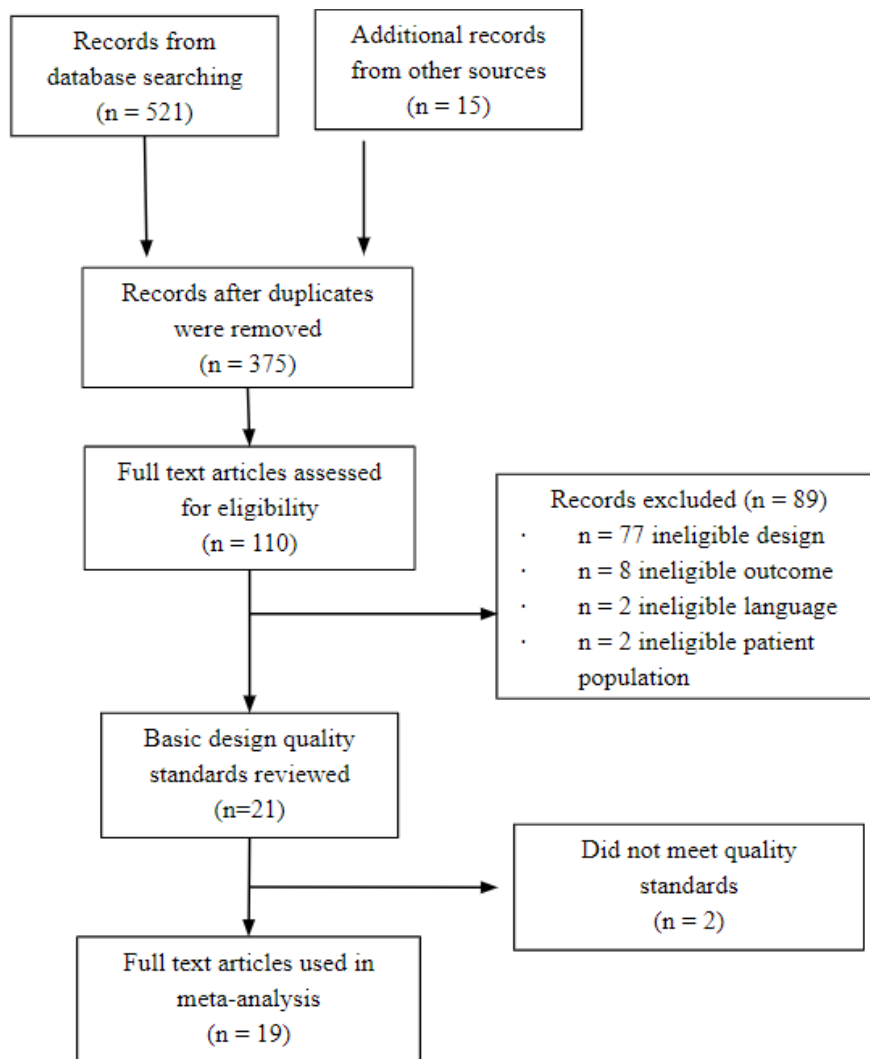
provided in the title and abstract to make an inclusion determination at that stage. Additional inclusion criteria were added at this stage and discussed below. There were 21 articles remaining in the pool following full-text exclusion procedures. See Figure 2.1 on the flow diagram for more information regarding the inclusion/exclusion process. The first stage of quality review single case design standards were also applied for the inclusion and exclusion criteria for full text.

### **Methodological quality standard review**

Methodological quality reviews were conducted on 21 studies to see if they met quality standards. A set of quality review standards was used for these 21 single case design studies (U.S. Department of Education, Institute of Education Sciences, and What Works Clearinghouse 2016). The first stage of the quality review included three criteria a) number of data points per phase b) at three attempts of experimental analysis c) interobserver reliability with over 80% for 20% of the total studies. After the methodological standards were applied only 19 studies, met inclusion criteria and two did not meet criteria. Studies that did not meet the basic quality standards were not included in the meta-analysis due to the objectives for this review to include evidence-based practices.

**Figure 2.1**

*Flow Diagram of Search and Review Procedures*





**Table 2.1**  
*Search Terms*

Databases searched	Search terms, Group 1	Search terms, Group 2
PsycINFO (157 results)	"Telemedicine", "Teleconferencing", "Online Therapy", "Teleconsultation", "Telepsychiatry", "Telepsychology", "Telerehabilitation". "Neurodevelopmental Disorders", "Developmental Disabilities""Disruptive Behavior Disorders", Telepractice”, “telemedicine”, “teletherapy” “telehealth”	"Autism Spectrum Disorders", "Autistic Traits", "Emotional and Behavioral Disorders" "Intellectual Development Disorder" "Learning Disorders" "Developmental Disabilities" "Specific Language Impairment" disabl* autis*
Medline Complete Ebsco (149 results)	"Telemedicine”, "Telerehabilitation”, "Remote Consultation", “telepractice or teletherapy or telehealth”	"Autism Spectrum Disorder", "Autistic Disorder", “intellectual or developmental” disable* autis* ”Developmental Disabilities” "Intellectual Disability".
CINAHL Ebsco (94 results)	"Telerehabilitation", "Telepsychiatry", "Telehealth", “telepractice”, “telemedicine”, teletherapy”	"Intellectual Disability", "Developmental Disabilities", disabl* autis*
ERIC Ebsco (59 results)	"Videoconferencing" “telepractice” “telemedicine” “teletherapy” “telehealth” consult*	"Autism", "Pervasive Developmental Disorders", "Behavior Disorders" "Communication Disorders" "Congenital Impairments" "Developmental Disabilities" "Intellectual Disability" "Language Impairments" "Learning Disabilities" "Perceptual Impairments", "Speech Impairments”
Academic Search Ultimate (61 results)	“telepractice”, “telemedicine” “teletherapy”, “telehealth” consult*	intellectual or developmental or disabl* or autis*

Fuente Académica (Ebsco) (1)	tele-education (tele-educación), tele-medicine (tele-medicina), telepractice (tele practica), distance (distancia), teletherapy (Teleterapia),	trastorno del espectro autista), ASD (TEA), intellectual development (desarrollo intelectual
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### Moderator Coding

Following all search and screening procedures, the remaining 19 included studies were then coded for four moderators a) characteristics of participants; b) characteristics of implementation of intervention; c) interventionist working with individuals with ASD or ID; d) characteristics of implementation of tele practice. The remaining 19 studies included raw data extraction to obtain information about effect size. See Table 2.2 for more information on the coded variables.

Discrepancies were discussed with the author and the coder until they agreed on inclusion or exclusion. Coders met for disagreements, discussed discrepancies, and came to consensus for inclusion and exclusion on each document at this stage. Some of the moderator coding was not analyzed in this review and only coded due to lack of data or if information was uniform (e.g. language proficiency, delivery format, primary language).

**Table 2.2**  
*Characteristics in Studies*

Moderator		Coding	Description
<b>Intervention Characteristics</b>	First author's last names		First author's last name
	Year of publication		Publication year (a proxy for availability and accessibility of technology)
	Dosage	<ul style="list-style-type: none"> <li>· 1-3 sessions</li> <li>· 4-6 sessions</li> <li>· 7-9 sessions</li> </ul>	The number of coach/training/service

	Feedback	<ul style="list-style-type: none"> <li>· &gt;10 sessions</li> <li>· Real time feedback</li> <li>· Delayed</li> <li>· Not reported</li> </ul>	<p>sessions provided to parents/educators</p> <p>The immediacy of feedback provided to coaches/trainers</p>
	Delivery Format	<ul style="list-style-type: none"> <li>· Phone Calls</li> <li>· Tele-practice/Online</li> <li>· Email</li> <li>· Other</li> <li>· Not reported</li> </ul>	Types of coach/training/services provided to caregivers
	Setting	<ul style="list-style-type: none"> <li>· Home</li> <li>· Clinic/hospital/center</li> <li>· Community settings</li> <li>· More than 2 settings</li> <li>· Not reported</li> </ul>	Settings that professionals delivered services to caregivers
	Intervention Type	<ul style="list-style-type: none"> <li>· Behavioral skills training</li> <li>· Parent mediation training</li> <li>· Mand training</li> <li>· Performance feedback</li> <li>· Bug-in-ear training</li> <li>· Mindfulness training</li> <li>· Imitation training</li> <li>· Incidental training</li> <li>· FCT</li> </ul>	Type of intervention implemented by the parent/educator
<b>Participant Characteristics (Individuals with ASD/ID)</b>	Diagnosis	<ul style="list-style-type: none"> <li>· ASD</li> <li>· ID</li> <li>· Other</li> </ul>	Diagnosis as described by study
	Child Age	<ul style="list-style-type: none"> <li>· &lt;4 years old</li> <li>· &gt;4 years old</li> </ul>	Age of each participant
	Child's Primary Language	<ul style="list-style-type: none"> <li>· English</li> <li>· Spanish</li> <li>· French</li> <li>· Others</li> </ul>	Native language of participant with ASD/ID
	Child Language Proficiency	<ul style="list-style-type: none"> <li>· High</li> <li>· Medium</li> <li>· Low</li> <li>· Not reported</li> </ul>	

<b>Interventionist Characteristics</b>	Role	<ul style="list-style-type: none"> <li>· Parent</li> <li>· Educator</li> <li>· SLP</li> <li>· Other</li> </ul>	Interventionist working with the coach/trainer
	Racial Background	<ul style="list-style-type: none"> <li>· American Indian or Alaskan native</li> <li>· Asian</li> <li>· African American</li> <li>· Native Hawaiian or Pacific Islander</li> <li>· White</li> <li>· Hispanic</li> <li>· More than one race</li> </ul>	Race of the interventionist
	Educational Level/ Previous Training	<ul style="list-style-type: none"> <li>· High School</li> <li>· Some College</li> <li>· Graduated</li> <li>· Other</li> </ul>	Educational level of the interventionist
	Interventionist Primary Language	<ul style="list-style-type: none"> <li>· Same as Individual with ASD or ID</li> </ul>	Native language of interventionist
	Language Proficiency	<ul style="list-style-type: none"> <li>· High</li> <li>· Medium</li> <li>· Low</li> <li>· Not reported</li> </ul>	Language proficiency of interventionist
<b>Coach/Trainer Characteristics</b>	Role	<ul style="list-style-type: none"> <li>· Same as Interventionist</li> </ul>	Coach/Trainer working with a person with ASD/ID
	Education Level/ Previous Training	<ul style="list-style-type: none"> <li>· Same as Interventionist</li> </ul>	Educational level of the coach
	Racial Background	<ul style="list-style-type: none"> <li>· Same as Interventionist</li> </ul>	Race of coach/trainer
	Coach Native Language	<ul style="list-style-type: none"> <li>· Same as Interventionist</li> </ul>	Native language of interventionist
	Language Proficiency	<ul style="list-style-type: none"> <li>· Same as Interventionist</li> </ul>	Language proficiency of interventionist

**Data Extraction**

Engauge Digitizer was used to extract data points on the communication analysis and challenging behavior analysis for individuals with ASD and ID by scanning graphs in JPEG and saving them into an excel sheet where they were organized by article (Mitchell et al., 2020). Data points in baseline and intervention phases were digitized and exported into an excel sheet for at least one pair per study for 19 articles for both communication and challenging behaviors.

### **Data Analysis**

Visual analysis of single case research design is defined by reaching reliable intervention effects by visually inspecting graphed data (Kazdin, 1982). Evidence has demonstrated the erroneous judgments made from visual analyses, including from expert raters (Park et al., 1990). Limitations of visual analysis include type I error if individual effects have more weight than replicated effects, if the visual analysis lacks clear rule (e.g.  $p < 0.05$ ), or when multiple influences need to be evaluated (e.g. level, trend, variability, immediacy, consistency; Brossart et al., 2006). Therefore, further analysis should be conducted to ensure that intervention effectiveness is achieved through single- case research designs.

Tau-*U* was adapted from Kendall's (1938) rank order statistics. It combines the nonoverlap, also called "dominance" between phases from trend from within the intervention phase (Parker et al., 2011). In single case data, these two phases would be the baseline and intervention phase. Non-overlap is due to the pairwise comparison of individual scores across two groups or phases to determine dominance over another score (Parker et al., 2011). Non-overlap will not summarize the data points computing for their central tendency, but will offer equal attention to each data point (Parker et al., 2011). Trend refers to the direction and slope of the data over time (Ledford et al., 2018). Tau-*U* is an extension of Tau by expanding to Tau-*U* scores identify the magnitude of effects between baseline phase and intervention phase which

ranged -1.0 to +1.0 with the strongest effect with +1.0 (Manolov et al., 2017; Parker et al., 2011). The scale of Tau-*U* is a correlation thus, as it moves to +1.0 it is strong and close to -1.0 is weak (Parker et al., 2011). Tau-*U* was selected for this study because it is said to be flexible, feasible, and popular to use when conducting single case experiments (Parker et al., 2011). In addition, compared to other nonparametric effect sizes, the advantages of Tau-*U* used in single-case research include the use of all data points, the ability to control for trend, high sensitivity, and ease of calculation (Parker et al., 2011).

Upon coding for moderators, a free online calculator (Vannest et al., 2016) was used for calculating the effect size of each baseline and intervention contrast per dependent variable (e.g. communication, challenging behavior), and the omnibus effect size per moderator per study and participant. The omnibus effect sizes were calculated by each weighted AB phase contrast based on inverse variance (Vannest et al., 2016).

The author used R studio for calculating the omnibus effect size across all studies in the communication analysis and separately for the challenging behavior analysis with the metaphor package. Ganz et al. (2017) and Vannest and Ninci (2015) adopted the benchmark from Cohen (1988) to create and interpret percentile rank and range for single case studies. Thus, the current study follows the same guidelines. Benchmarks were calculated using five categories of interpretation, which are very large in the 90<sup>th</sup> percentile, large in the 75<sup>th</sup> percentile, moderate in the 50<sup>th</sup> percentile, small in the 25<sup>th</sup> percentile and very small in the 10<sup>th</sup> percentile. For more information on the percentile rank and ranges, please see Table 2.3 and Table 2.4.

**Table 2.3**  
*Interpretive for Tau-U*  
*Values Based on*  
*Benchmarking from*

<i>Studies on Communication</i> <b>Tau-U values</b>	<b>Effect size interpretation</b>	<b>Percentile</b>
0.99-1.00	Very large sized effect	90th
0.82-0.98	Large sized effect	75th
0.50-0.81	Moderate sized effect	50th
0.30-0.49	Small sized effect	25th
$\leq 0.29$	Very small sized effect	10th

**Table 2.4**  
*Interpretive for Tau-U Values Based on Benchmarking from Studies on Challenging Behavior*

<b>Tau-U values</b>	<b>Effect size interpretation</b>	<b>Percentile</b>
-0.90- -1.00	Very large sized effect	90th
-0.84- -0.90	Large sized effect	75th
-0.66- -0.83	Moderate sized effect	50th
-0.36- -0.65	Small sized effect	25th
$\geq 0.36$	Very small sized effect	10th

Forest plot, funnel plot, and publication bias analyses were generated using this software. For the funnel plot, scatterplots of effect sizes were used to evaluate if there was a univariate effect. We evaluated indicators of asymmetry within the funnel plot and observed as hypothetical studies were inputted such as symmetry is achieved.

### **Moderator Analysis**

Kruskal-Wallis H test was used for moderator analyses due to the small sample size to examine two or more groups of comparisons across groups if statistical significance was found (Dunn, 1964). That said, the Kruskal Wallis test does not assume that the data is normal within distributions, instead it assumes that the distribution within different groups are the same (McDonald et al., 2015), which is why it is particularly applicable to single-case data. Kruskal-Wallis H test was used to obtain information about the moderator analysis per study, participant, and dependent variable (e.g. communication, challenging behavior). A fixed effect model was

used due to the small sample size; using random effect model would have a substantial impact on the estimates.

### **Interrater Agreement**

Title and abstract were searched by two coders who independently reviewed each of the articles. Two graduate students were trained and discussed discrepancies on three random articles prior to independently coding for 50% of the articles to see if the articles met inclusion criteria. Retraining was provided if the percentage was lower than 80%. IRR for title and abstract stage was 83%. Full-text was searched for the articles that met inclusion criteria at the title/abstract stage.

The same graduate students were trained on coding studies prior to coding full text for inclusion/exclusion independently for 100% of all articles with 84% reliability. Data extraction was also trained until coders met 80% reliability. IRR was conducted for 20% of studies between two coders with 85% reliability agreement. IRR was calculated by dividing the total number of agreements with the sum of all agreements and disagreements then multiplying by 100 (Marley et al., 2000).

## **Results**

### **Descriptive Review**

#### ***Intervention***

Seven of the 19 studies implemented real-time feedback and nine implemented delayed feedback, and three did not report the type of feedback given. Studies included in these meta-analyses involved implementation of telepractice and many of the studies incorporated other delivery formats as well. For more information, see Appendix 2.3.



### ***Children Participants***

Only six (10%) of all participants had a diagnosis of ID and most of the participants had a diagnosis of ASD. Most of the participants were reported to use speech/verbalization as their primary mode of communication with the exception of three participants who used gesture or body language and/or low-tech aided AAC as their primary mode of communication, however about a third did not report the communication mode. The racial background of more than half of the children was not reported with the exception of 19 (31%) children. The child's primary language was not reported for most participants except for six (10%) children. For one study they did not mention specifically what language, therefore the author was not able to specify (Tsami et al., 2019). See Appendix 2.4 for more information on child demographics.

### ***Interventionists***

There were 10 researchers, 13 educators, and 39 parents or caregivers (e.g. nanny) who served as interventionists working directly with children. Of the 62 participants only 16 (26%) reported the racial background of interventionists. There were two studies (11%) that reported the primary language of two interventionists in English and Spanish (Mcduffie, 2016; Tsami, 2019). 43 of 61 (70%) participants reported education level. 29 (67%) participants were reported as graduated from college. See Appendix 2.5 for more information about interventionists.

### ***Coaches***

There was one (5%) study using speech language pathologists (SLPs), 13 (68%) studies who used researchers (e.g., first author, graduate assistant, grad student) and four studies (21%) that did not specify who was the coach. The racial background of most coaches was not mentioned, but there were six studies (32%) that reported the coaches as Hispanic, White, or Asian. Only one (5%) study reported the primary language of coaches which were Greek (Tsami,

2019). Only two studies (11%) mentioned the fluency for coaches as fluent (Neely, 2020; Guðmundsdóttir, 2017). Unfortunately, although those two studies mentioned the languages spoken by the coach, they failed to mention which was their primary language, therefore, we noted as not reported. See Appendix 2.6 for more information about coaches.

### **Overall Results for Communication Skills**

Of the 19 studies there were 17 studies that measured communication outcomes were used to calculate the analysis on communication with a total of 75 AB phase contrasts across 55 children as young as two and not older than 13. See Appendix 2.6 for a summary of each study's descriptive information.

#### ***Omnibus Effect Sizes***

A total of 75 AB contrasts were analyzed with 55 children with ASD and ID from single case research design studies from communication outcomes. The overall effect size for interventions using telepractice indicated moderate effects ( $Tau-U=0.69$ ) on communication outcomes for children with ASD and ID across feedback delivery methods, years of training for interventionists, age of children, and dosage of intervention.

#### ***Moderators***

**Child Age.** To investigate child age on the effect of communication interventions for children with ASD and ID there were a total of 23 effect sizes for 54 children. The effect size was moderate ( $Tau-U= 0.64$ ) for both less than four years old and over four years old ( $Tau-U=0.55$ ). The Kruskal Wallis was conducted to show differences between conditions. This test showed no statistically significant results between ages for children with ASD and ID for communication outcomes  $\chi^2 (2) = 0.18, p= 0.66$ .

#### ***Intervention Dosage***

Dosage of interventions on the effect of communication interventions for children with ASD and ID were 20 effect sizes for 55 children. The effect size for dosage was moderate for both less than 60 minutes and (Tau- $U$ = 0.57; 0.71) for more than 60 minutes. The Kruskal-Wallis was conducted to show differences between doses of 60 minute. There were no statistically significant differences related to dosage for children with ASD and ID for communication outcomes  $\chi^2(2) = 0.05$ ,  $p = 0.82$ .

### ***Years of Experience of Interventionists***

Regarding years of experience as an interventionist, there were 13 effect sizes for 35 children with ASD and ID for communication outcomes. The effect sizes for years of experience were moderate and small (Tau- $U$ = 0.60; 0.45) for both less than 6 years and over. The Kruskal-Wallis was also conducted to show differences between years of experience for the interventionist. There were no statistically significant results related to amount of experience of interventionists in working with caregivers for communication outcomes  $\chi^2(2) = 0.02$ ,  $p = 0.89$ .

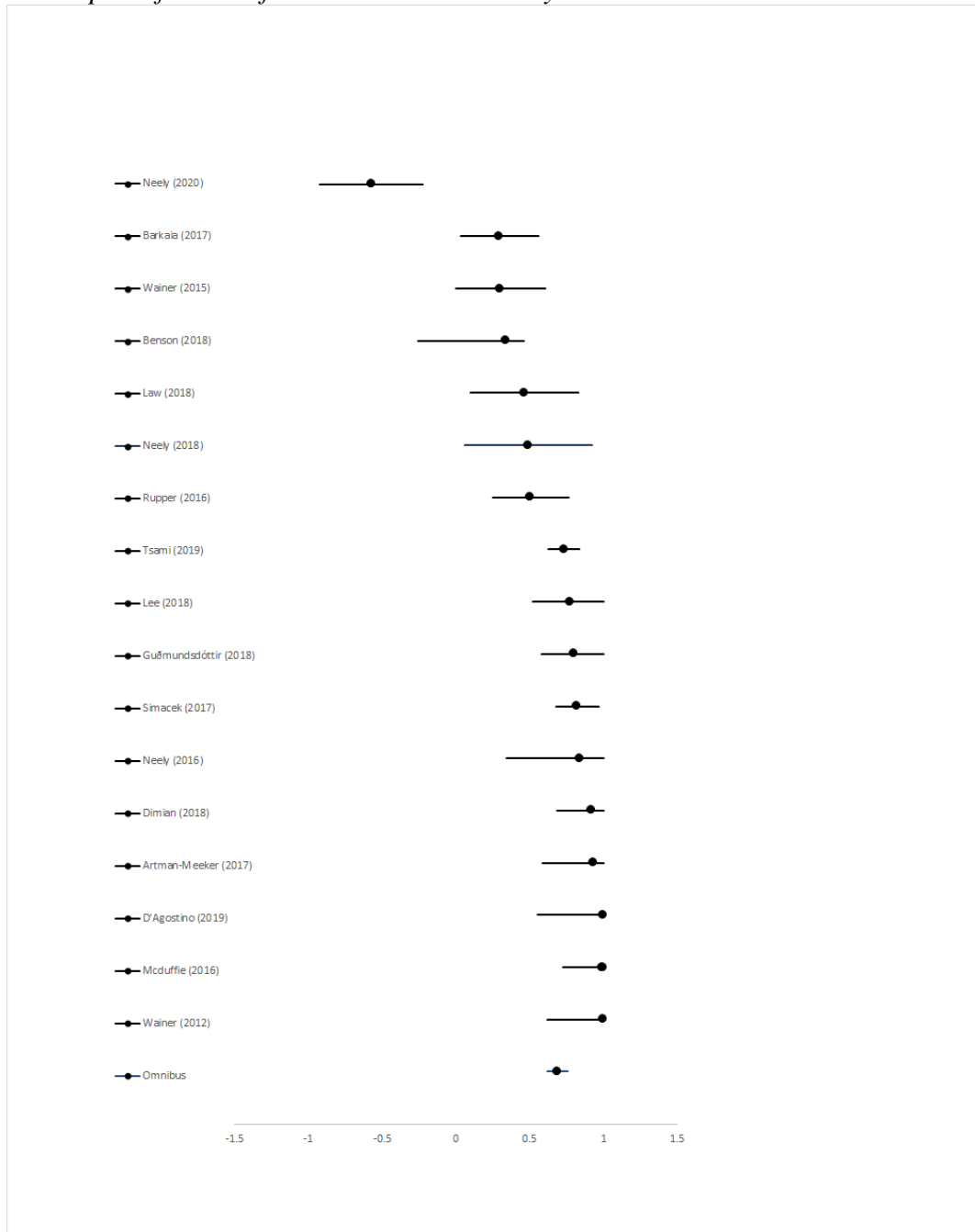
### ***Feedback***

The effect of the type of feedback (i.e. delayed vs real time) was also evaluated with 53 children with ASD and ID for communication outcomes. The effect sizes for feedback were moderate (Tau- $U$ =0.56) for both delayed and for real-time (Tau- $U$ = 0.75). The Kruskal-Wallis was conducted and did not show any statistically significant results across feedback type for children communication outcomes  $\chi^2(2) = 0.34$ ,  $p = 0.56$ . See table 2.5 for more information on effect sizes and communication outcomes.

**Table 2.5***Tau-U effect sizes and Kruskal-Wallis Test for Moderators in the Communication Analysis*

Moderator	Sub-Groups	Number of Studies	AB Phase Contrasts (Dyads/Triads)	Number of Participants	Tau-U	Status	Kruskal-Wallis
Age	Less than 4 years old	13	42	30	0.64	Moderate	$\chi^2 (2) = 0.18, p=0.66$
	More than 4 years old	10	32	24	0.55	Moderate	
Dosage	Less than 60 minutes	9	41	23	0.57	Moderate	$\chi^2 (2) = 0.05, p=0.82$
	More than 60 minutes	11	36	32	0.71	Moderate	
Years	Less than 6 years	6	17	21	0.60	Moderate	$\chi^2 (2) = 0.02, p=0.89$
	More than 6 years	7	25	14	0.45	Small	
Feedback	Delayed	9	29	25	0.56	Moderate	$\chi^2 (2) = 0.34, p=0.56$
	Real-Time	7	44	28	0.75	Moderate	

**Figure 2.2**  
*Forest plot of studies for communication analysis*



## **Overall Results for Challenging Behavior**

Nine of the 19 total studies to calculate challenging behavior with 48 AB contrasts with 34 children between ages two to 13 years old. See Table 2.7 for a summary of each study's descriptive information.

### **Omnibus Effect Sizes**

The overall effect size for interventions using telepractice had a small sized effect (Tau- $U = -0.56$ ) on challenging behavior for children with ASD and ID.

### **Moderators**

#### ***Child Age***

Child age on the effect of challenging behavior for children with ASD and ID had a total of 12 effect sizes for 34 children. The effect sizes for age were small (Tau- $U = -0.54$ ;  $-0.51$ ) for both less than four years old and over. The Kruskal-Wallis showed no statistically significant results across ages between children with ASD and ID in different age groups for communication outcomes  $\chi^2(2) = 0.02$ ,  $p = 0.87$ .

#### ***Intervention Dosage***

The dosage of interventions on the effect of challenging behavior for children with ASD and ID were 13 effect sizes for 34 children. The effect sizes for dosage were moderate (Tau- $U = -0.70$ ) and small (Tau- $U = -0.54$ ) for more than 60 minutes. The Kruskal-Wallis was conducted with no statistically significant results across dosage between children with ASD and ID for challenging outcomes  $\chi^2(2) = 0.02$ ,  $p = 0.88$ . There is not enough evidence to reject the null and conclude that there are no differences in dosage between conditions.

#### ***Years of Experience as an Interventionist***

For years of experience for interventionists, there were seven effect sizes for 24 children with ASD and ID for challenging behavior. The effect sizes were small (Tau-U= -0.62;-0.58) for both less than six years and over. There were only two effect sizes with more than seven years of experience training families of children with ASD and ID. After conducting the Kruskal-Wallis the test showed there were no statistically significant results across years of training for interventionists working with families for challenging behavior  $\chi^2 (2) = 0.15, p = 0.69$ .

### ***Feedback***

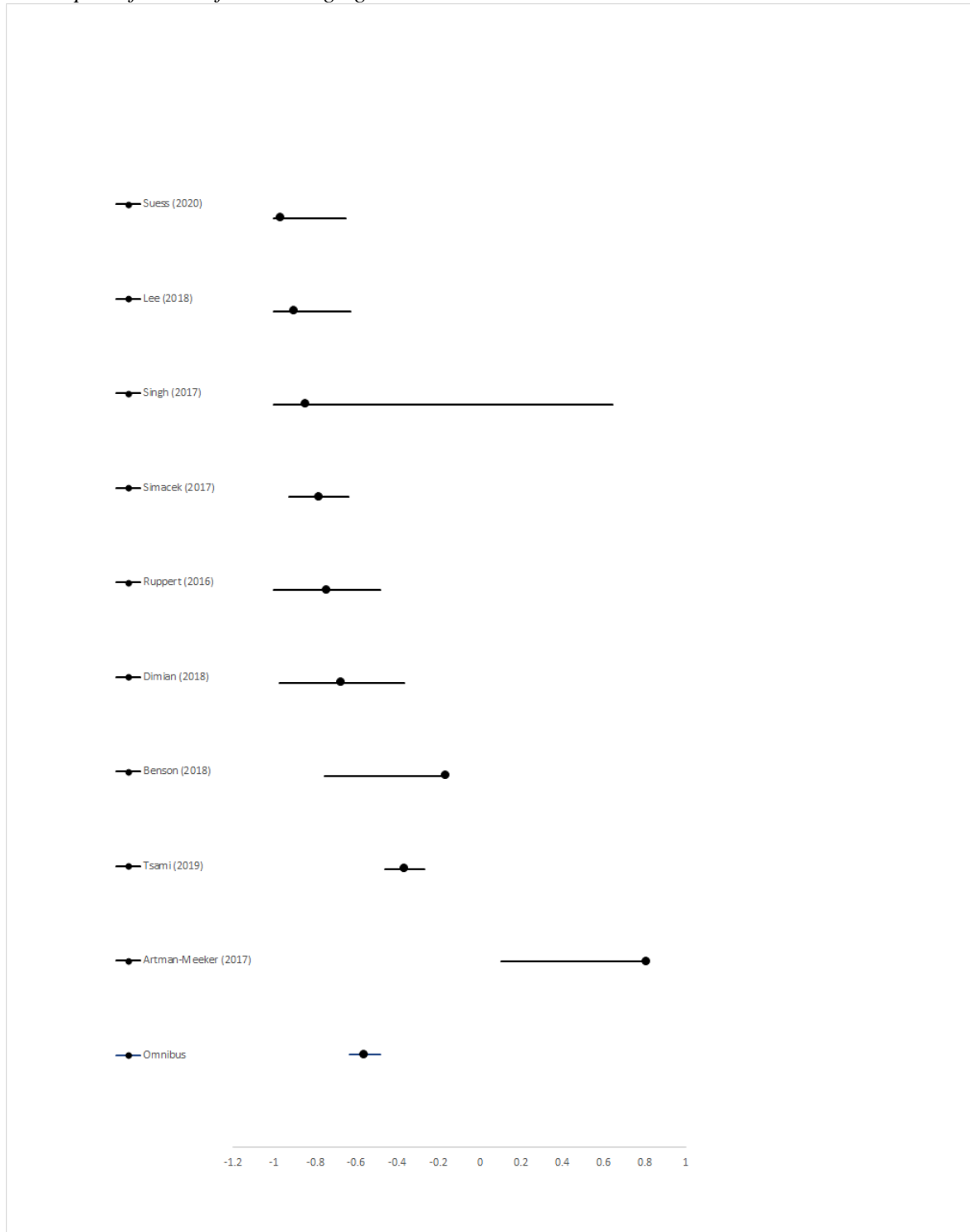
The effect of the type of feedback on challenging behavior was evaluated with 25 children with ASD and ID for challenging behavior outcomes. The effect size was moderate (Tau-U= -0.78) for delayed feedback and small (Tau-U=-0.36) for real-time. The Kruskal-Wallis test was conducted to evaluate differences in conditions and it did not show any statistical significance across feedback conditions for children challenging behavior outcomes  $\chi^2 (2) = 0.02, p=0.88$ . See table 2.4 for more information on effect sizes for challenging behavior outcomes.

**Table 2.6***Tau-U effect sizes and Kruskal-Wallis Test for Moderators in the Challenging Behavior Analysis*

Moderator Sub-Groups	Number of Studies	AB Phase Contrasts	Number of Participants (Dyads/Triads)	Tau-U	Status	Kruskal-Wallis
Age						$\chi^2 (2) = 0.02, p=0.87$
Less than 4 years old	6	23	15	0.54	Small	
More than 4 years old	6	25	19	-0.51	Small	
Dosage						$\chi^2 (2) = 0.02, p=0.88$
Less than 60 minutes	5	30	22	-0.70	Moderate	
More than 60 minutes	8	18	12	-0.54	Small	
Years						$\chi^2 (2) = 0.02, p=0.89$
Less than 6 years	5	14	12	-0.62	Small	
More than 6 years	2	15	12	-0.58	Small	
Feedback						$\chi^2 (2) = 0.34, p=0.56$
Delayed	2	4	4	-0.78	Moderate	
Real-Time	4	30	21	-0.36	Small	



**Figure 2.3**  
*Forest plot of studies for challenging behavior*

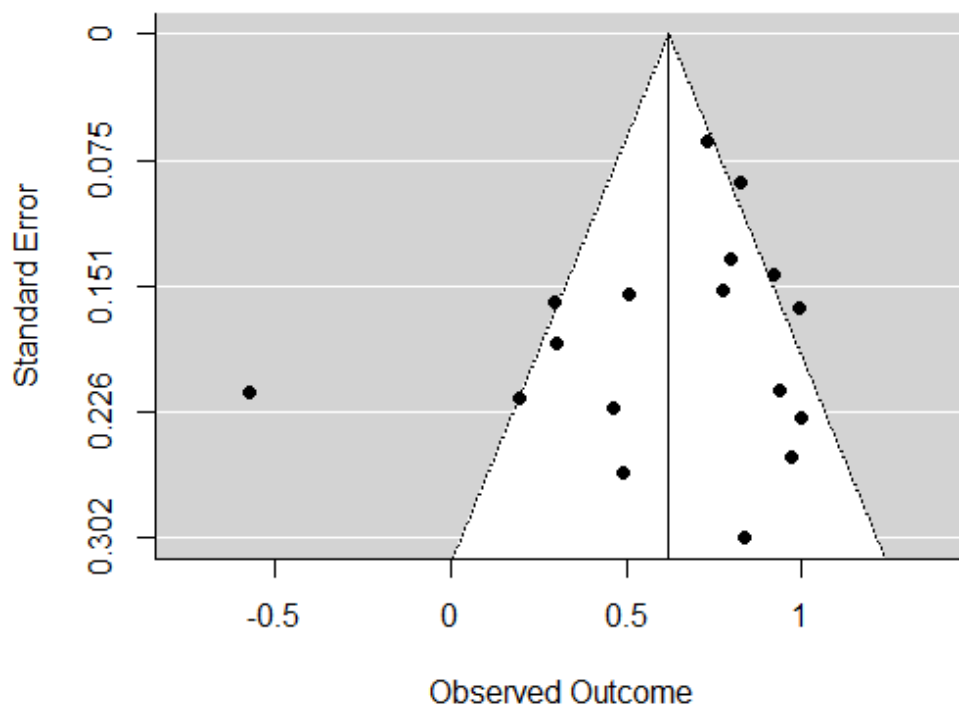


## Publication Bias

Publication bias was conducted by using funnel plot to show asymmetry demonstrating outcome-reporting bias. See Figure 2.2 and 2.3 for a visual representation of the publication bias for the independent analyses on challenging behavior and communication. Data points fell outside of the funnel, which indicates some publication bias.

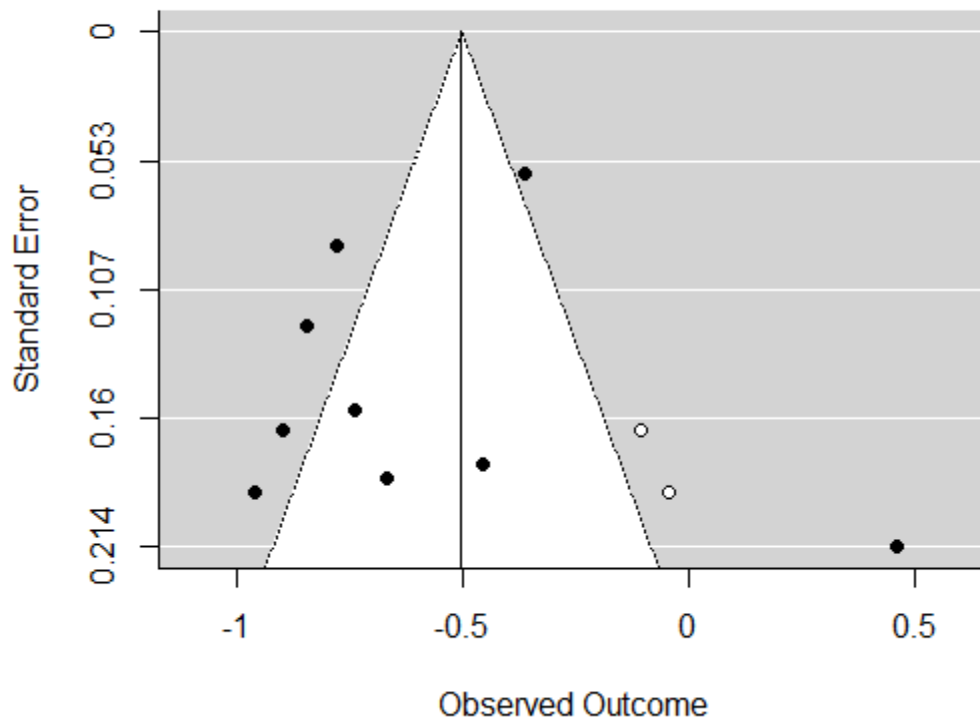
### Figure 2.4

*Funnel Plot of Communication Analysis*



**Figure 2.5**

*Funnel plot of challenging behavior*



### **Discussion**

These two independent meta-analyses investigated research published in English and Spanish for communication and challenging behaviors for individuals with ASD and ID, although no articles in Spanish were found. That said the magnitude for challenging behavior and communication is moderate for coaching. Meaning, the coaching intervention had a moderate effect on communication and a small effect on challenging behavior. No statistically significant results were found among the four moderators, possibly given the small sample size of the studies.

Participant age was a moderator of interest to indicate what interventions work best for different age groups. There was no statistically significant difference in effect size between children younger than 4 years old and older grade school children. The magnitude of age varied from moderate to small in its effect on both communication and challenging behavior. It was observed that all studies included children younger than 13 years old. This brings attention to the need for more studies with individuals who are adolescents or adults with disabilities.

Dosage of interventions was investigated to identify and implement a dosage that is effective for this population. There were no statistically significant findings between dosage and communication or challenging behavior outcomes. This finding indicates that neither longer or shorter sessions make a difference on child outcomes. The magnitude of effects from dosage on communication or challenging behavior outcomes varied from moderate to small.

Years of working with individuals with ASD or ID were coded to evaluate whether an increase of training for interventionists would indicate improvement in child outcomes. There were also no statistically significant differences between years of training for interventionists; which means that whether an interventionist had a year of training or more would not make an impact on child outcomes. It could be that with the inclusion of more studies in the analysis, researchers may see a difference in outcomes with varying years of training for coaches. All of the magnitude for years of experience had a small effect on communication and challenging behavior outcomes. The type of feedback for the different analyses presented was crucial and seen as proven training techniques in previous reviews (Ferguson et al., 2019). There were no statistically significant results for the type of feedback provided with children. That said real-time feedback might have similar outcomes as delayed feedback. This finding may indicate that interventionists can be more flexible with the immediacy of feedback to wait until the coach is

finished performing the intervention. The magnitude of effect from feedback on interventions had either a moderate or a small effect on communication or challenging behavior outcomes.

Consistent with previous literature, the age for children participants ranged from 2-13 years old with most participants (n=35) being under six years old (Ferguson et al., 2019). The reason for a focus on younger children instead of older individuals might be attributed to increased efforts toward early intervention for better outcomes (Ferguson et al., 2019). No previous reviews have looked at in detail the years of training for the coaches delivering the intervention to interventionists (Neely et al., 2017; Tomlinson et al., 2018). This area requires more investigation as the years of training may influence communication or challenging behavior outcomes. We hypothesized that the number of years of training would be related to an increase in fidelity of procedures and increased knowledge of the intervention. With an increase in fidelity of procedures and confidence in coaching, researchers can hypothesize an increase in outcomes for participants. Although we did not find any significant results for dosage, previous reviews. However, those studies evaluated mostly the fidelity outcomes of coaches and not sufficient evidence of the outcomes of individuals with ASD.

### **Limitations**

The literature is only based on single case research. However, there was group design research that was found and could be used in the future, but due to the small sample; it could not be added to this analysis. The AB contrasts or amount of data available for delayed versus real-time was vastly different, which warrants further examination with a similar sample size for more accurate results. Using publication bias for single case data is prevalent due to the high likelihood of acceptance rates among journals to include studies with significant results. This is a limitation because researchers are not getting a full picture of all studies available and end up

including only those that are accepted for publication. The validity of publication bias was not examined in this meta-analysis because it is based on large sample meta-analysis. The Kruskal-Wallis test for the moderators presents a limitation because it does not account for the issue that some of the effect sizes come from the same study, and are thus dependent, rather, Kruskal-Wallis assumes that each effect size is from an independent study, which is an incorrect assumption for any meta-analysis. The measurement observations are converted to ranks in the overall set. When values are substituted for ranks, they lose information from the original values, which can make it a less powerful test (McDonald et al, 2015). Lastly, type 1 error inflation is a limitation for this study given multiple analyses. As the number of analyses increases so does the error rate for the type 1 error because the original rate is no longer represented but rather the combined rate of error from all analyses (Higdon et al., 2013).

### **Implications for Research**

This meta-analysis has demonstrated areas of further improvement on research with telepractice for individuals with ASD and ID. More information should also be mentioned about participants in general, as some recent studies will omit important demographic basic information such as age or communication modes of child participants (Ferguson et al., 2019). This is crucial to ensure we can apply this information with diverse groups to have an actual representation of individuals from the U.S. Collecting and reporting demographic information of all participants, interventionists, and coaches could help better serve individuals with ASD and ID in the future. Researchers should also aim to include high standards within their studies to offer certainty of evidence in the use of telepractice and the intervention.

### **Implications for Practice**

For practitioners working with individuals from diverse backgrounds who have ASD or ID, including culturally responsive strategies within their teaching can help improve student outcomes (Krasnoff et al., 2016). If practitioners are working with culturally and linguistically diverse populations or dual language learners (DLL), appropriate measures should be taken to ensure their native language is taken into consideration when writing the treatment plan. Measures that focus on communication interventions or decreasing challenging behavior should take into account stakeholders that are more natural, different settings, and materials that will reflect the participant's day-to-day to have a greater impact on the quality of life.

### **Future Recommendations**

Future research should include more work in the use of telepractice to have more information about who and where these services are successful. Research should also focus on including rigorous standards to ensure the intervention is considering important aspects that will give confidence this intervention is effective. Lastly, there should be a wide range of diverse populations included in research as it can have an impact on the generalization of intervention outcomes.

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## CHAPTER III

### A SYSTEMATIC QUALITY REVIEW OF TELEPRACTICE FOR INDIVIDUALS WITH ASD AND ID

Some individuals with autism spectrum disorder (ASD) and intellectual disabilities (ID) have challenges communicating with others (American Psychiatric Association, 2013). About 40% of individuals with ASD and ID are non-verbal or lack functional communication (Centers for Disease Control and Prevention, 2019). In addition, children from minority populations have difficulties with communication and language achievement than their white English-speaking peers (Tek et al., 2012). This may be due to environmental factors such as socioeconomic status (SES), language barriers, and later diagnosis and treatment of ASD (Tek et al., 2012).

There are two main ways that lack of functional communication can affect families of individuals with ASD and ID. The first is parental stress and the second is isolation from the community. Parental stress is common for families who have a child with ASD (Hayes et al., 2013). They also experience further isolation to avoid social stigma (Picardi et al., 2018). These families are also faced with further consequences from lack of functional communication such as behavioral issues experienced by the child. Behaviors have different topographies; some of them can be severe while others can be mild. Without early intervention, behavioral issues may worsen; which is why early intervention is important (Simacek et al., 2017). However, most families lack services leading to low quality of life. Due to services being costly or far away, there is a huge need for interventions that are more attainable (Simacek et al., 2017). This is also true for educators who want to receive training on how to work with this population. Many educators are not well equipped to handle challenging behaviors in the classroom and must rely on external personnel to travel and help (Rule et al., 2006). Barriers related to consultant distance

include lack of frequency and immediate help, which can be essential and increased costs for families (Barretto et al., 2006). Coaching via telepractice can be an alternative for parents and educators of children with ASD.

Telepractice is the use of telecommunications or technology to provide consultation, services, education, and treatment via distance (Tomlison et al., 2018). Telepractice can help solve some of the issues mentioned previously by helping reach rural communities at low cost for families with children with ASD or ID. Technology can now be accessed via smartphone, tablet, laptop, or computer and can include phone calls, email, and videoconferencing. There are several ways for the use of telepractice, which include web-based conference platforms. The advantages of using telepractice is to reduce costs for families, reduce travel time, and reach more families and reach more families than traditional in-person appointments (Fitton et al., 2017). Other advantages of using telepractice is that interventions can be used at a time that is convenient for the families. Families can also access coaching at a place that is most convenient for them such as at home, at work, or at a public place. Coaching can also be conducted to more than one person at a time. This also saves time for coaches instead of having to meet one on one. Using telepractice, families can access evidence-based practices that would higher the quality of life for the children involved.

Parents and people working with individuals with ASD and ID may be more confident using this service delivery method using evidence-based interventions, especially if the body of literature has met rigorous design and methodological quality standards (Morin et al., 2018). Without a review of quality standards, researchers do not know with certainty if the studies cited in support of an intervention or practice were implemented with fidelity (Swanson et al., 2013). Evaluating the quality of research is crucial because it helps guide future research on standards



and to stress the gaps including the need for high quality research (Camargo et al., 2014; Jitendra et al., 2011). Few of the prior reviews that investigated telepractice reviewed the quality of methodology for factors relating to fidelity of parent or teacher implementation (Neely et al., 2017; Tomlinson et al., 2019), focused on specific interventions, or only included on individuals with ASD. To our knowledge, there are no quality reviews on telepractice that include both individuals with ASD and ID focusing on interventions beside applied behavior analysis; thus, a broader review is needed.

Social validity standards allow researchers to know the social significance of the intervention for stakeholders (Wolery et al., 2018). It is of particular interest for researchers to know more about social validity to make note of components that were useful, feasible, and acceptable to stakeholders. Knowing what specific components such as culturally responsive strategies, generalizability, cost effectiveness can help researchers modify their interventions to fit the needs of the families they serve. Several reviews evaluate the use of social validity for interventions using telepractice for individuals with ASD or ID (Ferguson et al., 2019; Neely et al., 2017; Tomlinson et al., 2018). They reported positive results with high acceptability for interventionists. However, these reviews include a narrow focus on social validity as measured by participants and related to intervention components or selected goals; therefore, a review encompassing additional social validity components is needed.

Participant's demographic characteristics include a wide range of information, which informs the reader about the individuals who were involved in the study (Wolery et al., 2018). This information should include a thorough description of the individuals in the study and measures or tests that were performed with the intention of providing researchers an overall look at with whom these interventions were effective (Wolery et al., 2018). It is crucial to include this

information to know what these interventions best serve. Research on these populations must also report participant characteristics including culture, ethnicity, and language, and whether measures were taken to accommodate individuals whose home language is different from the dominant language in their communities or if they may have cultural norms different from the dominant culture (Tomlinson et al., 2018). Few prior reviews evaluating the effectiveness of telepractice for individuals with ASD and ID describe participant demographics of the studies in their samples (Boisvert et al., 2010; Ferguson et al., 2019; Neely et al. 2017; Tomlison et al., 2018). Unfortunately, only one study included participants with a diagnosis other than ASD (Tomlison et al., 2018) and no previous reviews reported culture, language, or ethnicity. More support is needed in this area for the purposes of clinical implications related to individual characteristics for people with ID.

Although telepractice can be accessed online, it is vital to report the setting that the intervention took place and the materials used to understand which individuals may potentially be excluded based on equipment used or location of services offered. Setting and materials can inform practitioners and researchers about feasibility and generalization of services (Boisvert et al., 2010). None of the reviews on telepractice has reported information on implementation settings in detail using methodological standards. Materials were described if the authors involved the use of technology in their research question (Boisvert et al., 2010; Ferguson et al., 2019). These reviews focused on individuals with ASD and are lacking information on individuals with ID. Therefore, it would be useful for practitioners to have information regarding setting and materials for a broader population.

There will likely be differential effects of coaching outcomes using telepractice based on the racial, cultural, and linguistic characteristics of the interventionist coaching coaches on how

to work with individuals with ASD or ID (Neely et al. 2017). The disparity of ethnicity and race between educators and their students has a significant impact on student achievement (Orosco et al., 2010; Skiba et al., 2011). Thus, evaluating interventionists can affect the success of the intervention and is crucial to describe thoroughly to observe for which effects may generalize (Neely et al., 2017). Reviews include information about interventionists, but much of the description was limited for interventionists working with individuals with ASD. More information is needed for interventionists working with broader populations and different ages.

Beyond initial mastery and learning of new skills, demonstration that generalization of behavior occurs in several settings, with different people or materials is critical in demonstrating real world impact on participant's lives. Two reviews reported information about generalization (Ferguson et al., 2019; Tomlinson et al., 2018). More research on generalization within natural settings and interventions for individuals with ASD and ID is needed to understand if these interventions are also sustainable (Ferguson et al., 2019; Tomlinson et al., 2018). Further, it is critical to know if newly learned behaviors persisted throughout the study and are maintained after the intervention is faded. Given the recent emergency use of telepractice, particularly as students across the U.S. have been served remotely, more research should investigate maintenance and generalization of skills taught via telepractice to practitioners, family members, and individuals with disabilities (Neely et al., 2017).

The purpose of this paper is to evaluate the quality of studies and feasibility of telepractice-based interventions for stakeholders working with individuals with ASD and ID. The research question asks does the literature meet methodological standards (e.g. procedural fidelity, social validity, participant demographics, setting and material description, interventionist

description, maintenance, and generalization)? The gaps in the literature and future recommendations are also described thoroughly in the paper.

## **Method**

### **Literature Search Procedures**

A systematic search was conducted on the following five databases: ERIC (EBSCO), Medline Complete Ebsco, Academic Search Ultimate, CINAHL EBSCO, and PsycINFO. There were no year restrictions, yet results were limited to peer-reviewed studies only. The search terms used can be found in OakTrust (Yllades, 2021). This initial search was conducted in December 2019 and re-run in September 2020, which resulted in 521 studies after duplicates were resolved. An ancestral search was conducted following the database search. See Figure 3.1 for more details on the review process.

### **Title and Abstract Inclusion/Exclusion Criteria**

To be included in the review the following criteria had to be met: a) at least one participant with autism spectrum disorder, Asperger, pervasive development disorder, or intellectual disability; b) one dependent variable on social communication or behavior outcomes; c) single case experiments or between groups design; d) in English or Spanish; e) include telepractice. There were 382 articles reviewed by the first author to determine if they met inclusion criteria using a “yes” “no” option. Discrepancies between coders were resolved through discussion and overall agreement to include the study for the next stage or not. There were 120 articles that met the inclusion criteria and progressed to the full-text stage.

### **Full Text Inclusion/Exclusion Criteria for Single Case Studies**

Studies that were included following the title/abstract review stage underwent further evaluation into a) single case studies, with basic design standards b) at least one participant with

ASD or ID; c) include a social communication outcome (i.e. initiations, requesting, imitation, responding, commenting) or challenging behavior (i.e. hitting, kicking, biting, property destruction); d) English or Spanish; e) telepractice (i.e. phone calls, emails, webinar with feedback provided). There were 17 studies that remained following full-text inclusion criteria.

### **Basic Design Standards for Single Case Studies**

Basic design standards were based on What Works Clearinghouse (WWC) standards for 17 single case studies (WWC, 2017). All single case studies were evaluated using the adapted WWC (Kratochwill et al., 2010, 2014, 2018). The following standards were applied at the full-text stage: (a) the study measured interobserver agreement (IOA); (b) IOA was collected for 20% of the data points across the baseline and intervention phases; (c) IOA was at least 80% or .60% kappa; (d) there were at least 3 attempts of tiers or participants; (e) there were at least 3 data points per phase. After applying the basic standards, there were two studies that did not meet basic quality standards and 15 studies which met basic criteria.

### **First author, ancestral, and forward searches**

After 15 studies met inclusion criteria and basic quality standards were met, those studies were evaluated for first author, ancestral, and forward searches. The authors used Scopus to search for other studies that the first author contributed to, studies in the reference list, and articles that cited a specific study. Upon conducting the search and undergoing all the inclusion criteria standards, four more studies were included with a total of 19 studies.

### **Extended Methodological Standards for Single Case Studies**

All 19 single case studies that made it past the full-text stage and were included after reviewing basic standards were then evaluated for extended methodological standards. The extended methodological standards were proposed by several experts (Council for Exceptional

Children [CEC], 2014; Horner et al., 2005; Reichow et al., 2008). The authors at this stage also coded for dependent variable, procedural integrity (e.g., percentage and reporting), materials, baseline and intervention (e.g., session length, procedures allow for replicability), participant description (e.g., assessment data, age, primary diagnosis, educational services, familiarity with interventionist, inclusion/exclusion criteria, informed consent), social validity (e.g., reporting of the significance of the dependent variables), change in behavior, natural components, satisfaction of outcomes from stakeholders, the intervention was efficient and cost effective), setting (e.g., presence of individuals, dimensions of space, arrangement of furniture), interventionist description (e.g., occupation, familiarity with participants, education level, training), maintenance, and generalization (e.g., at least 4 weeks following the intervention, at least 3 data points) based on the adapted version of the WWC standards (WWC, 2017).

### **First author, ancestral, and forward searches for Group Design Studies**

After eight studies met inclusion criteria and basic quality standards were met, those studies were evaluated for first author, ancestral, and forward searches. The authors used Scopus to search for other studies that the first author contributed to, studies in the reference list, and articles that cited a specific study. Upon conducting the search and undergoing all the inclusion criteria standards, three more studies were included.

### **Full Text Inclusion/Exclusion Criteria for Group Design Studies**

Studies that were included following the title/abstract review stage underwent further evaluation into a) group design studies b) at least one participant with ASD or ID; c) include a social communication outcome (i.e. initiations, requesting, imitation, responding, commenting) or challenging behavior; d) English or Spanish; e) telepractice. There were eight studies that remained following full-text inclusion criteria.

### **Screening for Group Design Studies**

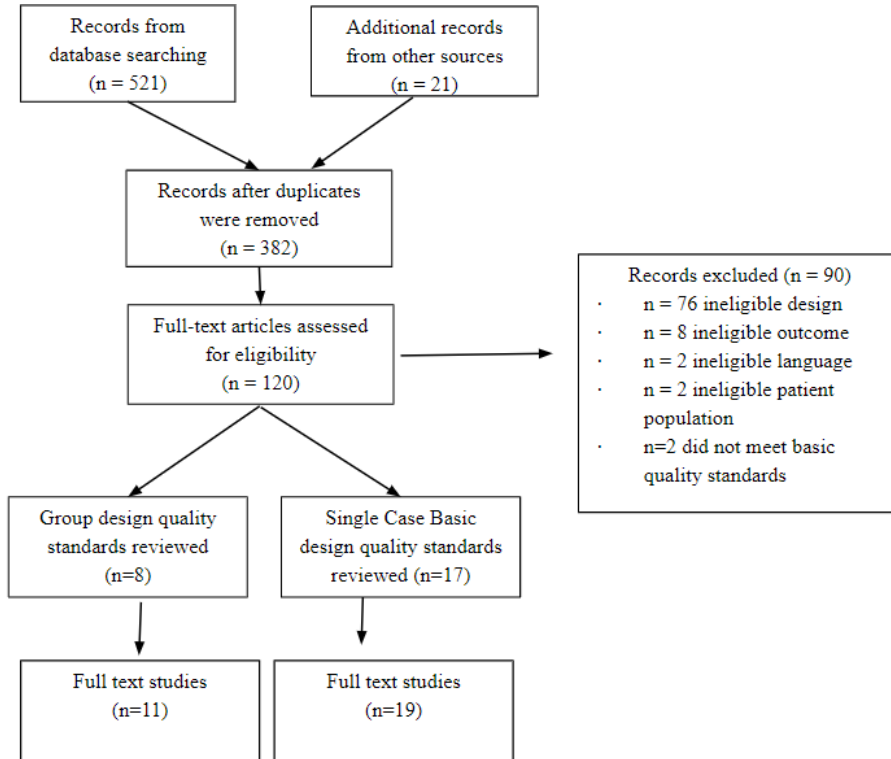
The 11 group design studies were initially screened before moving to the adaptation of the SEER standards (Institute of Science, 2020). This screening is provided by the Institute of Science and includes 10 yes or no questions to see if they meet eligibility criteria. For more information on the questions that were on the screening, refer to the *WWC Study Review Guide* (Institute of Education Sciences, 2018).

### **Standards for Excellence in Education Research (SEER) Standards**

All 30 studies were evaluated for an adaptation of the SEER standards (Institute of Science, 2020). Quality indicators for the Institute of Education Sciences have eight principles they base their research standards on. See their website for more information on the SEER methodological standards (Institute of Education Sciences, 2020).

**Figure 3.1**

*Flow Diagram of Search and Review Procedures*



### **Interrater Reliability**

Raters were graduate students who had experience coding methodological standards for systematic reviews and single case studies. Graduate students were trained to code during the title and abstract stage prior to assigning studies independently. Upon training, discussion, and achieving at least 80% reliability with the first author, coders could move to coding articles independently for title and abstract. The author and coders met to discuss disagreements on inclusion for the studies before proceeding to full-text.



Full-text was conducted for articles that met the inclusion criteria at the title and abstract stage. SEER quality standards were also coded for single case studies and obtained 94%. Extended methodological standards for single case studies was 86%. IRR for 100% of all group design studies. IRR for group design studies were 88% for 20% of studies. IRR was calculated by dividing the total number of agreements with the sum of all agreements and disagreements then multiplying by 100 (Marley, & Miriam, 2000). See Table 3.1 for more details on the inter-rater agreement.

**Table 3.1**

*Inter-Rater Agreement for Articles Coded*

	Percentage of Articles Coded	Percentage of Agreement
Title and Abstract Review	50%	84%
Full-Text Review	100%	84%
Basic Methodological Quality Review for Single Case Studies	100%	84%
Basic SEER Group Design Standards	100%	94%
Extended Methodological Standards (WWC & SEER) for Single Case Studies	74%	92%
Extended Methodological Standards (SEER) for Group Design Studies	20%	88%

## Results

This quality review aims to review and summarize studies for social communication and challenging behavior for individuals with ASD and ID. The literature, which met inclusion

criteria for full text, was evaluated for extended methodological standards using several resources. A total of 19 single case studies, which included two reversal or withdrawal research designs, five multiple probe design studies, 12 multiple baseline research designs, and 11 group design studies were reviewed, which included eight randomized controlled trials and three quasi experimental designs.

## **Extended Methodological Standards for Single Case Standards**

### ***Adaptation of What Works Clearinghouse Standards***

There were 19 single case research studies reviewed for methodological standard criteria related to descriptions of dependent variables, procedural integrity, materials, baseline and intervention, participants, social validity, setting, interventionist, maintenance, and generalization. Most studies met standards for dependent variables and procedural integrity with the exception of three studies that did not meet standards (Barkaia et al., 2017; Guðmundsdóttir et al., 2017; Suess et al., 2020) while all studies met standards with or without reservations for independent variable, inter-observer agreement, materials, baseline, and intervention description. However, there were mixed results for information on the social validity, setting, interventionist description, maintenance data, and generalization with participant information either meeting standards with reservations or not meeting standards at all. Thus, results related to these specific standards are expanded on in the following sections due to the wide range of standards to discuss further in depth. This information can also be reviewed in Table 3.3.

### ***Mixed Quality Standard Results***

Regarding social validity, only one (5%) study met standards for social validity (Tsami et al., 2019) and six (32%) studies met standards with reservations (Artman-Meeker et al., 2017;

Barkaia et al., 2017; D'Agostino et al., 2019; Neely et al., 2016, 2019; Ruppert et al., 2016). 12 (63%) studies did not meet standards with or without reservations.

Referencing the setting where interventions took place, only three (16%) studies met standards with reservations (Neely et al., 2019, 2020; Ruppert et al., 2016) and one (5%) met standards (Neely et al., 2016). A total of 15 (79%) studies did not meet criteria for setting. Regarding descriptions of the interventionist, 15 (79%) studies met standards with reservations and none of the total number of studies met all standards. There were four (21%) studies that did not meet standards for interventionist description (Suess et al., 2020; Wainer et al., 2012; Wainer et al., 2015; Law et al., 2018).

Regarding maintenance data, only two (11%) studies met standards for the maintenance data (D'Agostino et al., 2019; Guðmundsdóttir et al., 2017) and four (21%) studies of the 19 met standards with reservations (Artman-Meeker et al., 2017; Law et al., 2018; Neely et al., 2016; Wainer et al., 2012). 13 (68%) studies did not include enough data on maintenance to meet with or without reservations.

Lastly, for generalization data only one (5%) study met standards (Dimian et al., 2018) and five (26%) studies met standards with reservations (D'Agostino et al., 2019; Law et al., 2018; Lee et al., 2018; Mcduffie et al., 2016; Suess et al., 2020). 13 (68%) studies did not include information about generalization data. For more information on how dependent variables, participant characteristics, materials, and additional coding was performed see Ganz et al., (2020).

**Table 3.3***Results from an Adaptation of What Works Clearinghouse Standards*

	DV	Procedural Integrity	Social Validity	Participant	Setting	Materials	IM	Baseline	IV	Main	Gen	IOA
Meet standard	16 (84%)	16 (84%)	0 (0%)	18 (94%)	1 (5%)	12 (63%)	0 (0%)	17 (89%)	19 (100%)	2 (11%)	1 (5%)	9 (47%)
Meet standard with reservation	0 (0%)	0 (0%)	8 (42%)	1 (5%)	3 (16%)	7 (37%)	15 (79%)	2 (11%)	0 (0%)	4 (21%)	5 (26%)	10 (53%)
Does not meet standard	3 (16%)	3 (16%)	11 (58%)	0 (0%)	15 (79%)	0 (0%)	4 (21%)	0 (0%)	0 (0%)	13 (68%)	13 (68%)	0 (0%)

*Notes: 2 = met standard; 1 = met standard with reservations; 0 = did not meet standard*

IM = Interventionist, DV = Dependent Variable, IV = Independent Variable, Main = Maintenance, Gen = Generalization

## **Standards for Excellence in Education Research**

There were 19 studies of social communication and challenging behaviors coded for some of the standards per category within the SEER standards for Institute of Science (IES). There were eight questions selected for this review based on the different components of the standards (e.g. pre-registration, open data, core components, implementation, cost analysis, outcomes, generalization, and scaling). The questions were selected based on the objectivity of the questions to allow for less human error when coding. Information about the results of these questions are described more thoroughly below in the following paragraphs. An additional number of questions were evaluated for group design studies based on a screening tool from the IES website. See table 3.4 for more information.

**Table 3.4***Results from SEER Quality Standards for SCED*

	Pre- Registration	Open Data	Core Components	Implementation	Cost Analysis	Outcomes	Generalization	Scaling
Meet standard	0 (0%)	12 (63%)	19 (100%)	16 (84%)	0 (0%)	19 (100%)	8 (42%)	5 (26%)
Does not meet standard	19 (100%)	7 (37%)	0 (0%)	3 (16%)	19 (100%)	0 (0%)	11 (58%)	14 (77%)

### **SEER Standards for Group Design Standards**

All but three of the group design studies met eligibility criteria based on the online screening tool. There were an initial 10 questions, which were used to evaluate standards. See Appendix 3.1 for more information regarding the questions.

None of the 11 studies pre-registered, six (55%) of the studies made the studies available on ERIC, all of the studies (100%) reported core components of the intervention, while nine (82%) of the studies reported the fidelity of the intervention. None of the studies measured the cost of the intervention with a control group, all of the studies explored outcomes that were useful to student learning, only four (36%) of the 11 studies included sampling that would generalize to other participants, and lastly only three (27%). See table 3.5 for more information on the SEER quality standards for group design studies.

**Table 3.5***Results from SEER Quality Standards for Group Design Studies*

	Pre- Registration	Open Data	Core Components	Implementation	Cost Analysis	Outcomes	Generalization	Scaling
Meet standard	0 (0%)	6 (55%)	11 (100%)	9 (82%)	0 (0%)	11 (100%)	4 (36%)	3 (27%)
Does not meet standard	11 (100%)	5 (45%)	0 (0%)	2 (18%)	11 (100%)	0 (0%)	7 (64%)	8 (73%)



## **Discussion**

This quality review collected information about 19 single case studies and 11 group design studies for a total of 30 articles. The authors used WWC and SEER standards for the full-text and extended methodological standards, which were developed from expert sources (e.g., Council for Exceptional Children [CEC], 2014; Horner et al., 2005; and Reichow et al., 2008). These results exposed issues that need to be addressed related to individuals with ASD and ID for challenging behavior and social-communication outcomes for parent coaching via telepractice. This review extended the current literature by including individuals with ASD and ID, while including interventions other than applied behavior analysis. Regarding social validity, this review included additional criteria to determine if the single case studies met standards. In regards to setting, this review was broader since it included individuals with ID and ASD. Regarding participants' demographics as well as interventionist characteristics, this review coded for more information than previous reviews (i.e. culture, ethnicity, and language). Although, none of the studies had sufficient information about participant characteristics. Regarding maintenance and generalization, more resources were included in the coding than the ones used in previous reviews (Ferguson et al., 2019). This allows researchers to get a better understanding of whether a particular study met standards based on more than one resource rather than limiting to one.

### **Extended Methodological Standards**

Outcomes are most likely to be obtained and sustained when they are relevant, cost effective, and efficient to stakeholders (Hawkins et al., 1991). More than half of the studies did

not meet standards with or without reservations for social validity. Social validity is essential for ensuring the intervention is reasonable and makes a positive and meaningful impact for stakeholders. Without this information, researchers would not have a way to measure implications of the intervention. Feedback on this information would encourage improvement in the way the study is conducted and how to best serve the families researchers work with.

Regarding the information on the setting, which was not reported in more than half of the studies, researchers need this information to make informed decisions about how to change their own environment to replicate the study. Not reporting the setting works as a disadvantage because setting plays an important role in social communication and challenging behavior outcomes. There may be additional challenges and outcomes when implementing an intervention in the natural environment as opposed to a structured setting such as a clinic or classroom. Therefore, by reporting the setting, researchers can either plan for, arrange or code the setting that will give information about where interventions are effective for individuals with ASD and ID (Boisvert et al., 2010).

Regarding interventionists' description, in conducting this review, the author was unable to gather information regarding the demographics of participants because it was largely absent from the primary study sources, which prevents understanding of whom these interventions serve. Culturally and linguistically diverse (CLD) populations often experience different socioeconomic factors that need to be taken into consideration and planning (Sullivan, 2017). Unfortunately, there is personal bias from practitioners, which influences the way interventions are conducted (Gregory et al., 2014). Therefore, it is advised for researchers to become culturally competent when working directly with families from CLD backgrounds (Carter et al., 2019). Reporting demographics from interventionists is helpful for researchers to get an actual

representation of what population this intervention is most effective with and if there were any efforts to include families from CLD backgrounds in their research for generalization purposes.

Regarding maintenance data and description, few articles met with and without reservations. The majority of studies did not include this information. The lack of this information is a disadvantage to the population it targets because researchers are not able to make long-term inferences about the intervention and outcomes (Hong et al., 2018; Miller et al., 2014). Maintenance of skills is needed to understand if participants had a significant positive effect after the intervention is implemented. It is crucial to use and include maintenance data when working with participants so researchers can know if the interventions for social communication and challenging behavior are effective over time. The use of maintenance is essential for researchers, but equally important is for stakeholders to practice with their children and continue to see progress.

Generalization data were not included in the majority of studies. This finding demonstrates a need for more information regarding the use of skills in other environments, with other people, or with additional material (Hong et al., 2019). Being able to include generalization with individuals with ASD and ID can contribute to increased learning experiences in a natural setting or stakeholders and with stimuli that is familiar to participants. Researchers should encourage the use of generalization throughout different phases of the study to ensure this goal is met early on. Meeting generalization standards early on may help avoid issues with learner use of programmed responses, which may lack the ability of utilizing skills in a different setting, material, or with a different person than in the environment in which the behavior was practiced.

Pertaining to pre-registration for the SEER standards, there were no studies that included this information. Future researchers should aim to pre-register their studies to ensure

transparency of both single case and group design studies (Gonzales & Cunningham, 2015). Regarding open data information, about half of the studies overall were available publicly for researchers to replicate studies and thereby maximize outcomes (Institute of Education Sciences, n.d). In regards to core components, all studies included information that would allow replication from researchers using similar programs or steps (Ferber et al., 2019). With implementation, most studies met this standard. We were particularly interested in fidelity of intervention because it was objective but also essential in a study. Fidelity ensures that the intervention was conducted how it was originally intended by researchers (Swanson et al., 2013). Regarding cost analysis, there were no studies that included this component. Cost analysis should be measured when possible to understand how this intervention would have better positive outcomes outside of the independent variable (Hollands et al., 2016). As for outcomes, all studies included this component and had measures that were useful for individuals. Regarding generalization, there was not much attempt to include individuals from outside of the region in which the intervention was conducted. This does not allow for generalization to additional populations that are not the normal population in the U.S (Tipton & Olsen, 2018). Lastly, for scaling, not many studies reported that they developed a manual or tools for other researchers to use. Although some studies did include guides, many times, they were not developed by the authors themselves.

### **Limitations and Future Research**

Some limitations in this review need to be addressed. The sample size for both the single case studies and group design studies are small and therefore limited. Additionally, there was not consistency in the use of standards when coding for single case studies versus group design studies. The extended methodological standards used for the single case studies focused specifically on single-subject research, which is why the same standards were not used for group

design studies. Future research should aim to focus on generalizing and teaching natural communicative partners or in natural settings with individuals with ASD and ID. Future studies should also include additional participants from CLD backgrounds, as the research is limited for this population for single case and group design studies.

### **Implications for Research**

Researchers should collect more information regarding different components of the study such as social validity, generalization data, demographic description of participants, and maintenance. The information on participant description will also inform practitioners about whom those interventions help better serve and evaluate if there were any efforts by researchers to include culturally responsive practices with families from diverse backgrounds. There is a need for more information on participant native language as this can play a role on the effectiveness of generalization at home with families and ultimately quality of life. Most studies only included participants who were proficient in English with one study requiring participants to speak English “90%” of the time at home (Ibanez et al., 2018). This requirement limits the number of participants who can acquire services with their children. Researchers should make efforts to include participants from diverse backgrounds to meet the needs of different populations than the norm.

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## CHAPTER IV

### PARENT-COACHING USING TELEPRACTICE FOR SPANISH SPEAKING CHILDREN WITH AUTISM SPECTRUM DISORDER

There is an increasing number of children with autism spectrum disorder (ASD) in the U.S. (Baio et al., 2018). About 40% of children with ASD are nonverbal and cannot use speech to communicate adequately (Centers for Disease Control and Prevention [CDC], 2015). Many individuals with ASD experience challenges communicating appropriately (American Psychiatric Association, 2013), which can lead to behavioral issues as well as poor quality of life for the families (Zionts & Zionts, 2003). Research indicates that evidence-based interventions can help with communication skills (U.S Department of Health and Human Services, 2017). However, professionals struggle with meeting increased demand of services, language barrier, cost of services, time driving to services, and the long waitlists (Vismara et. al., 2012). These issues are also true and often exacerbated for individuals from culturally and linguistically diverse families (Hambly & Fombonne, 2012). For families who speak more than one language at home, additional questions or concerns on how raise their children are often raised (Hambly & Fombonne, 2012). While children with ASD from CLD backgrounds may learn how to communicate at school in English, the language may not always be understood at home with natural caregivers. Language barriers may lead to further isolation from family members. Telepractice with a bilingual coach may be favorable service delivery method to ameliorate some issues experienced by families with children with ASD from CLD backgrounds (Fitton et al., 2017).

Parent coaching through telepractice uses technology to coach parents on strategies at a distance (Vismara et al., 2012). This contemporary method of coaching can help resolve some of

the issues experienced by parents that reduce their access to high quality services for their children. Meeting online reduces time from driving that could be spent providing services (Ingersoll et al., 2017). This online approach increases the potential for caregivers to learn these behavioral strategies at a time that is convenient, in their own homes, in a natural context, and in their preferred language (Fitton et al., 2017). Most importantly, since parents spend more time with their children than service providers, coaching parents can teach skills that produce long-term effects for this reason (Vismara et al., 2012). Additionally, coaching parents can have a positive impact on the child's quality of life as they get to gain the skills in their natural setting (Vismara et al., 2012). For this reason, the authors of this study chose to focus on parent coaching and its procedural components using telepractice. Currently, a small but growing body of research presents results of telepractice interventions for young children with ASD with practices for culturally and linguistically diverse (CLD) families (Tsami et al., 2019).

The effectiveness of using telepractice to coach parents of children with ASD has been investigated in the literature (Ingersoll et al., 2017; Vismara et al., 2012). Parents have demonstrated implementation of behavioral strategies with high fidelity, to improve social communication skills of their children (Vismara et al., 2012; Wattanawongwan et al., 2020). However, although effects have resulted in positive outcomes for children with ASD, there is little evidence regarding whether these interventions are appropriate for families of diverse cultural backgrounds. Overall, using telepractice has shown parent improvement in skills with high fidelity, reduced costs for families, accessibility and feasibility (Vismara et al., 2012). Although most studies on telepractice parent coaching have focused on teaching communication strategies to parents, no studies, to our knowledge, have incorporated strategies systematically for CLD families.

It is vital to use culturally responsive practices when working with this population to understand their beliefs about ASD and help establish goals that are pertinent to the family (Fahim & Nedwick 2014). Understanding family perspectives can influence the way families interact with practitioners either positively or negatively (Fahim & Nedwick, 2014). Via culturally responsive practices, practitioners can familiarize themselves with the family worldview and learn about the child's cultures (Fahim & Nedwick, 2014). Practitioners can increase efforts in including culturally responsive practices using a 15-item rubric for quality indicators of special education research (Bal & Trainor, 2016). For the purposes of this study, we will focus on this 15-item rubric to meet as many quality indicators, as they are appropriate for this study. Bal (2016) sets a framework for using culturally responsive strategies within research, particularly single case studies. The authors of this study used these elements in the rubric to guide our intervention using telepractice as a service delivery rather than the traditional in person format.

The purpose of this study was to apply and evaluate the use of culturally responsive practices in a parent-coaching project with Spanish speaking families with children with ASD via telepractice. We evaluated the effects of the intervention to increase parent implementation of components of instruction and on child communication in English and Spanish. The authors also conducted a culturally responsive interview with families and included a social validity questionnaire at the end of the study to ensure cultural responsive strategies were being embedded as a guide for our parent coaching intervention (Bal & Trainor, 2016).

The research questions included the following: Is there a functional relation between the parent coaching intervention (e.g., modeling, expanding, and incentivizing communication) and the use of prompting components of the multimodal communication intervention for children with ASD? Is there an increase in parent behaviors as parents are coached in these strategies? Is

there improvement in child communication outcomes for children with ASD, corresponding with implementation of the parent coaching protocol? Was there a correlation between parent use of multimodal communication interventions and child communication outcomes? Lastly, did parents find instruction in these strategies and the parent coaching protocol via telepractice to be acceptable and useful?

## **Method**

### **Experimental Design**

A single-case multiple probe design across participants was conducted, which included at least 3 data points per phase to meet minimum What Works Clearinghouse (WWC) quality standards with reservations (Ledford & Gast, 2018). The study included three phases, baseline, intervention, and maintenance. The method for determining treatment onset was determined based on participant waiting period to initiate the research and need. The timing for which intervention phases were data-driven. Dyad A began the intervention phase, following a stable level with at least three points in baseline for the proximal dependent variable, parent prompting (Ledford & Gast, 2018). Intervention to the second dyad was introduced after a positive level change for the proximal dependent variable was demonstrated in the intervention phase with at least 3 data points of the first tier and baseline data remained stable for all tiers. A positive change was sufficient when there was an immediate change in level or there is a change in direction following intervention (Ledford & Gast, 2018). The same criteria was applied to subsequent tiers. The maintenance was provided two months post intervention. Generalization was also measured throughout all phases with at least one generalization data point per phase. Participant data were evaluated via visual analysis.

### **Participants**

Approval for the current study was obtained from the Institutional Review Board (IRB). The inclusion criteria included (a) children with a diagnosis of ASD with complex communication needs, who (b) come from a home that speaks a language other than English, and who (c) have reliable internet access. The first four applicants who met the inclusion criteria were recruited into this study. Four families were chosen to help with issues of attrition and to maintain WWC standards. Unfortunately, a fourth participant dropped out of the study following the interview and prior to baseline, failing to respond to further follow-up requests; therefore, this family's information was excluded from this study. Descriptions of this family may be obtained from the first author upon request. Therefore, the participants included three families, each including at least one bilingual caregiver and their child with ASD between the ages of 3 and 6 years. While the parents were the primary target participants, the children were distal participants in the study. Pseudonyms were used for this study to maintain confidentiality.

Aiden, Santiago, and Francisco had complex communication needs (characterized by significant delays in comprehension and/or speech production) and were chosen to participate due to parent interest in learning communication strategies via telepractice (i.e. asking questions, asking for items/activities, responding to questions). Dyad A had a bachelor's in social work, Dyad B had some college, and Dyad C had an associate in education. Dyad A and B did not have previous experience working with children with disabilities, but Dyad C had worked in an inclusive classroom. Parents were also asked to fill out the Autism Spectrum Rating Scale (ASRS) to evaluate whether participants met ASD criteria or a diagnosis from a professional. Participants were identified through the Coach to Communicate (C2C) website, ads on social media, contacting health care professionals, and word of mouth. C2C was a free and online



parent coaching service program to help coach parents to improve communication for their child that was sponsored by the state of Texas.

The children were brought up in a Hispanic background and were raised as Spanish speakers at home where Spanish was spoken by either parents or grandparents. They received either special education services at an elementary, applied behavior analytic (ABA) therapy or early childhood intervention. Prior to the study, the severity of ASD symptoms was evaluated using the ASRS questionnaire by a doctoral student in school psychology (Goldstein & Naglieri, 2009). For our study, we focused on peer and adult socialization, social communication, and total symptoms. The scores that were above 60 points were considered elevated. A score above 70 would indicate to be clinically significant and is likely to impair daily functioning for the child. Parents also completed the SCQ online prior to starting the study and during the baseline phase (Rutter et al., 2003). This 40-item survey was originally used as a screening tool for ASD symptoms for children. Points that were 15 or above indicated symptoms of ASD with average points for children with ASD being 24.2. Typically developing children average about 5.2 and children with some symptoms of ASD average 11.2. See Appendix 1 and Appendix 7 for a description of child behaviors and parent information, respectively.

### **Interventionist**

The parent coach for this study was the first author. The author had a master's degree in special education and was a second-year doctoral student in an educational psychology program, with an emphasis in special education, at the time of the study. She is a fluent Spanish and English speaker, who was born in Mexico, but lived in the US since age 6. She received undergraduate and graduate research experiences that allowed opportunities to work with families from diverse groups in the health field. Additionally, she received training in applied

behavioral strategies during her graduate and undergraduate experience. At the time of the study, she had 6 years of experience working with individuals with ASD, ages 2 to 24 years old. The coach did not have a prior relationship with the participants.

### **Dependent Variables and Data Collection**

The dependent variable(s) were parent behaviors with distal dependent measures of additional parent implementation strategies (e.g., modeling, expanding, incentivizing communication) and children independent communicative behaviors (see Appendix 1 for more information about dependent variables). The strategies mentioned were selected as a package due to the feasibility for families to implement and incorporate which are likely observed in their daily routines to maintain a culturally responsive approach (Bal & Trainor, 2016). The language chosen to train strategies was determined by the first author in collaboration with parents (Hambly & Fombonne, 2012). Parent proximal and distal behaviors are defined and examples are provided in Appendix 2.

Data were collected once a week from parent-created videos, which were approximately 3 minutes each, to improve the feasibility for parents, due to limitations in speed and data of internet access required. Videos of longer length were reportedly difficult to upload to the cloud drive. Both parent and child behaviors were assessed using a 10-second partial interval measurement system using paper and pencil for a total of 3 minutes. Using a definition sheet with abbreviations of parent and child behaviors coders marked the occurrence or non-occurrence of behaviors. Data were recorded when the coach received the videos on a weekly basis, prior to the next coaching session with that parent.

### **Materials and Settings**

The equipment used for this study included parents' cameras, HIPAA-compliant web conferencing software for the parent coaching meetings, and picture icons when requesting milk (leche in Spanish) for one participant. The toys and activities were chosen by the child at the time of the video recording. Aiden enjoyed playing with trains, letters, and jumping on his trampoline at home. Santiago enjoyed playing on his iPad, candy such as gummies, and playing with cars. Francisco enjoyed trains, drawing, painting, and riding his bicycle. These items were among the objects used to entice children to communicate with hopes that they were motivated to initiate a request or respond to questions regarding the item or activity. Parents met the coach for about an hour a week using their own electronic device and internet service. Parents could access the meeting at any preferred location, including outside the home. The coach selected a location on her end to meet with parents that allowed for adequate HIPAA compliance and maintained privacy of the families.

The intervention was conducted at each of the participants' homes, with the exception of generalization videos where the setting took place other than the home such as outside the home. For Dyad A, the setting took place in the parent's living room, which was approximately 12 x 18 feet where parents and the child's sibling would be present during the intervention. The living room was organized with one brown sofa near a window and two loveseats on one side of the living room. The opposite side had a television and a fireplace as well as toys including a small individual trampoline. For Dyad B the setting was the living room, which was approximately, 12 x 14 feet, and the child's sibling and mother would be present during the intervention. The living room had a brown sofa set and a table with toys. Dyad C performed the intervention in the child's bedroom, which was approximately 10 x 11 feet with dad and mom present. The bedroom included a bed and toys.

## **Procedures**

### **Online webinar pre-post quiz**

Parents received basic information about the strategies prior to baseline through a 1-hour webinar. This webinar was asynchronous and included a 10 question pre- and post-quiz to assess their knowledge in the strategies they were to be taught during intervention. The online webinar included information on typical communication development, receptive and expressive language, different types of communication modes, augmentative and alternative communication (AAC), and information about strategies that would be later taught online face to face and monitored by the coach. No instructions were given to parents during this time.

### **Culturally Responsive Questionnaire**

The questionnaire was conducted during the parent interview before the baseline phase. They were obtained from questions that were available in English and Spanish and were adapted from multiple sources (Fahim & Nedwick, 2014; Stephenson, 2000; Thorp, 1997). These questions targeted information about cultural adaptation and acculturation, communication, and parent beliefs (e.g., “what language are you comfortable speaking?”) that were useful for the author to understand every day routine and interactions (Bal & Trainor, 2016). The purpose of this questionnaire was to understand the family’s worldview, know about the family’s communities, understand cultural differences, and discuss mutual goals. In our program, the use of both languages was encouraged at home by parents if they reported that they spoke a second language fluently that they felt comfortable speaking (Fahim & Nedwick ,2014), in accordance with the recommendations of the Division for Early Childhood (DEC) to accommodate this population and to help embed telepractice with those practices (Sandall et al., 2005). The results of these questions are included in Appendix 7.

## **Baseline**

Baseline data collection began the same week for all participants. The onset of data collection in each of the baselines occurred concurrently. The duration of each phase depended on the participant data determined by visual analysis. The number of data points in each baseline and intervention phase was at least 3 per participant. The number of trials within each session in the baseline phase depended on the participant. A trial was defined by the number of opportunities given by the parent to the child within a session. A session was defined by number of trials within a specified time. Dyad A had four baseline data points, Dyad B had 8 data points, and Dyad C had 12 data points. The time interval between baseline and coaching sessions, i.e., intervention, was about a week and two data probes (e.g. two video recordings) were collected per week. Parents were asked to record two videos a week, during which they would be talking, in either language, to the child about a preferred topic or participating together in an interactive activity (e.g. reading a book, playing together with their favorite toys, helping the children with their homework). No skills, strategies, or feedback were given during this phase and data probes were collected from video recordings as well. The weeks in baseline phase ranged from 2-6 per dyad.

## **Development of Education Plan**

The education plan was based on the goals of the families, the results of the culturally relevant questionnaire, the baseline videos, and the needs of the children based on the assessments given (i.e. ASRS, SCQ). Education plans were discussed with parents and were periodically reviewed with parents to maintain social validity with families. A specific protocol was written and verbally discussed with parents that pertained directly to their child's communication goals. Participant responses about their language preference in teaching the

strategies to the child were included in the treatment plan. Child goals were those expressed above as dependent variables (see Appendix 1).

### **Intervention: Parent Coaching Sessions**

The independent variables included behavioral strategies such as, incentivizing communication, modeling, prompting, and expanding (see Appendix 2). All choices were informed by the culturally responsive questionnaire. Veronica used some words with her child in Spanish, such as milk or water and modeled the words in both languages. She spoke in English and Spanish with the coach. Adele primarily spoke Spanish with her child during the sessions. She spoke in Spanish throughout the coaching sessions. Desire primarily spoke English with some occasional words in Spanish to her child and spoke primarily in English with the coach as requested by both parents. Parent coaching included meeting with the parent via telepractice once a week for approximately an hour to explain verbally the written treatment procedures and give feedback based on the parent video recordings for that week in Spanish or English. Written feedback was also provided for the parent to review, download, and that was accessible at any time. The weekly feedback included the use of incentivizing communication; modeling, prompting, fading, expanding and reinforcement as a package (see Appendix 2 for more information). These documents were translated into Spanish for families to help them understand and to avoid any language barriers. The sessions also incorporated role-play and feedback on role-play of the strategies taught by the coach through videoconference. Meetings were conducted at a time that was convenient for the participants and that respected their times of worship as an effort to meet participant needs and preferences. The coach would first play the mother's role while the parent acted as the child, then vice versa to let parents have an opportunity to practice how to implement the strategies after watching the coach and given

feedback. The two videos from that week were also watched with parents and graphs of parent and child progress were shown with feedback during the meeting. Parents were instructed to use speech with their children and one parent used visuals such as pictures or low-tech AAC and speech as part of our multimodal communication approach in our intervention. The parents were encouraged to use the skills during the week with every opportunity that was presented with their child to increase communication skills. They used the skills in a natural setting with the child's preferred toys and activities to maintain engagement and increase the future probability of the target goal occurring in the future.

Toward the end of the intervention phases and depending on child progress, prompt fading was taught to avoid prompt dependency. Booster sessions were added due to poor child progress or lack of parent progress as determined by visual analysis on the graph in a decline or stable level in the intervention phase. They were necessary to improve independent use of communication skills for the child outcomes. A booster session included training as in the intervention phases to ensure independent target skills for the children. The coach provided feedback to the parents on their use of the skills taught. Weekly feedback covered the same strategies as the intervention phase. For Dyads A and B, there were an additional four sessions added to the intervention phase until the child independent outcomes reached a level higher than baseline. Dyad C was added two more booster sessions in the intervention phase until the child independent target behavior was at a higher level than baseline.

### **Maintenance and Generalization**

Maintenance occurred after parent-training intervention was implemented. Data were collected 3 weeks after intervention for Dyad A. Maintenance was collected 4 weeks for Dyad B and C following the conclusion of intervention. Parents downloaded one to two videos to the

cloud drive prior to meeting with the coach. There were no coaching strategies taught prior to the 4 weeks. The settings and materials were also the same as the intervention sessions.

Generalization was measured during baseline, intervention, and maintenance phases that included different settings, people, or materials that were originally planned for those phases.

The application of generalization data were based on participant's preference. For Dyad A, generalization data were taken in different settings (kitchen), different people (dad), and different materials (food and activities). Dyad B used generalization in different settings (bedroom and park) and different materials (food and activities). Dyad C used different settings (outside area), different people (dad), and different activities to record generalization videos. Fathers received informal training by mothers or by attending the interview with the interventionist. At least three generalization data points (videos) were obtained per level except for Dyad B who was only able to send one video during the maintenance phase.

### **Interobserver Agreement**

Interobserver agreement (IOA) data were collected for at a minimum of 20% of the data collected in each phase or condition for each participant. IOA was measured by the author upon each session and per trials. Three observers were trained prior to collecting IOA. Training involved data collectors reviewing operational definitions for participants, watching videos together with discussion, and observers then practiced collecting data until they met 80% or better reliability with the first author. IOA was calculated by dividing the agreements and disagreements by the total number of intervals. See Appendix 3 for more information on the average percentage of IOA between coders and range of percentages. Overall IOA was above 80% for all sessions, including generalization probes.

### **Procedural Fidelity**



Procedural fidelity was gathered by three data collectors collecting data on at least 20% of baseline, intervention, generalization, and maintenance data and met the minimum quality thresholds (80%) for phases. A randomly selected recording of the experimenter giving feedback to participants was watched by data collectors and recorded on a procedural integrity form. Behaviors were scored as correct if the interventionists included the written weekly feedback, watched videos, described the weekly feedback, model the skills, role played, and gave feedback on their performance in the role-play. Behaviors were incorrect if the interventionists did not include the strategies mentioned in their implementation of coaching parents, with the exception of baseline and maintenance where no strategies were taught to parents. Procedural fidelity on the coaching sessions was at 100% for both baseline and intervention phases for Dyad A and Dyad C. There was 100% in baseline for Dyad B with 80% in the intervention phase. The formula  $(EA \times 100) / \text{Treatment}$  was used where EA is experimental adherence.

### **Social Validity**

Social validity was measured to evaluate the social acceptability of goals and outcomes after maintenance. A questionnaire was administered after the intervention phase that included 10 multiple-choice questions to assess the effectiveness, generality, cultural awareness, and accessibility of the intervention involved. Post-social validity questionnaires were sent to all three participants via email using an electronic form. See Appendix 6 for more information on the social validity questions.

### **Data Analysis**

Data were analyzed by visual analysis using graphs to show results and by calculating an effect size. The data were visually analyzed through an evaluation of level, trend, variability, immediacy, and overlap to determine a functional relation across the baseline and intervention

phases. The author determined if parent and child intervention made enough progress with a comparison of level, trend, and variability for all participants in each of the phases (Ledford & Gast, 2018). Nonoverlap of All Pairs (NAP) was used to calculate effect sizes before the study began (Parker & Vannest, 2009). This method was chosen because it has high power efficiency, it was accurate and efficient in calculation, and since there was variability on the graph, it may have been more meaningful than calculating for trends (Parker & Vannest, 2009). Unfortunately, NAP did not do as well as other measures in precision and its width of confidence intervals (Parker & Vannest, 2009). Effect sizes for the child and parent communication scores were calculated via the NAP calculating program (Vannest et al., 2016). NAP effect sizes can be interpreted as such: strong to very strong effects: 0.96-1.00, moderate effects: 0.68-0.95, low effects: 0.38- 0.67, none to very low effects:  $\leq 0.37$  (Parker et al., 2011). NAP scores were evaluated for all intervention components (e.g. incentivizing communication, modeling, prompting, expanding, and any target behavior component). The correlation was calculated to show a relationship between parent implementation behaviors and child communication behaviors. Pearson's correlation coefficient was analyzed through STATA® (StataCorps, 2017). Using correlation, researchers evaluated if relationships were significant or insignificant.

## **Results**

The visual analysis supports a functional relation between the culturally responsive parent coaching intervention and parent implementation of prompting strategies (see Figure 1). There were three demonstrations of increased use of prompting for all parent participants, demonstrated by a positive level change for prompting between the baseline phase and the intervention phase for all three dyads. The overall omnibus NAP score for the use of prompting was 0.79\*, indicating that the coaching intervention had a moderate to strong effect on

prompting. The asterisk represents a moderate to strong effect. Furthermore, two parents demonstrated a pattern of low use of prompting at the beginning and into the middle of the intervention phase, and one parent demonstrated an instant level change at the beginning of the phase; all parents demonstrated a decreasing trend in prompt use as parents were instructed to fade prompts. Parents' use of modeling was also analyzed and had a positive level change between baseline and intervention for all dyads. The overall omnibus NAP score for the use of modeling was 0.50, which indicated a low effect. The low omnibus might be due to modeling fading towards the end of the intervention as instructed by coaches. The overall omnibus effect size for expanding was 0.92\* which indicated a strong effect. The omnibus effect size for incentivizing communication was 0.98\* indicating this coaching strategy as promising. All parent behaviors resulted in moderate to high effects, with the exception of modeling due to a fade in that strategy as instructed by the coach to parents. More information on the results per dyad are presented in Appendix 4. Parents maintained use of parent implementation behaviors at a stable level across the parents. Data on children's outcomes were a distal dependent variable, therefore, researchers cannot state that a functional relation is demonstrated with certainty; however, visual inspection of the children's data indicate that their independent communication also shows promising results from baseline to intervention.

### **Child Independent Behaviors: Visual Analysis and Magnitude of Effects**

Each of the target behaviors were selected with a collaborative goal from the researcher and the parent's needs. Coaching target behaviors included requesting and responding to questions from adults. The overall omnibus was .75\* for independent child communication outcomes, which demonstrated a strong effect. For each target behavior, each child behavior obtained moderate effect sizes. Dyad A's (Aiden) NAP score was .78 for independent requests.

The effect size for Dyad B (Santiago) was .76 for independent requesting. The effect size for Dyad C (Francisco) was .72 for independent responding to questions.

### **Child Prompted Behaviors: Visual Analysis and Magnitude of Effects**

For Dyad A, requesting was on the x-axis (0%). There was low trend, level, and variability for the baseline prompted behaviors. There was some gradual level change in the intervention phase and variability towards the end of the intervention phase. Maintenance phase showed a decrease in the use of prompted behaviors with small variability. The effect size for prompted behavior was .97\* demonstrating a strong effect.

For Dyad B, prompted communication was also on the x-axis (0%). There was no trend, variability or level change during the baseline phase. There was an abrupt change in level during the intervention phase with some variability and an increasing trend during the intervention phase. Maintenance data showed a decrease in trend, no variability and stable level. The effect size for prompted behavior was .95\* which shows a strong effect.

For dyad C, there was an initial increase in trend then decrease in baseline with some variability and low levels. There was a gradual change in level for prompted behavior during the intervention phase with variability and a decreasing trend towards the end of the intervention phase as the child became more independent and his use of prompted behaviors decreased. Maintenance data were at low levels with no trend and small variability. The effect size for dyad c was .85, which demonstrates strong effects.

### **Correlations between Parent Implementation and Child Outcomes**

Procedures for calculating R include importing all data observations for the dependent variables on an excel sheet. The excel sheet was broken down by dependent variables (e.g. modeling, prompting, incentivizing communication, expanding) and was uploaded on STATA

where 70 observations were calculated using the STATA output corr (dependent variable) (independent variable) to obtain results. There were positive correlations between parent behaviors and child communication outcomes (see appendix 5).

Prompting resulted in ( $r=.12$ ) were low correlations as with modeling ( $r= -0.14$ ). The results from prompting were low due to prompt and model fading back of strategies. Prompt and model fading were intentional to help increase the use of independent child communication outcomes. Expanding results in ( $r=.54$ ) were significant with moderate to low correlations. There was a significant positive correlation for parent use of incentivizing communication ( $r= .61$ ). Results indicate that these strategies were highly correlated with positive effects on children's independent behavior.

### **Social Validity**

Feedback on feasibility, acceptability, and cultural relevance were given to the main researcher after 4 weeks post intervention. All parents strongly agreed that the behaviors were beneficial to the participant and relevant to the context, that the intervention was efficient, contained a natural component, and was cost effective. Veronica also mentioned that she was pursuing certification in applied behavior analysis following our study given the results. Parents agreed or strongly agreed that their families were satisfied with the outcomes and procedures. Parents strongly agreed that the coach was interested in their child and the family, that they enjoyed the availability of this program in English and Spanish, that the coach set goals with the family, and that they learned new strategies to work with their children through this project. One parent responded that she felt neutral and the other parents felt a decrease in stress because of this program. They agreed or strongly agreed that this program helped understand their child's development. One parent reported anecdotally in an email that the intervention was

“helpful to her family and especially to her son,” that her “son’s language had improved since we last spoke,” that the program “served families to learn more techniques to use with him,” and that “the coach was helpful and patient during the program”. Parents made few negative comments, however one parent reported that she struggled with some internet issues in uploading the videos.

### **Discussion**

The results of this study indicate that the use of culturally responsive parent coaching via telepractice is promising for and acceptable to families with children with ASD from CLD backgrounds. Results showed increased outcomes across parents and children in the study with a gradual decrease in parent use of modeling and prompting due to prompt fading, as intended by the researcher. Prompt fading was systematically introduced to prevent prompt dependency for children and increase independent responding. Parents increased the most in their use of incentivizing communication (e.g., arranging their environment, using praise) and prompting. Furthermore, visual inspection of the graphs shows child improvement in their use of independent communication. Interestingly, the maintenance data showed similar results as in the intervention phase. Generalization was also observed at a lower level for proximal and distal dependent measures. That is, this intervention was useful across time, place, people, and materials. Effect sizes show promising results with strong effects for participants. Additionally, correlation results for parent use of behaviors and child independent communication outcomes were favorable, which is consistent with previous literature.

Several researchers have evaluated the use of telepractice for parent coaching. Prior research investigated the use of communication with children with ASD using telepractice (Ingersoll et al., 2017; Tsami et al., 2019; Vismara et al., 2012). The current work extended previous studies with the inclusion of culturally responsive strategies. This work is crucial for

families who otherwise would not have the opportunity to learn about evidence-based practices in a language they understand and are comfortable in.

Behavioral expectations may differ across families with diverse backgrounds; therefore, a partnership between practitioners and families is crucial (Brown et al., 2019). Parents in this study noted that cultural beliefs and beliefs of family members affected them. For example, one parent noted that they did not share their child's diagnosis with extended family members out of fear of stigma and others noted disagreements among family members related to treatment, such as use of controversial and unsubstantiated therapies. This belief is consistent with findings from prior literature (Wandry, 2009). Families could benefit from partnerships with practitioners to gain better communication and build rapport (Fahim & Nedwick, 2014). Similarly, this partnership would help practitioners understand family views and beliefs. For instance, in this study, parents also sought support from religious institutions and one suggested that his son was a gift from a higher power. This information helped the author understand parent beliefs and focused on educating the parents on current information from the Centers for Disease Control and Prevention (CDC) on evidence-based practices regarding their son's disorder. By building partnerships, practitioners can learn more about families to serve best their students depending on their unique needs.

This study has several implications for practitioners working with this population. Practitioners might use proxies for measuring and encouraging increased natural implementation and generalization of strategy use by asking the parents to tell them about the range of contexts in which they practice and providing social reinforcement to the parents for recounting multiple contexts in which they implemented naturalistic intervention.

## **Limitations**

There were a number of limitations to this study. Limitations for this study include the children outcomes as a distal dependent variable. We cannot say with confidence that our intervention was due to parent use of behaviors. Although the coach made efforts to stress to parents to use the intervention strategies with the child on a daily basis, we were unable to record data on overall dosage of implementation. Due to the nature of the study, researchers were unable to control for or ensure that parents were practicing outside of the coaching sessions. Given the naturalistic nature of the communication intervention, parents were free to choose when it was feasible to practice the strategies within their daily lives. Another limitation was the number of children participated. Given the small sample size, one may not generalize conclusions to families of children with ASD as a whole, without aggregating results with other, similar research. More research that is extended from this work is needed to evaluate this intervention as effective. There was also not a representation of overall conclusions as the videos were only 3.30 minutes long, which is a limitation of the study. Limitations regarding internet access and speed is a factor worth mentioning (Tomlinson et al., 2018). Without reliable internet access or speed, parents might be discouraged from using this method of intervention, as one parent noted in the post-intervention social validity questionnaire. There were also limitations with using Pearson's correlation for single-case studies, such as the relationship between two variables could be non-linear, a significant correlation does not always mean the relationship is meaningful and lastly, it does not represent causality (Armstrong, 2019). Lastly, these strategies focused on naturalistic communicative partners, however, the intervention was taught by researcher students, who are not in the naturalistic environment themselves.

## **Future Research**



Future studies are needed to replicate these results with diverse populations and different implementers, such as educators. Cultural and linguistic responsiveness can be addressed as demonstrated in this study with focus on parent collaboration. Practitioners are encouraged to gain knowledge of the cultures of the individuals they work with and set up a time to communicate with parents about goals, expectations, and concerns. This can be done through a phone call, telepractice, or in person visits. Future studies can include different settings, such as schools, recreational, and employment settings. Moreover, investigations of implementation with different child target behaviors, such as receptive communication and problem behavior, may be useful to increase relevance for parents.

This work shows a promising area of research that could aid parents, particularly families from diverse cultural backgrounds. Additional studies targeting this population are essential to ensure equitable representation and evaluation involving diverse families, who make up a large proportion of the community (Brown et al., 2019). Some suggestions for practitioners working with this population include developing inclusive relationships, providing culturally responsive practices, and gaining knowledge of the cultures represented (Brown et al., 2019).

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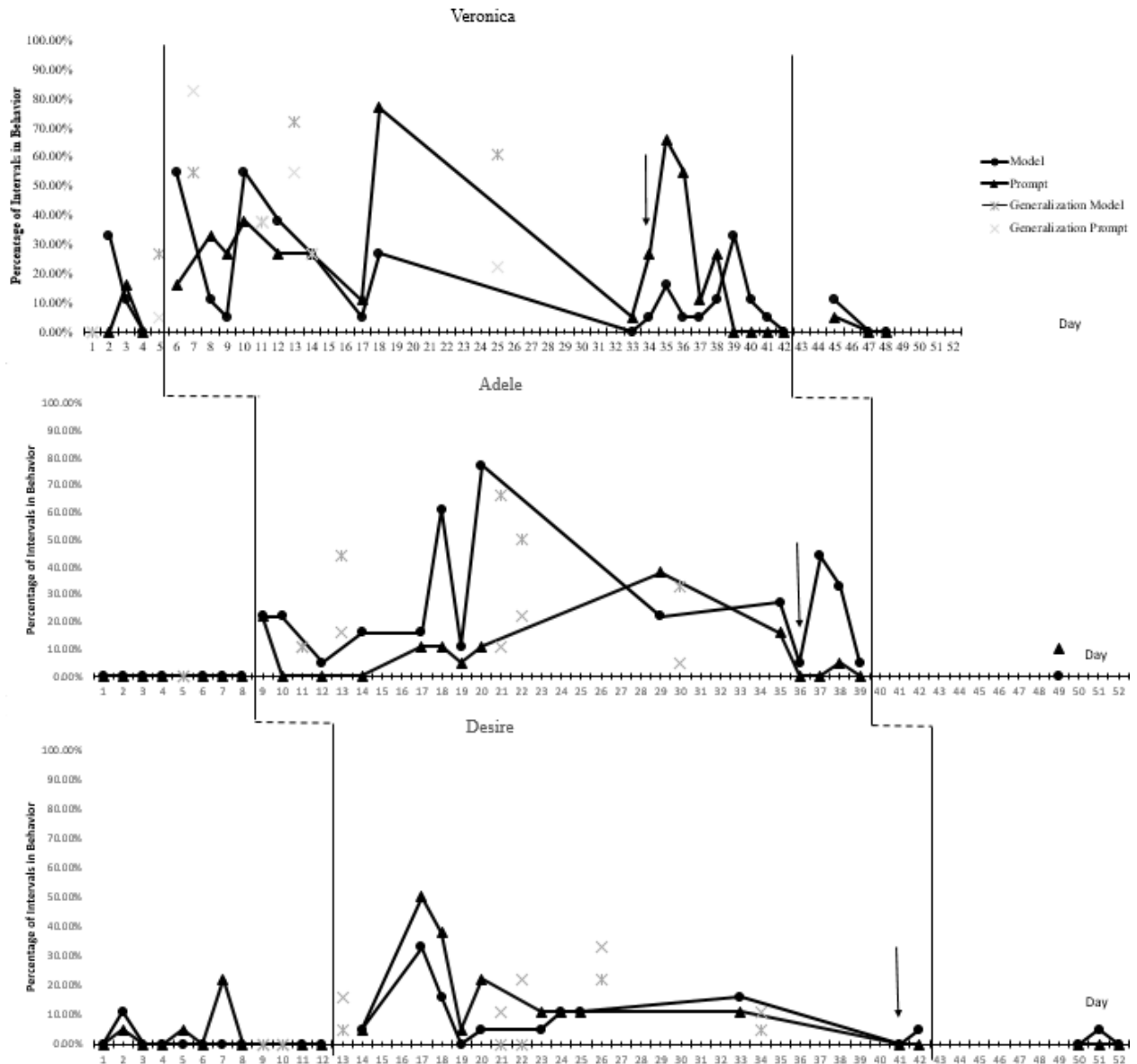
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**Figure 4.1**

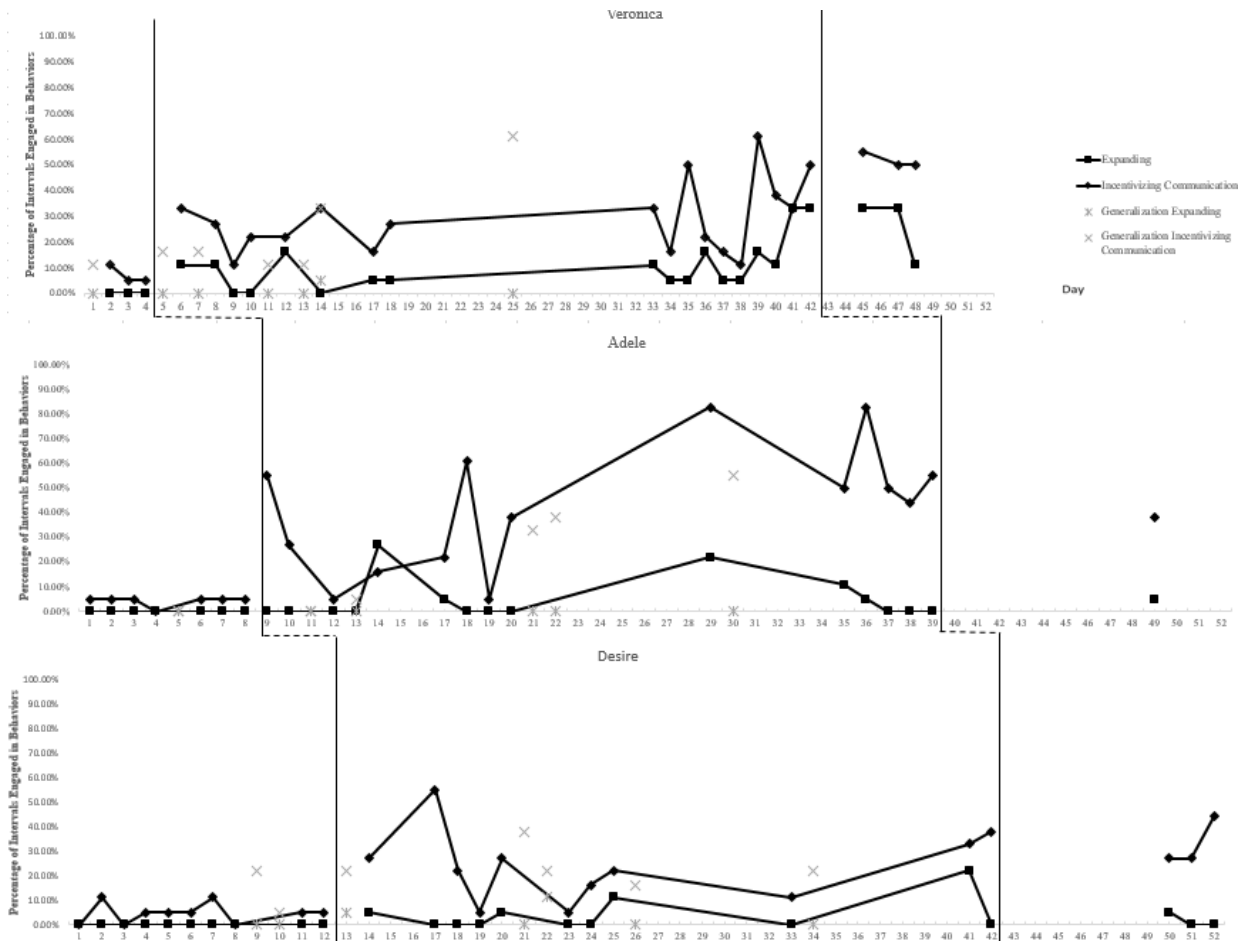
*Parent use of Prompting and Modeling*



Note. Arrows indicate the implementation of prompt fading by parents as taught by the coach.

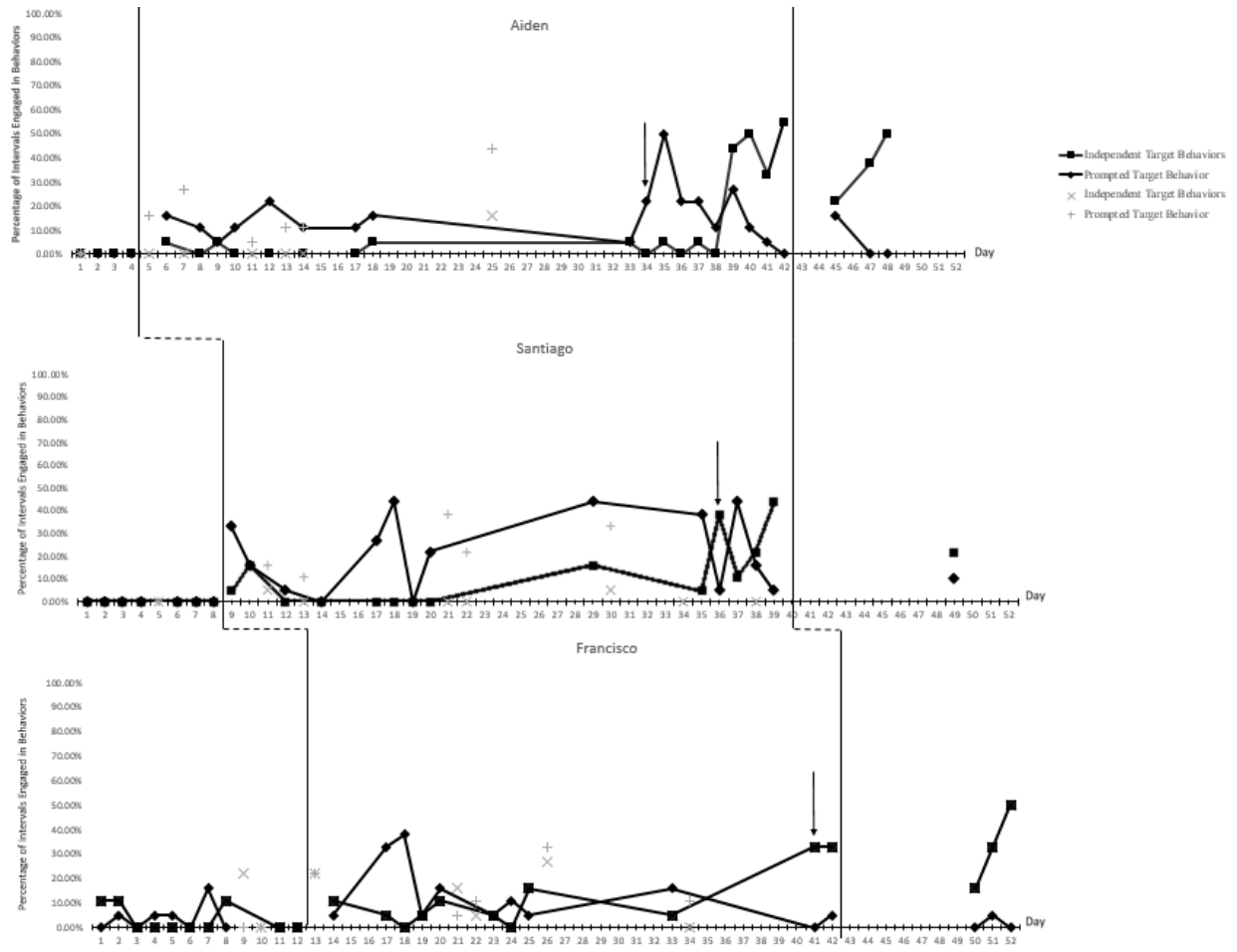
**Figure 4.2**

*Parent Use of Expanding and Incentivizing Communication*



**Figure 4.3**

*Child Independent Behaviors*



*Note.* Arrows indicate the implementation of prompt fading by parents as taught by the coach.



APPENDIX 1

PARTICIPANT DEMOGRAPHIC CHARACTERISTICS AND STANDARDIZED TEST SCORES

Participant	Age	Gender	Disability	Ethnicity	Home language	SCQ	ASRS	Communication modes	Dependent variable	Operational Definition
Aiden	3 year old	Male	Autism spectrum disorder	Hispanic or Latino	Spanish	24	76	Gestures/AAC & verbal approximations	Requesting items or activities	The child uses at least one-word requests with verbal approximations or a picture icon for items or activities.
Santiago	3 year old	Male	Autism spectrum disorder	Hispanic or Latino	Spanish	24	82	Single word utterances/ Three or more word utterances	Requesting items or activities	The child uses at least two word requests with verbal approximations or a picture icon for items or activities.
Francisco	6 year old	Male	Autism spectrum disorder	Hispanic or Latino	Spanish	8	56	Three or more word utterances	Responding to questions	After the parent asks a question, the child will respond using more than 3 words staying within the same context.

*Note.* The cutoff score for the SCQ ASD was 15. Francisco made eligibility due to an educational label of ASD.

## APPENDIX 2

### BEHAVIORAL STRATEGIES

Behavioral strategies	Definition	Example
Incentivizing Communication	Use of strategies to increase opportunities for the individual to communicate and interact with others and increase the likelihood that they will want to. The child does not always need to communicate for parents to incentivize communication.	Parents set up the environment with enticing materials and praises by providing access to the requested objects or activities after a communication attempt was made from the child. Parent: “Good job saying I want car!” as they hand the car to the child.
Modeling	Perform the skills or demonstrate the target behavior.	Parent: “I want car” or physically model for the child who used the picture icon.
Prompting	Parents gave the instruction or used cues.	Parent: “Say I want car” or physically prompt using graduated guidance for the child using picture icons.
Expanding	Introduction of new vocabulary or longer sentences after the child's response.	Parent: “You want the green car, it goes vroom vroom!”

APPENDIX 3

INTER-OBSERVER AGREEMENT: AVERAGE PERCENT AGREEMENT OF EACH  
BEHAVIOR

<b>Parent Behavior</b>		Dyad A	Dyad B	Dyad C
Incentivizing Communication	Baseline	89%	100%	99%
	Intervention	81%	87%	84%
	Maintenance	100%	72%	83%
Model	Baseline	94%	100%	99%
	Intervention	78%	87%	94%
	Maintenance	100%	100%	100%
Prompt	Baseline	100%	100%	97%
	Intervention	89%	87%	87%
	Maintenance	100%	94%	100%
Expand	Baseline	100%	100%	99%
	Intervention	92%	99%	99%
	Maintenance	94%	94%	94%
<b>Child Behavior</b>		Dyad A	Dyad B	Dyad C
Making Requests	<b>Baseline</b>	<b>Baseline</b>	<b>Baseline</b>	N/A
	100%	100%		
	(Range=100)	(Range=100)		
	<b>Intervention</b>	<b>Intervention</b>		
	90%	94%		
	(Range=78-100)	(Range=87-100)		
	<b>Maintenance</b>	<b>Maintenance</b>		
	96%	92%		
	(Range=89-100)	(Range=72-100)		
Responding to questions	N/A	N/A	<b>Baseline</b>	
			98%	
			(Range=97-100)	
			<b>Intervention</b>	
			93%	
			(Range=84-100)	
			<b>Maintenance</b>	
			94%	
			(Range=77-100)	

APPENDIX 4

EFFECTS ON THE USE OF INTERVENTION COMPONENTS BY PARENT

		<b>NAP</b>	<b>P-Value</b>	<b>LL CI%</b>	<b>UL CI 90%</b>
Prompting	Dyad A	0.79	0.12	0.03	1.00
	Dyad B	0.79	0.04	0.12	1.00
	Dyad C	0.85	0.02	0.18	1.00
	Omnibus Effects	0.79	0	0.55	1.00
Modeling	Dyad A	0.88	0.87	-0.55	0.67
	Dyad B	0.91	0.00	0.39	1.00
	Dyad C	0.85	0.01	0.28	1.00
	Omnibus Effects	0.81	0	0.57	1.00
Expanding	Dyad A	0.91	0.02	0.23	1.00
	Dyad B	0.64	0.29	-0.16	0.74
	Dyad C	0.68	0.16	-0.06	0.79
	Omnibus Effects	0.71	0	0.48	0.96
Incentivizing Communication	Dyad A	0.98	0.00	0.36	1.00
	Dyad B	0.94	0.00	0.43	1.00
	Dyad C	0.91	0.00	0.39	1.00
	Omnibus Effects	0.94	0	0.69	1.00

APPENDIX 5

PEARSON'S CORRELATIONS BETWEEN PARENT IMPLEMENTATION OF  
INTERVENTION COMPONENTS AND CHILDREN'S USE OF TARGET BEHAVIORS

<b>Parent Implementation of Intervention Components</b>	<b>Children's Use of Independent Behaviors</b>
Prompting	0.12
Prompt fading	-0.44
Modeling	-0.14
Expanding	0.54
Incentivizing	0.61
Communication	

## APPENDIX 6

### SOCIAL VALIDITY SURVEY

Thank you for participating in the study. The team members aim to provide high-quality coaching to meet different needs of families. Your evaluation of this survey can help us make this. Please tick the appropriate box for each question indicating your views and offer your views and comments. Your feedback is very important to us.

<b>Individual Parent Coaching</b>	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The target behaviors were beneficial to the participant and relevant to the context/ Los objetivos fueron beneficiosos para el participante y relevantes para el contexto.	•	•	•	•	•
The intervention was efficient and cost effective/ La intervención fue eficiente y barato	•	•	•	•	•
The intervention contains a natural component for each participant/ La intervención contiene un componente natural para cada participante	•	•	•	•	•
All individuals involved, who were surveyed, are satisfied with the procedures and outcomes/ Todas las personas involucradas, que fueron encuestadas, están satisfechas con los procedimientos y resultados	•	•	•	•	•
My coach was genuinely interested in me and my child/ Mi entrenador estaba realmente interesado en mí y en mi hijo.	•	•	•	•	•
I felt less stressed because of this program/ Me siento menos estresada por este programa	•	•	•	•	•
This program increased my understanding of my child 's development/ Este programa aumentó mi comprensión del desarrollo de mi hijo.	•	•	•	•	•
I enjoyed that the program was available in English and Spanish/ Disfruté de que el programa estuviera disponible en inglés y español	•	•	•	•	•
My coach and I partner to set goals for my child, myself, and my family/ Mi entrenador y yo nos asociamos para establecer metas para mi hijo, yo y mi familia.	•	•	•	•	•
Overall, I have received good opportunities and experience to learn about different strategies to work with my child through this project/ En general, he	•	•	•	•	•

recibido buenas oportunidades y experiencia para aprender sobre diferentes estrategias para trabajar con mi hijo a través de este proyecto.					
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APPENDIX 7

ACCULTURATION AND CULTURAL BACKGROUND SURVEY

<b>Cultural Adaptation and Acculturation</b>	<b>Dyad A</b>	<b>Dyad B</b>	<b>Dyad C</b>
How long have you been living in the U.S./Desde cuando tiene viviendo en los Estados Unidos?	She was born in the U.S but her parents were born in Mexico.	21 years	Mom was born in the U.S but dad was from Mexico.
What is your daily routine at home?/ Cual es su rutina en casa?	Family gets up at 6:30am-7am, her son has therapy from 8-3pm. At home, he watches T.V, plays with them on the trampoline or at the park. They have dinner, bath and are usually in bed by 9-10pm.	Family gets up at 5am and they have to drop off their three daughters and son at different schools. They pick up their son at 11:30am for afternoon therapy. They go to parks.	Family gets up at 6am and take their children to school. They have a snack at 3:30pm-4pm, do homework, then play. They have dinner then bath and bed.
Do you use make up words for bedtime and food?/ Usa palabras inventadas para la hora de dormir y comida?	For bath they say, “splash splash”	No	No
Do you use any gestures at home?/Usan gestos en casa?	No	Yes, throughout the day.	No
<b>Communication</b>			
What is your fluency level in English?/ ¿Cuál es su nivel de fluidez en inglés?	High proficiency	Low proficiency in speaking but can read and write English.	High proficiency
What language do you speak at home with your child?/Que idioma usan en casa con su hijo?	English and Spanish	Spanish	English
What language are you comfortable speaking?/ ¿En qué idioma te sientes cómodo hablando?	English	Spanish	English
What language do other members speak at home?/ Que idioma usan otros miembros en casa?	English and Spanish	Spanish and English	English and Spanish
What language does your child communicate in?/Que idioma se comunica su hijo?	English and Spanish	Spanish and English	English and Spanish
<b>Autism-Related Beliefs and Practices</b>			



What are your attitudes, values, and beliefs about your child's autism?/ ¿Cuáles son sus actitudes, valores y creencias sobre el autismo de su hijo?	Parents expressed they were trying to learn and help as much as they can. They do not expect a miracle or cure but are trying to find the best treatment for him. The goal for parents was to find the right kind of therapy and support to communicate as much as possible and teach independence.	Mom never imagined her son had autism spectrum disorder. She wanted to believe he is on the higher end of the spectrum. Mom was in denial, but she believed God sent him as he is. She was worried as a mother about his behavior.	Parents try to be proactive by attending parent trainings and they believe that the more they practice strategies with their son the more he will improve his skills.
Do family members have similar values and beliefs?/ ¿Tienen los miembros de la familia valores y creencias similares?	Yes, but it took time for parents to understand the diagnosis of autism spectrum disorders.	Yes, they are receptive to his learning and his siblings to their best to teach him skills.	No, their parents do not understand and think the disorder is a phase.
Do family members affect parent decisions to choose special education and other services for their child?/ ¿Afectan los miembros de la familia las decisiones de los padres de elegir educación especial y otros servicios para su hijo?	Grandparents tried to persuade parents of alternative therapy such as a special liquid that would help her son talk faster.	His mother primarily makes the decisions for him.	Other family members do not influence their child's services.
How do your family and cultural group view autism spectrum disorder?/ ¿Cómo ven su familia y grupo cultural el trastorno del espectro autista?	Their family did not know about autism spectrum disorder and they did not want to accept it. Eventually their family members read more and became supportive.	Only his immediate family members know. Their extended family is not aware to avoid stigma.	Family members think autism spectrum disorder could be cured.
What accommodations do family members make to provide caregiving to the child?/ ¿Qué adaptaciones hacen los miembros de la familia para brindar cuidados al niño?	Family members try to provide sensory stimulation for their child with autism spectrum disorder.	His siblings try to teach him and understand his needs.	It is rare for them to be with extended family members.
How do you access resources in their communities?/ ¿Cómo accede a los recursos en sus comunidades?	Through their preferred church.	Online or going to local workshops.	Online or through their caseworker.
Which religious institutions support them?/ ¿Qué instituciones religiosas los apoyan?	Their church provides a special needs support group.	They do not have any affiliations in church.	The church they attend.

## CHAPTER V

### CONCLUSIONS

The first meta-analysis results indicate a moderate effect size for using telepractice with interventions focusing on communication outcomes for individuals with ASD and ID. The results of this analysis indicates that caregivers, researchers, and practitioners are able to implement interventions focusing on communication with success and improvement on individual communication outcomes. There were no significant differences between moderators of age of individuals, dosage, years of experience for interventionists, and feedback.

The second meta-analysis on challenging behavior outcomes for individuals with ASD and ID indicate a small effect. These findings indicate that the challenging behavior interventions were not as effective as reducing challenging behavior. There were also no statistically significant outcomes between moderators (e.g. age, dosage, years of experience, and feedback).

There were several limitations to this analysis given the small sample size and nature of the study. The first limitation was type 1 error inflation due to multiple analyses. The second was the omission of group design studies given the lack of literature in this area. The third is publication bias for single case data. Some implications for practice and research would be to collect and report demographic data of all participants involved among all tiers within a study (e.g. interventionists, coaches, and participants). More information about participants will help researchers know whom these interventions are most effective for. Future research should focus on increasing the literature for group design studies in the area of telepractice for individuals with ASD and ID with a focus on communication and challenging behavior outcomes.

The systematic quality review included 19 single case studies and 11 group design studies for a total of 30 articles. There were both SEER and WWC standards that were used to

evaluate the quality standards of all single case studies and the SEER studies for the group design studies. Various key aspects of the study were not included or reported. Such aspects include details of the setting with more than half of the studies not reporting this with enough detail or at all for researchers to replicate. There was also information missing on interventionist, coach, and participant description of demographics for four studies. Without enough demographic information, researchers are not able to make decisions about whom these interventions on communication and challenging behavior serve best. There was a lack of reporting for the maintenance and generalization for the majority of studies included. This is a key part of the study as it allows researchers to observe objectively whether the intervention was able to last over time and in different settings, people, and materials. Lastly, social validity was not reported for more than half of the studies. Social validity is crucial for ensuring researchers are making an impact with stakeholders that goes beyond the scope of their personal research agenda.

Future research would encourage researchers to use reporting demographics for participants and interventionists involved. More and better reporting needs to be included in studies to inform practitioners and researchers about the study itself and to allow for replication of studies.

The single case study on individuals with ASD using a parent coaching telepractice intervention with culturally responsive practices indicates acceptable for families from Spanish speaking backgrounds. Results showed an increase in parent use of strategies and child communication outcomes in two different languages. There were increases on the graph for child communication and parent use of strategies with the exception of modeling and prompting, as intended. Effect sizes showed promising results with strong and moderate effects for children

(NAP= .97, .95, and .85). There were also significant positive correlations for parent use of incentivizing communication and moderate to low correlations on the use of expanding. This study expanded from previous research with the inclusion of the culturally responsive strategies implemented including the questionnaire.

The implications for this study working with a population diagnosed with ASD from CLD backgrounds would be to use naturalistic contexts for increase of generalization and social reinforcement for participants. In addition, gaining information beyond the child and about their family background could help with building rapport and meeting the needs of families. Some limitations for this study were internet access and speed for parents. There were also issues with researchers ensuring that the strategies were being implemented outside of the recording session. Lastly, the small sample size was not able to generalize the conclusion for all children with ASD. Future recommendations include the use of parent coaching strategies with participants from culturally and linguistically diverse backgrounds who are older. In general, this area needs more literature. Future studies could also focus on other natural settings such as recreational areas and additional behaviors.