PREPARING BEHAVIORAL INTERVENTIONISTS FOR INDIVIDUALS WITH AUTISM SPECTRUM DISORDER VIA TELEPRACTICE

A Dissertation

by

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ABSTRACT

The prevalence of autism spectrum disorder (ASD) in the United States has increased exponentially within the past decade. The increasing prevalence has strained the current delivery system, resulting in a service-need gap. Identification of effective and efficient means of preparing ASD interventionists in evidence-based practices is necessary to address this gap. Telepractice, or instruction and support delivered using communication technologies (e.g., videoconferencing, online modules, and computerized software programs), has emerged as means of reducing this service-need gap by addressing barriers to obtaining quality training. To further the literature base, this dissertation contains two studies. The purpose of the first study was to synthesize the empirical literature on the use of telepractice to prepare ASD interventionists. The first study assessed the quality of the literature and identified future research priorities. A systematic search identified 12 studies for inclusion in the review. The 12 studies delivered training programs to 83 ASD interventionists, with reported improvements in interventionists' skill reported for all 12 studies. The review also assessed the research quality of nine of the 12 included studies by applying researcher developed rubrics to evaluate the studies' research rigor and effects of the trainings. None of the nine evaluated studies met all of the quality indicators for either group or single-case methodology.

The second study evaluates the effects of a telepractice pyramidal training package on coaches' and interventionists' implementation of incidental teaching, as

measured by the percentage of procedural steps completed and the number of communication opportunities offered. The effect of incidental teaching on students' subsequent requesting behaviors was also obtained. Coaches were first taught to implement incidental teaching and then taught subsequent interventionists. The training package consisted of an online module, interventionist video self-evaluation, and feedback provided on interventionist self-evaluation via videoconferencing. Following the telepractice training program, coaches and interventionists reached the preset performance criteria and implemented incidental teaching with high fidelity. Generalization probes indicated that both coaches' and the interventionists, for whom generalization was assessed, generalized their skills to a new setting. All of the child participants increased their requesting behavior above baseline levels.

DEDICATION

To all the children and families I have been fortunate to meet. Your perseverance, strength, and love are a daily inspiration to me. I can only hope my work will be meaningful for you.

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NOMENCLATURE

ABA	Applied Behavior Analysis
ASD	Autism Spectrum Disorder
BACB	Behavior Analysis Certification Board
BCBA	Board Certified Behavior Analyst
CBRS	Child Behavior Rating Scale
CEC	Council for Exceptional Children
CDC	Center for Disease Control
DTT	Discrete Trial Teaching
EBP	Evidence-based practice
ESDM	Early Start Denver Model
FA	Functional Analysis
FCT	Functional Communication Training
ID	Intellectual Disability
IOA	Interobserver Agreement
IRR	Interrater reliability
MBRS	Maternal Behavior Rating Scale
NAP	Non-overlap of all pairs
PDD-NOS	Pervasive Developmental Disorder – Not Otherwise Specified
RIT	Reciprocal Imitation Training

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CHAPTER I

INTRODUCTION

Autism spectrum disorder (ASD) is the most prevalent developmental disability in the United States, with a current estimate of 1 in 68 children diagnosed with the disorder (Center for Disease Control [CDC], 2014b). Core characteristics of the disorder include social-communication impairments and repetitive and restrictive behaviors and interests (Diagnostic and Statistical Manual-V, American Psychological Association, 2012). Individuals with ASD are at increased risk for poor academic performance, lower rates of employment, increased levels of challenging behavior, and reduced social engagement (Lord, Risi, & Pickles, 2004; Wilczynski, Trammell, & Clarke, 2013). Providing life time services to a single individual with ASD costs society more than $3 million, with a total cost of $35 billion per year (Ganz, 2007). Currently, there is no known cause or identified cure for the disorder (CDC, 2014a).

To mediate deficits of the disorder, early intensive intervention, founded on the principles of Applied Behavior Analysis (ABA), can lead to greater independence, higher employment rates, and improved overall performance (Kuppens & Onghena, 2012; Makrygianni & Reed, 2010; National Research Council, 2001). ABA is an evidence-based approach that applies the principles of behaviorism to the teaching of socially significant behaviors (Baer, Wolf, & Risley, 1968; Wong et al., 2013). Through systematic investigation of the variables that affect human behavior, the science of ABA focuses on the modification of the environment to improve socially significant behavior.

In practice, effective ABA programs should consist of two major components: assessment of behavior and intervention based on the assessment results (Steege, Mace, Perry, & Longenecker, 2007). To implement ABA programs, interventionists first identify a socially significant behavior and define the behavior so that it is observable and measurable. Using the operationalized behavior, assessments are conducted to inform the development of the intervention plan. Interventionists then apply research supported behavioral strategies and collect ongoing data to evaluate the effectiveness of the interventions (Steege et al., 2007). Best practices in ABA treatment consist of both highly controlled teaching (i.e., discrete trial teaching) and the incorporation of teaching into ongoing activities (i.e., naturalistic interventions; Hsieh, Wilder, & Abellon, 2011; McGee, Kratnz, Mason, & McClannahan, 1983; Schepis, Reid, Fitzgerald, Faw,Van Den Pol, & Welty, 1982). With extensive research supporting its effectiveness for individuals with ASD, programs based on the principles of ABA are considered the treatment of choice for ASD (Wong et al., 2013).

To facilitate correct implementation of ABA, a specialist (i.e., Board Certified Behavior Analyst [BCBA], behavioral therapist, speech language pathologist, special educator, or psychologist), skilled in the implementation of ABA practices, is often required. Unfortunately, while the number of children and youth receiving special education services for ASD during the 2011-2012 school year was approximately 448,000, there is a well-documented shortage of specialists available to support and teach them (Barton, Moore, Squires, 2012; Cancio, Albrecht, & Johns, 2013; Stinnett, Bui, & Capaccioli, 2013). In the latest estimate of available BCBAs, the Behavior

Analyst Certification Board (BACB) cited over 8,569 BCBAs worldwide (BACB, 2011). With the increasing demand for services and shortage of trained professionals, researchers have investigated various dissemination models to prepare parents and service providers as interventionists to supplement the current services.

Preparing ASD Interventionists

A substantial literature base demonstrates the effectiveness of teaching ABA assessment and intervention skills to parents of children with ASD (e.g., Lang, Machalicek, Rispoli, & Regester, 2009; Patterson, Smith, Mirenda, 2011), educators of students with ASD (e.g., Machalicek et al., 2009b), and therapists of students with ASD (e.g., behavioral therapists, occupational therapist, speech language pathologist; Vismara, Young, Stahmer, Griffith, McMahon, & Rogers, 2009). These programs (termed "training programs" within the extant literature; e.g., Heitzman-Powell, Buzhardt, Ruisko, & Miller, 2014; Vismara, Young, Stahmer, Griffith, & Rogers, 2009; Vismara et al., 2012; Vismara, McCormick, Young, Nadhan, & Monlux, 2013; Wainer & Ingersoll, 2014) have resulted in positive outcomes for the interventionists, with improved behavior(s) for the child/student with ASD (Barton-Arwood, Morrow, Lane, & Jolivette, 2005; Madzharova, Sturmey, Jones, 2012; Sarokoff & Sturmey, 2008).

Despite the success of training programs to improve interventionists' skills, interventionists rarely maintain skills following the initial training (Robinson, 2011; Schepis, Reid, Ownbey, & Clark, 2003). To support sustained behavioral change quality training programs which include didactic experiences and provide ongoing support and feedback have shown to be effective (Buzhardt & Heitzman-Powell, 2005; Gross,

Duhon, & Doerksen-Klopp, 2014). During didactic training, experts provide instructions, model the targeted skills, allow for learners to practice the skill, and provide feedback on the learners' performance (Ward-Horner & Sturmey, 2012). Following the didactic training, ongoing support and feedback is often necessary to ensure maintenance of the skills and generalization to authentic settings (Machalicek et al., 2010; Wainer & Ingersoll, 2014). However, there are numerous barriers and factors that can prevent access to these quality training programs.

Significant and often cited barriers include the time and monetary investments necessary to access quality training (Kunnavantana, Bloom, Samaha, & Dayton, 2013; Wainer & Ingersoll, 2013). Parents, educators, and therapists all report difficulty in managing daily demands to allow for time to dedicate to training programs (Wainer & Ingersoll, 2013). In addition, funding shortages within the schools and clinics, as well as family budgetary considerations, lead most training to be conducted within a one-time workshop format (Kunnavantana et al., 2013; Lang & Fox, 2003; Robinson, 2011). While workshops allow for many people to be taught at one time in a cost and time efficient manner, they are consistently deficient in producing lasting behavioral change (Robinson, 2011; Schepis et al., 2003). It is vital to identify efficient means of providing effective training in a manner that is sustainable, usable, feasible, and portable (Gross et al., 2014).

Telepractice

Recent literature has focused on the use of telepractice technologies as a means of delivering quality training programs to interventionists (Wainer & Ingersoll, 2013).

Telepractice uses communication technologies (e.g., online modules, videoconferencing, and computerized software programs; Vismara et al., 2012), to allow for a specialist to provide training to interventionists in geographically separate locations. Telepractice can allow specialists to maximize resources by providing instruction to a greater number of people with inexpensive equipment (Heitzman- Powell et al., 2014; Wacker et al, 2013a; Wacker et al, 2013b). Telepractice technologies also have the potential to better accommodate busy lifestyles and routines with flexible training times, schedules, and locations (Vismara et al., 2013; Wainer & Ingersoll, 2013).

To date, telepractice has been used to prepare parents (e.g., Suess et al., 2014), educators (e.g., Gibson, Pennington, Stenhoff, & Hopper, 2010) and therapists (e.g, behavioral therapists, occupational therapist, speech language pathologist; Vismara et al., 2009) as interventionists for individuals with ASD. Participants have been taught behavioral principles (e.g., Heitzman-Powell et al., 2014), naturalistic teaching strategies (Baharav & Reiser, 2010; McDuffie et al., 2014), discrete trial teaching (Hay-Hansson & Eldevik, 2013), functional communication training (Gibson et al., 2010; Suess et al., 2014), preference assessments (Machalicek et al., 2009b), behavioral assessments (Machalicek et al., 2010; Wacker et al., 2013a), and comprehensive intervention models such as the Early Start Denver Model (Vismara et al., 2009; Vismara et al., 2012; Vismara et al., 2013). Within the literature, telepractice training programs typically consist of two major components: online instruction and tele-coaching.

Online Instruction

Online instruction is a popular means of disseminating academic and conceptual knowledge to a large audience (Heitzman-Powell et al., 2014). The portability and cost efficiency of online instruction has made it an appealing alternative to face-to-face training (Jang, Dixon, Tarbox, Granpeesheh, Kornack, & de Nocker, 2012). Recent investigations of online instruction have validated its effectiveness in teaching both parents and therapists ABA principles (Granpeesheh, Tarbox, Dixon, Peters, Thompson, & Kenzer, 2010; Jang et al., 2012). Online instruction has also been used as an important element in preparing interventionists to implement assessments and interventions for individuals with ASD (Vismara et al., 2009). Elements of effective online instruction typically consist of interactive learning activities (e.g., Hamad et al., 2010; Heitzman-Powell et al., 2014), step-by-step instructions (e.g., Vismara et al., 2009), and video models and exemplars (e.g., Hamad et al., 2010; Vismara et al., 2009).

Tele-coaching

Although online instruction can be effective in providing declarative knowledge, practice opportunities, with individualized feedback, is often necessary to ensure accurate implementation of the targeted skills (Machalicek et al., 2009a). Coaching via videoconferencing (tele-coaching), characterized by an expert providing support at a geographically separate location from the leaner, has emerged as a means of complementing online instruction to ensure trainee's fidelity in implementing EBPs (Boisvert, Lang, Andrianopoulos, & Boscardin, 2010; Nelson & Palsbo, 2006). Tele-coaching has shown to be as effective as on-site training (McDuffie et al., 2013). Tele-

coaching can also help surmount some of the barriers to obtaining high-quality training, with decreased training costs, flexible training times, and enhanced portability of the training (Heitzman- Powell et al., 2014; Wacker et al, 2013a; Wacker et al, 2013b; Wainer & Ingersoll, 2013).

Pyramidal Training

Although telepractice can overcome some of the barriers of distance and cost of training, the use of telepractice has depended on a service delivery model where a specialist provides the individualized feedback to service providers. With the increasing shortage of skilled specialists, this dependence on an outside consultant can lead to delays in training, and leave parents, educators, and therapists susceptible to controversial, ineffective, or potentially harmful treatments (Simpson, 2005). Therefore, there is a need to build a sustainable method of ongoing support and feedback to complement restricted specialist resources (Graff & Karsten, 2012).

One method of building a sustainable training model within an organization is with the use of a pyramidal training model. Pyramidal training (i.e., train-the-trainer) involves a specialist teaching a small group of individuals within an organization (coaches). Once these coaches have reached performance criteria, they are then prepared by the specialist to teach other interventionists within the organization (McCahill, Healy, Lydon, & Ramey, 2014; Page, Iwata, & Reid, 1982). Pyramidal training has been used to prepare individuals in a number of evidence-based practices: preference assessments (e.g., Pence, St. Peter, & Tetreault, 2012), behavioral assessments (e.g., Pence, St. Peter, & Giles, 2014), behavioral interventions (e.g, Page et al., 1982), and behavior

management (e.g., Jones, Fremouw, Carples, 1977). Pyramidal training has been proven effective in preparing parents (e.g., McGimsey, Greene, & Lutzker, 1995), educators (e.g., Pence et al., 2014), and therapists (e.g, Schlosser, Walker, & Sigafoos, 2006) in evidence-based procedures. Research supports that a pyramidal training model may be an effective means of building a sustainable training model within an organization and assist in the dissemination of evidence-based practices. However, to date, no studies have investigated the implementation of a pyramidal training model with telepractice technologies.

Research Questions

Telepractice has emerged as potentially viable means of preparing interventionists for supporting and teaching individuals with ASD. With the current prevalence of ASD and increasing service-need gap, identification of effective and efficient means of preparing interventionists in EBPs for individuals with ASD is necessary. To further the literature base in this area, this dissertation has the following objectives:

1. Evaluate the research quality of the literature base supporting the use of telepractice to prepare interventionists working with individuals with ASD.
2. Determine the effectiveness of implementing a pyramidal training model to prepare interventionists to implement incidental teaching procedures using telepractice.
3. Evaluate the distal effects of the use of a telepractice training program on child communication goals.

This dissertation aims to answer the following research questions:

1. What is the quality of the extant literature supporting the use of telepractice in preparing educators, therapists, and parents to implement interventions and assessment for individuals with ASD?
2. What is the effect of preparing coaches in incidental teaching via telepractice on their implementation of incidental teaching strategies?
3. What is the effect of preparing coaches in incidental teaching via telepractice on their generalization of incidental teaching strategies to untrained settings?
4. What is the distal effect of preparing coaches to implement incidental teaching via telepractice on student requesting behavior?
5. What is the effect of preparing interventionists to implement incidental teaching via pyramidal training on their implementation of incidental teaching strategies?
6. What is the effect of preparing interventionists to implement incidental teaching via pyramidal training on their generalization of incidental teaching strategies to untrained settings?
7. What is the distal effect of preparing interventionists to implement incidental teaching via pyramidal training on student requesting behavior?

To answer these research questions, this dissertation consists of two papers in journal article format. The first article analyzes the quality of the literature supporting preparing interventionists for individuals with ASD via telepractice using quality indicators adapted from Reichow, Volkmar, and Cicchetti (2008) and informed by the *Council for Exceptional Children Standards for Evidence-based*

Practice in Special Education (2014). The second article is a single-case study that implements pyramidal training using a telepractice package to prepare coaches and interventionists to implement incidental teaching procedures. As part of the second article, impacts of the program on child outcomes are evaluated.

CHAPTER II

PREPARING AUTISM SPECTRUM DISORDER INTERVENTIONISTS VIA TELEPRACTICE: A REVIEW OF RESEARCH QUALITY

The increasing prevalence of ASD has provoked widespread public interest and concern (McDonald, Pace, Blue, & Schwartz, 2012). The prevalence of ASD in the U.S. has increased 114% in the past decade, from 1 in 150 (CDC, 2007) to 1 in 68 children diagnosed with the disorder (CDC, 2014b). Similar prevalence rates have been described worldwide, and ASD is reported to affect people across all ethnicities, races, and socioeconomic groups (Durkin et al., 2010). Although scientists have identified certain risk factors for ASD, there is no known cause and no identified cure (CDC, 2014a).

Despite the uncertainty surrounding the cause and cure, early identification and intensive intervention can mitigate symptoms of the disorder (National Autism Center, 2009). Early intensive intervention, using ABA, can lead to significant gains in cognitive and adaptive skills (Kuppens & Onghena, 2012; Makrygianni & Reed, 2010; National Research Council, 2001). ABA is a scientific approach, based on the theory of behaviorism, which focuses on the systematic teaching of socially significant behavior (Baer et al., 1968) using operant conditioning. To facilitate correct implementation, a specialist (i.e., BCBA, behavioral therapist, speech language pathologist, special educator, or psychologist), skilled in the implementation of ABA practices, is often required. However, the increasing prevalence of ASD has generated a gap between available resources and consumer demand (Wainer & Ingersoll, 2013).

The service-need gap is a habitual problem in health care and education, and various service models have been researched to address this gap (Hersh et al., 2002; Nelson & Palsbo, 2006). For decades, the medical field has investigated the use of telemedicine as a means of extending the reach of health care providers (Augestad & Lindsetmo, 2009). Following telemedicine, telehealth has expanded the use of distance technology to the dissemination of other services, such as psychological and psychiatric services (Elford et al., 2000; Tousignant, Boissy, Corriveau, & Moffet, 2006). In the educational field, telepractice, or the use of online instruction and videoconferencing, has expanded the accessibility of knowledge to populations that would have not been able to access that information due to geographical, time, or monetary barriers (Symon, 2001).

In the past ten years, researchers have begun to utilize telepractice to teach individuals to implement effective assessment and intervention practices for persons with ASD (Boisvert et al., 2010). A review by Boisvert and colleagues in 2010 identified five studies that utilized telepractice to support interventionists in conducting assessments (Machalicek et al., 2009a; Machalicek et al., 2009b; Machalicek et al., 2010) and implementing interventions for individuals with ASD (Gibson et al., 2010; Vismara et al., 2009). However, since their review, a number of studies have been published which further the literature base and investigate the use of telepractice to teach a varied population of interventionists including parents of individuals with ASD (e.g., Heitzman-Powell et al., 2014; McDuffie et al., 2013), behavioral therapists,(e.g., Wainer & Ingersoll, 2013), and educators of students with ASD (e.g., Hay-Hansson & Eldevik,

2013). With the increasing literature base, there is a need to update the previous review and focus on the use of telepractice as a means of delivering high quality training programs to interventionists of individuals with ASD.

While a systematic review of the literature base provides a narrative summary of the literature and identifies future research questions, a review of the quality of the literature summarizes the research rigor and strength of study outcomes and identifies needs for improvement in research design. This study provides both a descriptive review of the outcomes being targeted, training procedures and delivery methods, in addition to a review of the research quality focusing on research rigor and extent to which the outcomes were achieved. A review of this nature can inform the future research priorities and assess the status of this developing research base.

The purpose of this review is to synthesize the extant literature supporting the use of telepractice to prepare interventionists working with individuals with ASD. This review also aims to assess the quality of the research base and to identify future research priorities. The following research question is addressed:

1. What is the quality of the extant literature supporting the use of telepractice in preparing educators, therapists, and parents to implement interventions and assessment for individuals with ASD?

Method

To answer the research question, the following steps were conducted: (a) systematic search of electronic databases, (b) a screening of potential studies against pre-set inclusion criteria, (c) descriptive synthesis of the literature base, (d) evaluation of

study rigor by applying quality standards adapted from Reichow, Volkmar, and Cicchetti (2008) and informed by the Council for Exceptional Children (CEC; 2014).

Literature Search Procedures

A systematic search was conducted in the following online databases: ERIC (EBSCO), Medline Complete, Academic Search Complete, and Psychology and Behavioral Sciences Collection, and Psyc*INFO*. Publication year was not restricted, but results were limited to peer-reviewed research. Search terms to describe individuals with an ASD were combined with terms to describe telepractice. The terms for individuals with an ASD included 'Asperger', 'autis*', 'developmental disab*', 'ASD', and 'PDD-NOS'. The search terms to describe telepractice included 'telehealth', 'telepractice, 'videoconferenc*', 'telemedicine', 'distance train*', 'distance education', and 'teleconference'. This initial search, which was conducted in June 2014 with an update in October 2014, identified 189 studies.

The titles and abstracts of the resulting studies were reviewed against the preset inclusion criteria. A comprehensive list was compiled resulting in 31 articles for review against study inclusion criteria. The reference lists of the articles identified for inclusion were then hand-searched to identify additional studies that might meet the inclusion criteria. Finally, a hand search of the references from Boisvert et al. (2010) was conducted to ensure an exhaustive search. The reference search and hand search resulted in 53 additional articles for review against inclusion criteria.

Inclusion Criteria

To be included in this review, articles had to meet the following criteria: (1) be peer-reviewed and published in the English language; (2) use a form of telepractice to train a participant (e.g., parent, teacher, health care provider) working with an individual with ASD (inclusive of ASD, pervasive developmental disability, Asperger's syndrome, or an individual described as having "autistic" like behaviors); and (3) provide data pertaining to the participant's implementation of the intervention or assessment procedure. For the purpose of this review, telepractice training was defined as expert or specialist providing training to an interventionist using communication technologies (i.e., online instruction, videoconferencing software, or computerized software; Boisvert et al., 2010; Nelson & Palsbo, 2006; Vismara et al., 2012). Studies which combined in-situ instruction with telepractice instruction, in which the effects of the telepractice instruction could not be isolated, were excluded (i.e., Baharav & Reiser, 2010; McDuffie et al., 2013). Also excluded were studies which did not report interventionist outcomes (e.g. fidelity, accuracy, etc.) (i.e., Barretto, Wacker, Harding, Lee, & Berg, 2006; Wacker et al., 2013b). After applying the inclusion criteria to all identified articles, a total of 12 articles were included in this review.

Descriptive Synthesis

Each study was summarized according to the following variables: (a) characteristics of the participant with ASD (i.e., age, diagnostic information, gender), (b) characteristics of the interventionist (i.e., relationship to participant with ASD [teacher, parent, etc.], age, gender, and previous experience with the target assessment or

intervention), (c) dependent variables for the interventionist(s), (d) dependent variables for the participant(s) with ASD dependent variable(s), (e) telepractice delivery methods utilized (i.e., online module, videoconferencing, etc.), (f) description of the training procedures (e.g., video models, written instruction, verbal instruction), (g) duration of training, (h) outcomes for the interventionist(s), (i) outcomes for the individual(s) with ASD, (j) fidelity of independent variable implementation, (k) study design, (l) generalization, (m) maintenance, and (l) social validity.

Quality of Research Evaluation

Studies were reviewed for quality utilizing single-case and group design standards adapted from Reichow et al. (2008) and informed by the CEC quality indicators (2014). Reichow et al.'s evaluative method was specifically developed to evaluate and determine evidence-base practices for ASD, includes both internal and external validity measures, and allows for identification of specific areas of methodological strength and weaknesses. In order to provide more precise operational definitions for methodological rigor, modifications to Reichow et al.'s criteria, according to the latest CEC criteria, is proposed.

For both the group design standards and the single-case design standards the quality indicators were separated into primary indicators and secondary indicators. The primary indicators are intended to capture the research elements that are essential to establishing the validity of the study. For the primary indicators, each study was rated as either "M" (met criterion), "PM" (partially met criterion), or "NM" (criterion not met). The secondary indicators are to capture the research elements that are important but not

essential in establishing the validity of the study. Secondary indicators were rated on a dichotomous scale of "1" (criterion met) or "0" (criterion not met).

Within the primary indicators, two of the group and three of the single-case indicators were modified from Reichow et al.'s original criteria. The "participant information" indicator was revised in both of rubrics to outline the following criteria: participants' demographic information, information concerning the trainer's role, and information concerning trainee's previous experience with the skills being targeted (can be satisfied with baseline data). This adaptation aligns with the purpose of this review to focus on the interventionist's demographic information.

The "independent variable" indicator was also expanded in both rubrics to include requirements that the study describe the materials necessary to conduct the training (e.g., web camera, laptops, and/or internet requirements), and that the researcher controls and systematically manipulates the independent variable. Although Reichow et al.'s original criteria does identify that the information concerning the intervention be provided with replicable definition, this additional language was added to further operationalize this indicator and to align it with the purpose of this review (e.g., preparing interventionists through telepractice), and to align with CEC (2014) standards.

The "experimental control" indicator was modified within the single-case rubric. Reichow et al.'s original criteria indicates that three demonstrations of experimental effect must occur at different times and that changes in the dependent variable must vary with the systematic manipulation of the independent variable to establish experimental effect. To further operationalize experimental control, this review added an additional

criterion: a study must use a single-case design capable of providing experimental control (i.e., ABAB, multiple-baseline, alternating treatments, or changing criterion). In addition, this indicator was adapted to include the requirement that a phase have a minimum of three measurement points to be considered eligible for offering evidence of experimental control (five if an alternating treatments design). Although this was not specifically stated in the original "experimental control" criteria, the "baseline" criterion does indicate that baseline phases must have a minimum of three measurement points, and this requirement for three measurement points (five if alternating treatments design) is consistent with other evaluative procedure (i.e., CEC, 2014).

The interobserver agreement (IOA) indicator was revised in both rubrics to include a requirement that IOA be collected for 20% of all sessions *within* each condition and across all raters, and participants. The group design "attrition" indicator was also adapted from the Reichow et al. criteria. Reichow et al.'s original criterion indicates that differential attrition must be less than 25% across comparison conditions. To further increase the rigor of the indicator and align it with other evaluative procedures (i.e., CEC, 2014), this was reduced to less than 10% differential attrition.

Additional information was also added to the "use of statistical test" criterion and "effect size" criterion within the group rubric to further operationalize the definitions., The following was added to the "use of a statistical test" criterion: define what constitutes an acceptable test "e.g., t tests, ANOVAs/MANOVAs, ANCOVAs/MANOVAs, hierarchical linear modeling, structural equation modeling". For the "effect size" criterion, the following was added to define what satisfies as an

acceptable effect size "e.g., Cohen's d, Hedge's G, Glass's Δ". These additions are consistent with the operationalized definitions offered by other criteria (i.e., CEC, 2014). The scoring rubric for the group design standards is presented in Table 1 and the single-case rubric is presented in Table 2.

Establishing Inter-rater Reliability

Inclusion criteria. A second independent rater reviewed 100% (n=189) of the studies during the title/abstract search. The second rater read each title and abstract and rated them as "1" for potential inclusion in the review or "0" does not meet criteria for inclusion in this review. Resulting inter-rater reliability (IRR) was calculated as the number of agreements divided by the sum of the agreements plus disagreements and multiplied by 100 to obtain a percent. The resulting IRR was 93% for the title/abstract review. Following the title/abstract review, a comprehensive list of articles identified by either rater as potentially meeting inclusion criteria was developed for a total of 31 articles resulting from the initial title/abstract review.

The 31 articles resulting from the initial title/abstract review and an additional 53 articles from the reference search were systematically rated for potential inclusion in this review. IRR was established for 100% of the articles (n=84). Each study was reviewed based on all three inclusion criteria and assigned a rating of "1" (meets criterion) or "0" ("does not meet criterion"). An overall rating of "1" (meet all the criteria) or "0" ("does not meet all of the criteria") was also assigned. IRR was calculated using a percent agreement measure by dividing the total agreements by the total sum of items reviewed and multiplying by 100. The agreement for whether an article was peer-reviewed and

published in the English language was 100%. The agreement for whether an article used a form of telepractice to train a participant working with an individual with ASD was 94%. The agreement for whether an article provided fidelity data was 92%. The overall agreement for whether or not to include an article was 99%. Following the calculation of IRR, the two raters reviewed the discrepancies and came to a collaborative consensus for a final IRR of 100%. After applying the pre-set criteria to all identified articles, a total of 12 articles met requirements for inclusion in this review.

Descriptive synthesis. A second independent rater coded 100% of articles (n=12) for a measure of IRR. There were a total of 144 opportunities to establish agreement (i.e., 12 articles with 12 variables). IRR was calculated by dividing the total number of agreements by the sum of the agreements plus disagreements and multiplying by 100 to obtain a percentage. There were 14 disagreements for a total IRR of 90%. Upon instances of disagreements, the first rater and second rater reviewed and came to a collaborative decision for a final IRR of 100% on the extracted data.

Study rigor. Prior to rating, the first rater and the second raters trained together by rating a single- case study and a group-design study independently and meeting to discuss discrepancies. After the initial rating, the first rater and the second raters coded 100% of the included articles for a measure of IRR. There were a total of 84 opportunities to establish agreement for the single-case studies (i.e., 6 articles with 14 quality indicators) and 48 opportunities to establish agreement for the group design studies (i.e., 3 articles with 16 quality indicators. IRR was calculated by dividing the total number of agreements by the sum of the agreements plus disagreements and

multiplying by 100 to obtain a percentage. There were 5 disagreements for a total IRR of 94% for the single-case studies and 3 disagreements for a total IRR of 94% for the group design studies. Upon instances of disagreements, the first rater and second rater reviewed and came to a collaborative decision for a final IRR of 100% on the quality ratings.

Results

Descriptive Review

Eight journals published the 12 articles included in this review. The highest concentration (*n*=4) was published in the *Journal of Autism and Developmental Disabilities.* Publication dates ranged from 2009 to 2014. Table 3 summarizes each study with respect to the participant characteristics, dependent variables, telepractice delivery method, description of the interventionist training program, outcomes for the interventionists, and outcomes for the individual(s) with ASD.

Participant characteristics. A total of 83 interventionists participated across the 12 studies. Four of the 12 studies taught teachers of individuals with ASD (33%; Gibson et al., 2010; Hay-Hansson & Eldevik, 2013; Machalicek et al., 2009b; Machalicek et al., 2010), and six included parents of a child diagnosed with ASD (50%; Heitzman-Powell et al., 2014; Suess et al., 2014; Vismara et al., 2012; Vismara et al., 2013; Wacker et al., 2013a; Wainer & Ingersoll, 2014). One study taught both therapists (e.g., occupational therapist, behavior analyst, psychologist, and speech language pathologist) and teachers of individuals with ASD (8%; Vismara et al., 2009). One study taught both parents of a

child with ASD and therapists working with children with ASD in a clinical setting (8%; Wainer & Ingersoll, 2013).

Seven of the studies reported the gender of their participants (Gibson et al., 2010; Machalicek et al., 2010; Vismara et al., 2012; Vismara et al., 2013; Wacker et al, 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014), with 54 of the 83 interventionists being female (65%). Four of the studies reported ages for their interventionists with an average age of 33 years (range 22-47 years; Heitzman-Powell et al., 2014; Machalicek et al., 2010; Suess et al., 2014; Wacker et al., 2013a). Ten out of the 12 studies (83%) reported whether the interventionists had prior knowledge on the targeted skills prior to their study. Two of the studies provided descriptive data in the participant information section by stating the participants had no prior experience (Machalicek et al., 2009b; Wacker et al., 2013a). Three provided results from skill assessment (i.e., pre-test or baseline performance data) prior to the introduction of the training program (Heitzman-Powell et al., 2014; Vismara et al., 2013; Vismara et al., 2012). Five provided both descriptive data and assessment data regarding interventionists' prior knowledge (Hay-Hansson & Eldevik, 2013; Machalicek et al., 2010; Vismara et al., 2013l; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). Eleven of the studies also included a total of 67 individuals with ASD as participants (92%; Gibson et al., 2010; Hay-Hansson & Eldevik, 2013; Machalicek et al., 2009b; Machalicek et al., 2010; Suess et al., 2014; Vismara et al., 2009; Vismara et al., 2012; Vismara et al., 2013; Wacker et al., 2013a; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). Five of the studies reported the gender for the participants with ASD (42%; Gibson et al., 2010; Machalicek et al.,

2009b; Suess et al., 2014; Vismara et al., 2012; Wainer & Ingersoll, 2013) with 16 male and 8 female participants. Ten of the studies reported the age of their participants with ASD (83%; Gibson et al., 2010; Machalicek et al., 2009b; Machalicek et al., 2010; Suess et al., 2014; Vismara et al., 2009; Vismara et al., 2012; Vismara et al., 2013; Wacker et al., 2013a; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). The average reported age of the participants was 3.6 years (range 1.3 – 9 years).

Dependent variables. Across the 12 studies, four prepared interventionists to implement assessments (Heitzman-Powell et al., 2014; Machalicek et al., 2009b; Machalicek et al., 2010; Wacker et al., 2013a), and nine studies focused on behavioral intervention and teaching strategies (Gibson et al., 2010; Hay-Hansson et al., 2013; Heitzman-Powell et al., 2014; Suess et al., 2014; Vismara et al., 2009; Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). Of the four studies that included assessments, two taught interventionists to conduct a preference assessment (Heitzman-Powell et al., 2014; Machalicek et al., 2009b), and two taught interventionists to conduct a functional analysis of challenging behavior (17%; Machalicek et al., 2010; Wacker et al., 2013a). A total of five different strategies were taught across the nine studies focused on behavioral intervention and teaching strategies: functional communication training (Gibson et al., 2010; Suess et al., 2014), discrete trial teaching (Hay-Hansson et al., 2013), Early Start Denver Model (Vismara et al., 2013; Vismara et al., 2012; Vismara et al., 2009), reciprocal imitation training (Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014), and other behavioral teaching strategies (e.g., prompting, shaping, and reinforcement procedures; Heitzman-Powell et al., 2014).

Nine of the 12 studies (75%) reported outcomes for participants with ASD whose interventionists were trained via telepractice. Over half of those studies (n=5;56%) focused on social communication behaviors (e.g., spontaneous verbalizations, prompted verbalizations, and joint attention; Vismara et al., 2009; Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). Three of the nine studies (33%) collected data on the participants' challenging behavior (e.g., elopement, aggression, and property destruction; Gibson et al., 2010; Wacker et al., 2013a), and one study (11%) reported the outcomes of preference assessments for the participants with ASD (Machalicek et al., 2009b).

Telepractice delivery method. The 12 studies used a combination of four different delivery methods for their training programs: online modules, videoconferencing, online modules with videoconferencing, and DVD with videoconferencing. Half of the studies (*n*=6) used videoconferencing only to prepare interventionists (Gibson et al., 2010; Hay-Hansson & Eldevik, 2013; Machalicek et al., 2009b; Machalicek et al., 2010; Suess et al., 2014; Wacker et al., 2013a). The other six studies were split between online modules (n=1; Wainer & Ingersoll, 2013), videoconferencing with online modules (*n*= 3; Heitzman-Powell et al., 2014; Vismara et al., 2013; Wainer & Ingersoll, 2014) and DVDs with videoconferencing (n= 2; Vismara et al., 2009; Vismara et al., 2012).

Description of the training program. The procedures used to teach interventionists varied across the 12 studies in regards to duration and instructional elements. While all of the studies utilized telepractice to deliver the instruction, 11 of the

studies provided one-on-one instruction (92%; Gibson et al., 2010; Hay-Hansson & Eldevik, 2013; Heitzman-Powell et al., 2014; Machalicek et al., 2009b; Machalicek et al., 2010; Suess et al., 2014; Vismara et al., 2013; Vismara et al., 2012; Wacker et al., 2013a; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014), and one provided group instruction (8%; Vismara et al., 2009). The number of instructional sessions varied from between studies, with 11 of the studies reporting the total duration of the training program. Reported instructional times ranged from 40 minutes to 44 hours. Most of the programs included more than one session (*n*=11, 92%; Hay-Hansson & Eldevik, 2013; Heitzman-Powell et al., 2014; Machalicek et al., 2009b; Machalicek et al., 2010; Suess et al., 2014; Vismara et al., 2013; Vismara et al., 2012; Vismara et al., 2009; Wacker et al., 2013a; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). While all of the programs included some form of didactic instruction (i.e., instructor led verbal and written instruction), six of the studies delivered the didactic instruction via videoconferencing (50%; Gibson et al., 2010; Hay-Hansson & Eldevik, 2013; Machalicek et al., 2009b; Machalicek et al., 2010; Suess et al., 2014; Wacker et al., 2013a), with four using online modules to provide the didactic instruction (33%; Heitzman-Powell et al., 2014; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014), and two providing DVDs to participants prior to videoconferencing (Vismara et al., 2009; Vismara et al., 2012). For example, Wacker et al. (2013) met with their interventionists for a one hour pre-assessment meeting prior to coaching while they conducted a functional analysis. During this pre-assessment meeting, the interventionists were provided verbal and written instruction regarding behavioral assessment rationale

and procedures. In contrast, Heitzman-Powell et al. (2014) had the interventionists complete an online module prior to meeting with the trainer via videoconferencing. They then used the videoconferencing sessions to provide performance feedback on interventionists' implementation of behavioral strategies (e.g., prompting and reinforcement).

Instructional elements included a combination of: (a) verbal instruction, (b) written instruction, (c) modeling, (d) role-play, (e) performance feedback, (f) question and answer, (g) video examples, and (h) interactive learning activities (e.g., assessing others' ability to implement reciprocal imitation training; Wainer & Ingersoll, 2013). Ten of the studies used verbal instruction (83%; Gibson et al., 2010; Hay-Hansson & Eldevik, 2013; Heitzman-Powell et al., 2014; Suess et al., 2014; Suess et al., 2014; Vismara et al., 2012; Vismara et al., 2009; Wacker et al., 2013a; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014) and 10 incorporated written instruction (83%; Gibson et al., 2010; Heitzman-Powell et al., 2014; Machalicek et al., 2009b; Suess et al., 2014; Suess et al., 2014; Vismara et al., 2012; Vismara et al., 2009; Wacker et al., 2013a; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). Also commonly used by a majority of studies was performance feedback (n = 10; 83%; Gibson et al., 2010; Hay-Hansson & Eldevik; Heitzman-Powell et al., 2014; Machalicek et al., 2009b; Machalicek et al., 2010; Suess et al., 2014; Suess et al., 2014; Vismara et al., 2012; Vismara et al., 2009; Wainer & Ingersoll, 2014)

Verbal instruction typically included the rationale of the intervention or assessment (Heitzman-Powell et al., 2014; Suess et al., 2014; Vismara et al., 2009;

Vismara et al., 2012; Vismara et al., 2013; Wacker et al., 2013a; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014), introduction to the components of the intervention (Gibson et al., 2010; Hay-Hansson et al., 2013; Heitzman-Powell et al., 2014; Suess et al., 2014; Vismara et al., 2009; Vismara et al., 2012; Vismara et al., 2013; Wacker et al., 2013a; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014), or prompting during the implementation of the assessment or intervention (Wacker et al., 2013a).

Written instructions included instructions outlining the implementation of the assessment or intervention (e.g., checklists, step-by-step instructions; Gibson et al., 2010; Machalicek et al., 2009b; Vismara et al., 2009; Vismara et al., 2012; Vismara et al., 2013; Wacker et al., 2013a) and instruction on the rationale and support for the intervention or assessment (Heitzman-Powell et al., 2014; Suess et al., 2014; Vismara et al., 2009; Vismara et al., 2012; Vismara et al., 2013; Wacker et al., 2013a; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014).

Across the 12 studies, nine of the studies provided immediate one-on-one targeted performance feedback to the interventionists after viewing a live demonstration of the skill with a child participant (Gibson et al., 2010; Hay-Hansson et al., 2013; Heitzman-Powell et al., 2014; Machalicek et al., 2009b; Machalicek et al., 2010; Suess et al., 2014; Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2014). One of the participants in a study by Wainer and Ingersoll (2014) received delayed performance feedback rather than immediate performance feedback due to internet connectivity issues. One study provided performance feedback in a group setting rather

than one-on-one and used role-play with an interventionist acting as a child (Vismara et al., 2009).

Less commonly used instructional elements included: modeling (*n* = 3, 25%; Gibson et al., 2010; Hay-Hansson & Eldevik; Wacker et al., 2013a), role-play (*n* = 1, 8%; Gibson et al., 2010), interactive learning activities (*n* = 4, 33%; Heitzman-Powell et al., 2014; Vismara et al., 2009; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014), built in question and answer opportunities (*n* = 5; Heitzman-Powell et al., 2014; Suess et al., 2014; Vismara et al., 2012; Vismara et al., 2013; Vismara et al., 2009), and video examples (*n* = 5; Vismara et al. 2009, Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014).

Outcomes for the interventionists. All of the studies reported interventionists were able to implement the assessment or intervention with increased fidelity following the training program. Five of the studies established a pre-set performance criterion for their interventionists (Vismara et al., 2009; Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). Of those five studies, one reported that all of the interventionists met the performance criterion (20%; Vismara et al., 2012). Four studies reported that, while improvements were noted for all of the interventionists, some interventionists did not meet the performance criteria (Vismara et al., 2009; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). One study conducted a pre-experimental component analysis of training elements by evaluating interventionists' fidelity following two program phases: (a) self-directed website containing four online modules and (b) three videoconferencing sessions (Wainer &

Ingersoll, 2014). Results indicated that three of the five interventionists improved above baseline levels following the online modules, but all improved following the videoconferencing.

Outcomes for the individual with ASD. Although a majority of the studies reported that data were collected on outcomes for participants with ASD (n=10; 83%), outcomes in two studies were either not reported (Hay-Hansson & Eldevik, 2013) or could not be isolated for the participants with ASD (Vismara et al., 2009). For example, Vismara et al. (2009) assigned ten interventionists to two groups and compared the effects of a training program delivered through telepractice versus on-site. Although they collected data for the participants with ASD, the results were aggregated for the two groups and reported results combined. Therefore, the results for the telepractice group could not be isolated.

Of the eight studies where the outcomes for the participants with ASD could be isolated, five of the studies reported improvements in the targeted behaviors for all participants (63%; Gibson et al., 2010; Suess et al., 2014; Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2013), and one reported clear assessment outcomes (13%; Machalicek et al., 2009b). One study reported mixed results with some participants demonstrating improvements and some maintaining pre-intervention levels (13%; Wainer & Ingersoll, 2014). One study reported clear assessment outcomes for 18 of their 20 participants in terms of clear functions of their challenging behavior (13%; Wacker et al., 2013a).

Experimental design. Although all 12 articles reported outcomes for interventionists' regarding their implementation of an assessment or intervention, only nine employed an experimental design to systematically manipulate the independent variable (i.e., training program) and evaluate the effects on interventionists' treatment fidelity. Of the nine studies, 33% (*n*=3) used group design methodology and 66% (*n*=6) used single-case design. Of the group design studies, two studies employed a pre-experimental non-randomized pre/post design (Heitzman-Powell et al., 2014; Vismara et al., 2009), and one utilized a randomized group assignment design with pre/post analysis (Hay-Hansson & Eldevik, 2013). Hay-Hansson and Eldevik (2013) and Vismara et al. (2009) both aimed to evaluate the effects of delivering training via telepractice versus face-to-face. Both assigned participants to two groups (i.e., telepractice and face-to-face) and compared outcomes between the groups. Heitzman-Powell et al. (2014) had one group of participants and assessed their implementation of six behavioral skills (i.e, preference assessment, reinforcement procedures, structuring the environment, general skills, prompting, and shaping) both before their telepractice training program and after.

For the six studies utilizing single-case methodology, the majority (*n*=5; 83%) employed a multiple-baseline design across interventionists (Machalicek et al., 2010; Vismara et al., 2013; Vismara et al., 2012; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). Wainer and Ingersoll (2013) staggered the introduction of their training program across interventionists and assessed interventionists' implementation of reciprocal imitation training continuously throughout their study. The remaining study utilized a multi-element design without a baseline phase to evaluate parent's

implementation of functional communication training during sessions coached via videoconferencing versus sessions implemented independent of coaching (Suess et al., 2014).

Fidelity of training program. In regards to the fidelity with which the training programs were implemented, four of the 12 studies (33%) collected data on the implementation of their training program (Heitzman-Powell et al., 2014; Machalicek et al., 2010; Vismara et al., 2012; Vismara et al., 2013). In three of the studies, the coaches were trained to criterion on the training procedures prior to the intervention and fidelity data was collected throughout the study (Heitzman-Powell et al., 2014; Vismara et al., 2012; Vismara et al., 2013). For example, Heitzman-Powell had four pre-set performance criterions for their coaches before the coaches were able to teach other interventionists: 80% or higher on post-test measure, 85% reliability when scoring parent performance, 90% fidelity for delivering in-session coaching statements, and 100% fidelity on following the scripted manual. They then collected ongoing fidelity data on the coaches' adherence to the coaching procedures during the sessions they trained the interventionists. Similarly, during two studies conducted by Vismara and colleagues (2012; 2013), the coach was and trained to criterion on training procedures prior to the study and an independent rater collected fidelity data throughout the study. During the study conducted by Machalicek et al. (2010), the first author implemented the intervention and a second rater evaluated her adherence to performance feedback procedures throughout the study.

Maintenance and generalization. Five of the 12 studies (42%) collected maintenance data on interventionists' implementation of the targeted skills following the conclusion of the training phase (Hay-Hansson & Eldevik, 2013; Machalicek et al., 2010; Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2014). Follow-up probes ranged from one-week to three-months following the conclusion of the intervention. Three of the studies reported that skills maintained above baseline levels at a 6-week follow up for implementation of the Early Start Denver Model (Vismara et al., 2012), 2-month follow-up for discrete trial teaching (Hay-Hansson & Eldevik, 2014), and 3-month follow up for the Early Start Denver Model (Vismara et al., 2013). Two of the studies reported mixed results with some interventionists returning to baseline levels for conducting a functional analysis at 1- to 3-week follow-ups (Machalicek et al., 2010), and implementing reciprocal imitation training at 1- to 3-month follow-ups (Wainer & Ingersoll, 2014).

Only one study evaluated the generalization of the interventionists' skills. Hay-Hansson & Eldevik (2013) prepared eight interventionists to implement discrete trial teaching with children with ASD. At their two-month follow-up tests, three of the interventionists implemented with a new child as their original child had relocated during that time frame. While the numerical results are not presented, the authors report the interventionists generalized their discrete trial teaching skills to the new child.

Social validity. Social validity of the training programs was reported for six of the 12 studies (Heitzman-Powell et al., 2014; Machalicek et al., 2010; Vismara et al., 2009; Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2014). Five of

these studies (83%) utilized a Likert-type questionnaire ranging from either from one to five (Heitzman-Powell, 2014) or one to six (Vismara et al., 2009). Three studies used open-ended questions either in addition to a Likert-type questionnaire (Vismara et al., 2009; Wainer & Ingersoll, 2014) or as the primary means of evaluating social validity of the telepractice program (Vismara et al., 2012). Results were positive across all the studies with high acceptability for online modules (Heitzman-Powell et al., 2014; Vismara et al., 2013; Wainer & Ingersoll, 2014) and videoconferencing delivery methods (Heitzman-Powell et al., 2014; Machalicek et al., 2010; Vismara et al., 2013; Wainer & Ingersoll, 2014). In addition, Vismara et al. (2009) reported results of a social validity questionnaire in terms of variability between the groups assigned to the on-site training program versus the telepractice program. They found there was no difference in the satisfaction between the two groups.

Responses to the open ended questions found that interventionists found the video examples to be most helpful for learning the targeted intervention (Vismara et al., 2009; Vismara et al., 2012; Wainer & Ingersoll). Interventionists also identified performance feedback as a highly useful training procedure (Machalicek et al., 2010; Vismara et al., 2009). Vismara et al. (2012) also found that, while interventionists were initially concerned about the level of support available through telepractice, by the end of the study all of the interventionists reported that telepractice was as informative and valuable as face-to-face delivery methods. While interventionists in Wainer and Ingersoll (2014) and Vismara et al. (2009) did indicate that there were some technology issues throughout the studies, they reported these issues were easily remedied. Overall,

interventionists from Vismara et al. (2009) and Vismara et al. (2012) indicated that they would recommend telepractice approach to other parents of children with ASD.

Quality of Research Evaluation

As only nine of the 12 studies utilized an experimental design to evaluate the effect of a telepractice training program on interventionists' implementation skills, only those nine studies were evaluated for the quality of the research. Three of the studies were evaluated using the group design standards (Hay-Hansson & Eldevik, 2013;Heitzman-Powell et al., 2014; Vismara et al., 2009) and the remaining six were evaluated using the single-case standards (Machalicek et al., 2010; Suess et al., 2014; Vismara et al., 2013; Vismara et al., 2012; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014).

Quality of the group design studies. Table 4 presents the results of the quality of research evaluation for the three group design studies included in this review. The studies were reviewed and evaluated on whether both the primary indicators and secondary indicators.

Primary indicators. The studies were reviewed and evaluated on whether the eight primary indicators were met ("M"), partially met ("PM") or not met ("NM"), according to the criteria outlined in Table 1.

Participant information for trainees. For this indicator one of the three group studies (33%) met this criterion (Hay-Hansson & Eldevik, 2013). Of the two studies which did not meet this criterion, one did not provide the age and gender of the interventionists (Vismara et al., 2009) and one did not provide the gender of the

interventionists (Heitzman-Powell et al., 2014). However, all of the studies provided information regarding the interventionists' previous experience with the targeted intervention, the relationship between the interventionist and the individual with ASD, and information regarding the coach's role in the study.

Participant information for individuals with a disability. While two of the three studies collected data for both interventionists and the individuals with ASD (Hay-Hansson & Eldevik, 2013; Vismara et al., 2009), neither met the requirements for this indicator. Vismara et al. (2009) did provide the mean age of the children with ASD in the telepractice group, but did not provide the number of children with ASD in the telepractice group or the children's gender. Hay-Hansson and Eldevik (2013) did provide the total number of participants in the telepractice group, but the children's age could not be extracted for the telepractice group from the overall sample and gender was not provided.

Independent variable. Two of the studies (66%) met the minimum criteria for this indicator (Heitzman-Powell et la., 2014; Vismara et al., 2009). One study (Hay-Hansson & Eldevik, 2009) partially met this indicator as it was identified that addition information was necessary in order to replicate the study. For example, the authors mention that three discrete trial teaching programs (i.e., matching, receptive and expressive labeling) were discussed during the training. However, it was unclear if they targeted one program per session or all of the programs each session.

Control condition. None of the studies met the criteria for this indicator. While Hay-Hansson and Eldevik. (2009) and Vismara et al. (2009) did include two groups (i.e.,

training delivered via telepractice versus face-to-face), neither included a group that did not receive any instruction regarding the targeted skill. Heitzman-Powell et al. (2014) did not include any control or comparison group.

Dependent variable for trainees. All three studies met the criteria for this indicator. Expected interventionist behaviors were operationally defined as the implementation of discrete trial teaching (Hay-Hansson & Eldevik, 2013), the Early Start Denver Model (Vismara et al., 2009), or six behavioral skills (Heitzman-Powell et al., 2014). In addition, all three collected data at appropriate times throughout the study and included measures linked to the dependent variables.

Dependent variable for individuals with a disability. While two of the three studies collected data for both interventionists and the individuals with ASD (Hay-Hansson & Eldevik, 2013; Vismara et al., 2009), neither met the full requirements for this indicator. Vismara et al. (2009) partially met this indicator by reporting outcomes for the participants with disabilities, collecting data at appropriate times and linking the measures to the dependent variables. However, additional detail is needed to replicate the measures for the child social-communication behaviors. Hay-Hansson and Eldevik (2013) did state that they collected data for children with ASD, however, they did not report the outcomes.

Link between research question and data analysis. All three studies met the criteria for this indicator (Hay-Hansson & Eldevik, 2013; Heitzman-Powell et al., 2014; Vismara et al., 2009). The data was strongly linked to the research questions and used the correct unit of analysis. For example, Heitzman-Powell et al. (2014) had three

research questions regarding the training program's effect on parent's behavioral knowledge, parent's implementation fidelity, and parent's satisfaction with the training program. They utilized pre/post knowledge and skill assessments as well as a post-intervention satisfaction survey that were tied to their research questions.

Use of statistical test. None of the studies met the criteria for this indicator. While two of the studies did conduct statistical analyses (Hay-Hansson and Eldevik, 2013; Vismara et al., 2009), neither had an adequate sample size with five participants (Vismara et al., 2009) and seven participants (Hay-Hansson and Eldevik, 2013). The remaining study (Heitzman-Powell et al., 2014) did not conduct any statistical tests.

Secondary indicators. There were seven secondary indicators rated on a dichotomous scale of "1" met or "0" not met according to the criteria outlined in Table 1.

Random assignment. One of the three studies (33%) met this indicator by utilizing random assignment of participants to groups (Hay-Hansson et al., 2013). One study did not have more than one group (Heitzman-Powell, 2014) and one did not mention randomization of their participants into groups (Vismara et al., 2009)

Interobserver agreement. One of the three studies (33%) met this indicator by specifying that two independent observers assessed participants' skills for more than 40% of the pre-test sessions and 28% of the post-test sessions (Heitzman-Powell et al., 2014). Resulting reliability was above the 80% requirement. While the other two articles did collect reliability data across participants, with resulting coefficient above 80%, they

did not specify that the data was collected for 20% of sessions within each study condition (Hay-Hansson & Eldevik, 2013; Vismara et al., 2009).

Blind raters. One of the three studies specified their raters were blind to the treatment condition (Vismara et al., 2009). They also specified that the raters were blind to the study hypothesis and the training group (i.e., telepractice or face-to-face).

Fidelity. One of the three studies (33%) met this indicator by assessing the fidelity with which the training program was implemented (Heitzman-Powell et al., 2014). Heitzman-Powell et al. (2014) trained their coaches to meet fidelity criteria prior to the coaches training subsequent interventionists. They then collected ongoing data on the coaches' adherence to the coaching procedure throughout the study.

Attrition. All of the three studies met this indicator with less than 30% participant attrition (Hay-Hansson & Eldevik, 2013; Heitzman-Powell et al., 2014; Vismara et al., 2009).

Generalization or maintenance. One of the three studies (33%) assessed the maintenance and generalization of the interventionists' implementation of the targeted intervention following the conclusion of the training phase (Hay-Hansson & Eldevik, 2013). The 2-month follow-up indicated that interventionists' were able to maintain high levels of implementation fidelity of discrete trial teaching. As one child was not available during the follow-up, three of the interventionists implemented discrete trial teaching with a new child, and skill generalization was assessed. Although the authors did not provide quantitative data regarding the interventionists' generalization, they did report that the interventionists were able to generalize to the new student.

Effect size. None of the three studies reported effect sizes for their outcomes and, therefore, none of the three studies met the criteria for this indicator (Hay-Hansson and Eldevik, 2013; Heitzman-Powell et al., 2014; Vismara et al. 2009).

Social validity. All of the articles met the criteria for this indicator. Two of the studies met six of the seven social validity elements (i.e., persons are trained in socially important assessments or interventions, time and cost efficient training, change in participants' procedural fidelity that is practically significant, participants are satisfied with the training results, training conducted by someone who would typically train the participant, and a natural context for training; Heitzman-Powell et al., 2014; Vismara et al., 2009). The third study met five of the seven elements (i.e., persons are trained in socially important assessments or interventions, time and cost efficient training, change in participants' procedural fidelity that is practically significant, training conducted by someone who would typically train the participant, and a natural context for training; Hay-Hansson & Eldevik, 2014).

Quality of the single-case design studies. Table 5 presents the results of the quality of research evaluation for the six single-case design studies included in this review. The studies were reviewed and evaluated on both the primary indicators and secondary indicators.

Primary indicators. The studies were reviewed and evaluated on whether the eight primary indicators were met ("M"), partially met ("PM") or not met ("NM"), according to the criteria outlined in Table 1.

Participant information for trainees. For this indicator one of the six single-case studies (17%) met the criteria (Machalicek et al., 2010). While, all of the studies did report the relationship between the interventionist (i.e., trainee) and the participants with ASD, three of the studies (50%) did not report the gender of the interventionists (Suess et al., 2014; Vismara et al., 2012; Wainer & Ingersoll, 2014), and three of the studies (50%) did not report the age of the interventionists (Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2014). In addition, one of the studies did not report if the interventionists had any previous experience with the targeted skills (Suess et al., 2014).

Participant information for individuals with disabilities. While all of the studies collected data for both interventionists and the individuals with ASD, only one fully met the requirements for this indicator (Suess et al., 2014; Vismara et al., 2012). The other four studies did not meet the requirements for the criteria as they did not provide the gender of the participants with ASD (Machalicek et al., 2010; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014).

Independent variable. All of the studies (n = 6; 100%) met this minimum criteria for this indicator (Machalicek et al., 2010; Suess et al., 2014; Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). The six studies used a combination of three different delivery methods for their training programs: videoconferencing, online modules with videoconferencing, and DVD with videoconferencing. The training programs a combination of eight components: (a) verbal instruction, (b) written instruction, (c) modeling, (d) role-play, (e) performance

feedback, (f) question and answer, (g) video examples, and (h) interactive learning activities.

Dependent variable for individuals with a disability. Five of the six studies collected data for both interventionists and the individuals with ASD (83%; Suess et al., 2014; Vismara et al., 2013; Vismara et al., 2012; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). Four of the five studies met the full requirements for this indicator (88%; Suess et al., 2014; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014. Vismara et al. (2012) partially met this indicator by reporting outcomes for the participants with disabilities, collecting data at appropriate times and linking the measures to the dependent variables. However, additional detail is needed to replicate the measures for the child social-communication behaviors.

Baseline. One of the six studies fully met the requirements for this indicator (17%; Wainer & Ingersoll, 2014). Three of the studies partially met the indicator (50%; Vismara et al., 2013; Wainer & Ingersoll, 2013), while two of the studies did not meet this indicator (33%;Suess et al., 2014; Vismara et al., 2012). Three of the studies partially met this indicator by including a baseline phase and operationally defining the baseline conditions, however, one of the studies baseline conditions contained counter-therapeutic trends (Vismara et al., 2013), while two studies contained less than three data points in a baseline condition (Machalicek et al., 2010; Wainer & Ingersoll, 2013). While Vismara et al. (2012) did contain a baseline condition with more than three data points for each participant, some of the participant's demonstrated counter-therapeutic

trends and more detail was necessary to promote the replicability of the baseline procedures. One study (Suess et al., 2014) did not include a baseline condition.

Visual analysis. None of the studies fully met the requirements for this indicator. Three of the six studies partially met the requirements for this indicator (50%; Machalicek et al., 2010; Vismara et al., 2012; Wainer & Ingersoll, 2013) while three did not meet the requirements (50%; Suess et al., 2014; Vismara et al., 2013; Wainer & Ingersoll, 2014). Three of the studies partially met this indicator by containing less than 25% overlap between adjacent conditions, however, two of the studies did not demonstrate a large shift in level or trend for some of their participants (Vismara et al., 2012; Wainer & Ingersoll, 2013), while the data for Machalicek et al. (2010) demonstrated variability in level and trend. Vismara et al. (2013), the authors reported that they employed a multiple baseline design; however, the graph displays a series of A-B design so it is not possible to determine if there was a large shift in level or trend that corresponds to the systematic implementation of the independent variable. Suess et al. (2014) utilized an alternating treatments design to evaluate the effects of coached implementation versus independent implementation of functional communication training. While their results have significant social implications, there was no differentiation between the phases resulting in large overlap of data. Finally, the results for Wainer and Ingersoll (2013) indicate significant variability in the data in addition to shifts in level and trend

Experimental control. Three of the six studies fully met the criteria for this indicator (50%; Vismara et al., 2012; Wainer & Ingersoll, 2013; Wainer & Ingersoll,

2014), while three of the six studies did not met the criteria for this indicator (50%; Machalicek et al., 2010; Suess et al., 2014; Vismara et al., 2013). While all three of the studies that did not meet the indicator report that they utilized a single-case design capable of demonstrating experimental control, two did not demonstrate changes in the dependent variable with systematic manipulation of the independent variable as they utilized an alternating treatments design with no differentiation between phases (Suess et al., 2014), or reported a series of AB designs (Vismara et al., 2012). Machalicek et al. (2010) employed a multiple baseline design across participants, and participants in the multiple baseline design had less than three data points in some phases.

*Secondary indicators***.** There were six secondary indicators rated on a dichotomous scale of "1" met or "0" not met according to the criteria outlined in Table 2.

Interobserver agreement. One of the six studies (17%) met this indicator by specifying that two independent observers assessed participants' skills for more than 20% of the sessions within each condition (Machalicek et al., 2010). Resulting reliability was above the 80% requirement. While the other studies did collect reliability data, with resulting coefficient above 80%, it was specified that the data was collected for 20% of sessions within each study condition (Suess et al., 2014; Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014).

Kappa. None of the studies reported a kappa measure and did not meet this indicator.

Blind raters. Three of the six studies met this indicator and specified that raters were blind to the treatment condition (Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2014).

Fidelity. Four of the six studies (66%) met this indicator by assessing the fidelity with which the training program was implemented (Machalicek et al., 2010; Vismara et al., 2013; Vismara et al., 2012; Wainer & Ingersoll, 2013).

Generalization or maintenance. Three of the six studies (50%) met this indicator by assessing the maintenance of the interventionists' implementation of the targeted intervention following the conclusion of the training phase (Machalicek et al., 2010; Vismara et al., 2012; Vismara et al., 2013). None of the studies assessed the generalization of skill following the conclusion of the training phase.

Social validity. All of the articles met the criteria for this indicator. Four of the studies met six of the seven social validity elements (i.e., persons are trained in socially important assessments or interventions, time and cost efficient training, change in participants' procedural fidelity that is practically significant, participants are satisfied with the training results, training conducted by someone who would typically train the participant, and a natural context for training; Machalicek et al., 2010; Vismara et al., 2013; Vismara et al., 2012; Wainer & Ingersoll, 2014). One study five of the seven social validity elements (i.e, persons are trained in socially important assessments or interventions, time and cost efficient training, change in participants' procedural fidelity that is practically significant, training conducted by someone who would typically train the participant, and a natural context for training; Wainer & Ingersoll, 2013). One study

met four of the seven elements (i.e., persons are trained in socially important assessments or interventions, time and cost efficient training, training conducted by someone who would typically train the participant, and a natural context for training; Suess et al., 2014).

Discussion

This review synthesized 12 studies focused on the use of telepractice as a means of preparing ASD interventionists. The 12 studies telepractice studies delivered training programs to 83 ASD interventionists with reported increases in interventionists' skill for all 12 studies. This review also assessed the research quality of nine of the 12 included studies by applying researcher developed rubrics to evaluate the research rigor of the included studies and training effects. None of the nine evaluated studies met all of the primary quality indicators for either group or single-case methodology. Overall, this literature base can be best described as limited due to the small number of studies/participants and variability in the rigor of the included research.

Descriptive Review

The first purpose of this review was to summarize the extant literature on the use of telepractice to prepare ASD interventionists. Across the 12 studies telepractice technology was used to deliver training programs to 83 ASD interventionists. A variety of assessments and interventions were taught including preference assessment, functional analysis, functional communication training, discrete trial teaching, reciprocal imitation training, and the Early Start Denver Model. Training procedures included verbal and written instruction, modeling, role-play, performance feedback, question and

answer, video examples, and interactive learning activities. Training was delivered via online modules, videoconferencing, or DVDs. All of the studies reported that interventionists were able to implement the assessment or intervention with increased fidelity following the training program. However, results were reported as mixed in four studies as some participants needed additional training beyond the intervention to meet the authors' preset performance standards.

A training procedure used within 67% of the studies combined verbal/written instruction with performance feedback (Gibson et al., 2010; Heitzman-Powell et al., 2014; Suess et al., 2014; Vismara et al., 2009; Vismara et al., 2012; Vismara et al., 2013; Wacker et al., 2013a; Wainer & Ingersoll, 2014). Previous research supports the use of this training package, and in particular performance feedback, as an effective means of training ASD interventionists (Alvero, Bucklin, & Austin, 2001; Ward-Horner & Sturmey, 2013). Of the 12 studies included in this review, only two did not specify the use of performance feedback as a component of their intervention. Wacker et al. (2014a) provided synchronous coaching and prompting during parent implementation of a functional analysis and, therefore, may have provided some elements of performance feedback (i.e., error correction) within their coaching procedure. The second study, Wainer and Ingersoll (2013) assessed interventionist implementation fidelity following an online module with mixed results as some participants requiring additional individualized coaching and feedback to reach the implementation criteria. These results suggest performance feedback may be an active element necessary for effective training of ASD interventionists via telepractice. However, the effect of the individual training

elements is not known as a variety of procedures were used across the studies. Future research might address this issue by conducting component analyses to isolate the active training elements.

Beyond the instructional elements, other variables, such as the duration and the acceptability of the program, may influence the effectiveness of the training program. Strengths of this literature base are a majority of the studies reported the duration of the training program and half of the studies assessed the social validity of the program. While durations varied with the complexity of the skills being taught, the median duration of training was 3 hrs. This, combined with positive results from the social validity questionnaires, suggest that training via telepractice may be an efficient and acceptable means of preparing ASD interventionists.

Although all of the studies provided some demographic information regarding the interventionists, the descriptions were limited and typically did not include the age and gender of the participants, previous educational experience, or their previous experience with the skill being taught. As participant characteristics and previous experiences are likely to affect the success of the training, these descriptions are necessary to identify the populations for which the effects might generalize (Vismara et al., 2013; Wainer & Ingersoll, 2014). Interventionists' previous experiences may also correlate to implementation fidelity and the ease with which they acquire the skills (Vismara et al., 2013). Future researchers should provide comprehensive descriptions of interventionist participants to promote the external validity of this literature base and to serve as potential moderators of training effectiveness.

Quality Review

The second purpose of this review was to assess the quality of the research base and identify future research priorities. A total of nine articles were included in the quality review with three group design studies and six single-case studies. Studies were evaluated for their adherence to primary (those essential to establishing the internal validity of the study) and secondary indicators (important but not essential to establishing the internal validity of the study).For the group design studies, each study met three of the primary indicators and three of the secondary quality indicators. All of the studies met the indicator for the description of the dependent variable for the interventionist, and the link between the research questions and the statistical tests. None of the studies met the control group quality indicator as none employed a control group in their design. In regards to the secondary indicators, all of the studies met the requirement for the attrition indicator and social validity indicator, and none of the studies met the requirements for the effect size indicator as effect sizes were not included in the analyses.

For the single-case studies, none of the studies met all of the primary indicators (elements essential to establishing the study's internal validity) with an average of 3.3 indicators met (range 2-5). All of the studies met the indicator for description of the independent variable (i.e., training procedures). However, most notably, most of the studies did not meet the requirements for the description of the interventionists or the description of the participants with ASD. In particular, three studies did not report the gender of the interventionist (Suess et al., 2014; Vismara et al., 2012; Wainer &

Ingersoll, 2014), three did not report the interventionists' age (Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2014), and one did not report if the interventionists had previous experiences with the targeted skill (Suess et al., 2014). When considering the participant information for the participants with ASD, four of the studies did not include the gender of the participants with ASD (Machalicek et al., 2010; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). Future researchers should ensure the inclusion of this information as these factors can influence the effectiveness of the training and generalizability of the results to other populations, (Vismara et al., 2013; Wainer & Ingersoll, 2014).

In addition, due to the inclusion of less than five data points within each phase, counter therapeutic baseline data trends, and data overlap between baseline and intervention phases, most of the studies did not meet the requirements for the baseline indicator, visual analysis indicator, and experimental control indicator. All of these indicators are essential to establish a functional relationship between the intervention and the dependent variables. Future researchers might consider increasing the rigor of their experimental designs by including a baseline phase and collecting at least five data points within each phase. In addition, future researchers might consider establishing a maximum performance criterion to their interventionist inclusion requirements to address issues related to data overlap and counter therapeutic trends.

When considering the secondary indicators (the important but not essential indicators to establishing the internal validity of the study), studies using single-case methodology met an average of 2.8 secondary indicators (range 1 – 4). A majority of the

studies did not meet the indicators for the collection of interobserver agreement or kappa. In addition, only 50% of the studies met the indicators for blind raters and maintenance/generalization.

These overall results inform future researchers regarding the identified gaps in the extant literature and steps necessary to advance the empirical support for the use of telepractice in the preparation of ASD interventionists. In particular, both group researchers and single-case researchers should attend to providing detailed demographic information for both the interventionists and the participants with disabilities. There is also a need to increase the methodological rigor of the literature base. Group researchers should consider the addition of a control condition with random assignment to groups, while single-case researchers should rely on strong experimental designs capable of demonstrating experimental control (e.g., alternating treatments design with the addition of a baseline condition or multiple-baseline design with each phase having a minimum of three data points). Equally important, both group and single-case researchers should ensure reliability measures met or exceed current minimum standards.

Limitations and Implications for Research

While the literature base has advanced within the past five years, the existing literature is limited and varied in the training components and procedures. In addition, the results of the quality review highlighted a need to enhance the quality of the existing literature. Therefore, there are a number of limitations in the extant literature that may serve as suggestions for future research.

Most notably, none of the included articles met all of the primary quality indicators in either the group rubric or the single-case rubric. As these indicators were adapted from Reichow et al. (2008) and informed by the CEC (2014), these results indicate major limitations within the extant literature. Therefore, there is a need to evaluate telepractice training programs using rigorous experimental designs that allow for conclusions regarding the conclusiveness of the evidence

Second, a majority of the studies provided training using one-on-one instruction. This dependence on a specialist to deliver individualized training to interventionists may delay interventionists' access to quality training programs and leave interventionists susceptible to controversial or ineffective treatments. Future research might investigate ways to maximize specialist services by delivering training in small group formats, or capitalizing on available online trainings and supplementing with individualized feedback.

While this review highlights the potential use of telepractice to facilitate early intervention, the fact that all of the participants with ASD were preschool or elementary age limits the generalizability of the outcomes. It is not possible to conclude that similar results would be obtained for interventionists working with adolescents or adults with ASD. Therefore, future research might consider replicating or extending the previous research to include interventionists working outside of early childhood and evaluate variables (e.g., duration of training) that might impact the effectiveness of training programs delivered via telepractice for this population.

Finally, this review was limited to the information provided by the authors of the included articles within the confines of the published article. It is possible that the authors may not have provided all the information pertinent to the intervention. For example, some articles provided detailed descriptions of the participants with ASD and limited descriptions of the interventionists. These omissions may be due to publication restrictions or the availability of the data. Regardless of the reason, the conclusions of this review are constrained by the information provided and may not reflect the full extent of this literature base.

Implications for Practice

Given the documented shortage of ASD interventionists, this review demonstrates promise for the use of telepractice technology in practice. Overall, the use of telepractice to prepare ASD interventionists was linked to positive outcomes for the interventionists. In addition, improved behaviors were also noted for a majority of the participants with ASD. Therefore, the preliminary results suggest that telepractice may be an effective means of preparing ASD interventionists.

Of note, of the studies that assessed outcomes for the individuals with ASD, all of the studies included preschool and elementary aged children. These results are encouraging as previous research identifies that early intervention is correlated to improved functioning for individuals with ASD (Kuppens & Onghena, 2012; Makrygianni & Reed, 2010; National Research Council, 2001). Telepractice may facilitate early intervention by allowing specialists to serve those populations who were previously inaccessible due to the barriers of distance, time, and money. However,

considering that none of the participants were adolescents or adults with ASD, practioners should exercise caution when using telepractice to prepare ASD interventionists working with adolescents or adults with ASD.

With respect to the training components used, practioners may consider the use of didactic instruction including verbal/written instruction and individualized performance feedback. The combination of these training components appeared in the majority of the studies and was linked to increased implementation fidelity for the interventionists. In particular, individualized performance feedback may be an active element to effective training programs and verbal/written instruction may be necessary for more complex skills.

While results suggest that telepractice did lead to initial acquisition of skills, the results were mixed for the maintenance and generalization of the skills. Of the studies that collected maintenance data, 40% reported that the skills did not maintain (Machalicek et al., 2010; Wainer & Ingersoll, 2014). In addition, only one study reported generalization data with descriptive results that the interventionists generalized skills across their students (Hay-Hansson & Eldevik, 2013). Therefore, it is recommended that specialists plan to embedded some form of planned generalization (Gianoumis & Sturmey, 2012; Stokes & Baer, 1977) and to provide ongoing support to ensure adherence to intervention procedures.

While this literature base demonstrates promise, it is still developing. Practitioners should take care to evaluate the effectiveness of their program through continued progress monitoring. In addition, although the current literature base did

provide some preliminary support for the use of telepractice in lieu of face-to-face training, there is a need to enhance the rigor of the research and advance the conclusiveness of the evidence. Therefore, practioners should continue to rely on face-to-face training when feasible and supplement with telepractice where necessary.

CHAPTER III

IMPLEMENTATION OF PYRAMIDAL TRAINING VIA TELEPRACTICE TO PREPARE INTERVENTIONISTS IN INCIDENTAL TEACHING

Autism spectrum disorder (ASD) is characterized by social-communication deficits and restricted and repetitive behaviors and interests (RRBIs; Diagnostic and Statistical Manual-V, American Psychological Association, 2012). Social-communication deficits can be particularly severe with an estimated 30 to 50% of individuals with ASD never developing functional speech (Preston & Carter, 2009). Lack of functional speech and other social-communication deficits can lead to numerous negative outcomes including: poor academic performance, lower rates of employment, increased levels of challenging behavior, and reduced social engagement (Lord et al., 2004; Wilczynski et al., 2013).

To mitigate symptoms of the disorder, early identification and intensive intervention using evidence-based practices (EBP), can lead to significant gains in social-communication skills (Kuppens & Onghena, 2012; Makrygianni & Reed, 2010; National Autism Center, 2009; National Research Council, 2001). The use of EBPs has been emphasized throughout the literature base and in recent landmark legislation (Individuals with Disabilities Education Improvement Act [IDEIA], 2004; No Child Left Behind [NCLB], 2001). Both IDEIA (2004) and NCLB (2001) emphasize the importance of employing EBPs in the treatment of students with ASD to enhance student outcomes.

Naturalistic interventions have been identified as an EBP to facilitate the acquisition and generalization of communication skills for individuals with ASD (McGee & Daly, 2007; Wong et al., 2013). Incidental teaching is one type of naturalistic intervention designed to improve the social-communication skills of individuals with ASD. Incidental teaching trials are typically embedded within daily routines and activities and are characterized by an interventionist capitalizing on the child's interest to construct communication opportunities within the natural context (Hsieh et al., 2011; Ryan, Hemmes, Sturmey, Jacobs, & Grommet, 2008). When utilizing incidental teaching, interventionists might offer communication opportunities by placing preferred items in sight but out of reach (e.g., on a high shelf), sabotaging task completion activities (e.g., giving some pieces of a puzzle but not all of the pieces), or engaging in unexpected behaviors during a routine (e.g., pausing by a door without opening it). Interventionists would then wait for the child initiation and, if necessary, prompt the child to use the target communicative response (e.g., "cars", "more puzzle pieces please", or "open door"). Natural reinforcers are provided for correct responding (e.g., giving access to the toy or opening the door), and a new teaching trial begins when the child initiates towards another motivating stimulus.

Since its original introduction by Hart and Risley (1968), incidental teaching has been demonstrated an effective intervention for individuals with ASD. Starting in the 1980's, work by McGee, Krantz, McClannahan and colleagues found that incidental teaching was effective in teaching individuals with ASD to respond to social interactions (McGee, Almeida, Sulzer-Azaroff, & Feldman, 1992), to label items (McGee et al.,

1983), and to utilize various parts of speech (e.g., prepositions; McGee, Krantz, & McClannahan, 1985).

These studies also identified the benefit of incidental teaching in promoting generalization of language skills. For example, a study by McGee et al. (1985) compared an incidental teaching strategy to a more traditional operant teaching procedure (e.g., discrete trial teaching) in the acquisition and generalization of preposition use for three children with ASD. In the traditional teaching approach, children worked one-on-one with a teacher with teacher selected stimuli, and correct responding was reinforced with an arbitrary reward that was not related to the teaching stimuli. In the incidental teaching strategy, children continued to work one-on-one with a teacher, but the trials occurred within a play setting, stimuli were selected by the child (i.e., child initiations), and correct responding resulted in access to the stimuli rather than an arbitrary reward. Results of the study found that, although both procedures were effective in the acquisition of the communication target, incidental teaching resulted in increased generalization of language across stimuli, settings, and teachers. These results have been replicated by additional researchers (e.g., Charlop-Christy & Carpenter, 2000; Miranda-Linne and Melin, 1992; McGee et al., 1992) suggesting that incidental teaching has the particular advantage of promoting generalization of language across different settings and people (i.e., stimulus generalization), as well as the promoting varied communication in response to the same stimulus (i.e., response generalization).

Although incidental teaching, and other naturalistic teaching strategies, have been established as EBPs for promoting social-communication skills for individuals with

ASD (Wong et al., 2014), interventionists (i.e., educators, therapists, and parents) are not adequately prepared to utilize these strategies (National Research Council, 2001; Wainer & Ingersoll, 2013). As incidental teaching is intended to be implemented within a child's natural environment, there is a critical need to prepare interventionists to implement these strategies (e.g., Hsieh et al., 2011; MacDuff, Krantz, MacDuff, & McClannahan, 1988). To address these issues, researchers have recently investigated a variety of procedures to prepare interventionists in incidental teaching, including modeling, feedback, and rehearsal (Hsieh et al., 2011; MacDuff et al., 1988). While initially able to acquire the skills, there have been mixed results for the maintenance of the skills, with some interventionists not maintaining their performance following the initial training (e.g., Ryan et al., 2008)

To support the maintenance of skills following the initial training, empirical studies highlight the importance of ongoing support and feedback (Graff & Karsten, 2012). With the increasing shortage of skilled specialists, this dependence on an outside consultant to provide ongoing support can lead to delays in inadequate training, and leave parents, educators, and therapists susceptible to controversial, ineffective, or potentially harmful treatments (Simpson, 2005). A sustainable method of ongoing support and feedback is necessary to complement restricted specialist resources (Graff & Karsten, 2012). One means of supplementing the initial consultation is to build a system of training and support within an organization.

Pyramidal training is an effective training model to build sustainability within an organization or community (Haberlin, Beauchamp, Agnew, & O'Brien, 2012; Pence et

al., 2014). Pyramidal training involves an expert teaching a small subset of individuals (coaches). These identified coaches then teach subsequent individuals within the organization/community (McCahill et al., 2014; Page, Iwata, & Reid, 1982). Pyramidal training has been used to increase interventionists' procedural fidelity when implementing preference assessments (Pence et al., 2012), behavioral assessments (e.g., Pence et al., 2014), behavioral program s (e.g., Page et al., 1982), and classroom management (Jones et al., 1977). Pyramidal training has been used to effectively teach a variety of interventionists including direct behavioral staff, residential staff (Parsons & Reid, 1995; Schlosser et al., 2006), parents (McGimsey et al., 1995; Neef, 1995), and teachers (e.g., Pence et al., 2014). Pyramidal training may also be more effective than a consultation model in facilitating behavioral change for staff (e.g., Haberlin et al., 2012).

Despite the promise of implementing pyramidal training to disseminate EBPs, there are numerous barriers that limit interventionists' initial access to the training. The most commonly cited barriers to high quality training programs are the time and cost needed to access specialist resources (Kunnavantana et al., 2013; Wainer & Ingersoll, 2013). Telepractice, training via online instruction and videoconferencing at a location geographically separate from the trainee, is gaining attention as a potential means of delivering high quality training programs. Telepractice technologies can allow specialists to maximize resources by providing training to a greater number of people with inexpensive equipment (Wacker et al., 2013b). Telepractice technologies have the potential to better accommodate interventionists' lifestyles and routines with flexible training times, schedules, and locations (Vismara et al., 2013; Wainer & Ingersoll,

2013). Preparing interventionists via telepractice has resulted in significant impacts on interventionists' fidelity of implementing various naturalistic interventions including: naturalistic language intervention (e.g., McDuffie et al., 2013), the Early Start Denver model (e.g., Vismara et al., 2013), and reciprocal imitation training (e.g., Wainer & Ingersoll, 2013). To date, there have been no studies have utilized telepractice to prepare interventionists in incidental teaching.

The Present Study

The present study builds upon the previous research to assess the effectiveness of a telepractice training program, delivered via pyramidal training, on interventionists' implementation of incidental teaching. Recent telepractice training programs have begun to provide didactic instruction via online modules (e.g., Heitzman-Powell et al., 2014; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014) and follow didactic instruction with individualized feedback (e.g., Gibson et al., 2010; Hay-Hansson et al., 2013; Heitzman-Powell et al., 2014; Machalicek et al., 2010; Suess et al., 2014; Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2014). Commonly used elements of the online modules include written and verbal instruction (e.g., Heitzman-Powell et al., 2014; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014) and video examples (e.g., Vismara et al. 2009, Vismara et al., 2012; Vismara et al., 2013; Wainer & Ingersoll, 2013; Wainer & Ingersoll, 2014). Following didactic instruction, some autism-specific training programs have incorporated individualized feedback in the form of self-evaluation (e.g., Keller, Brady, & Taylor, 2005; Roscoe, Fisher, Glover, & Volkert, 2006; Wright, Ellis, & Baxter, 2012) and performance

feedback (e.g., Heitzman-Powell et al., 2014; Suess et al., 2014; Vismara et al., 2013; Wainer & Ingersoll, 2014). Research has demonstrated the efficacy of self-evaluation in the initial acquisition of skills (e.g., Roscoe et al., 2006; Wright et al., 2012), and has suggested that self-evaluation can promote maintenance of learned skills (Keller et al., 2005). In addition, feedback, delivered immediately following the interventionist's demonstration of the targeted skill, has consistently correlated to improved implementation fidelity for interventionist's working with individuals with ASD (e.g., Heitzman-Powell et al., 2014; Machalicek et al., 2010; Suess et al., 2014; Vismara et al., 2013; Wainer & Ingersoll, 2014). Given prior research, the components of this professional development model include an online module to provide the declarative knowledge concerning incidental teaching, interventionist self-evaluation of the implementation of incidental teaching, and feedback on self-evaluation provided by a coach to the interventionist.

The goals of this study are to implement a research informed telepractice training program via pyramidal training and: (a) to examine the use of pyramidal training to prepare interventionists to implement incidental teaching (b) to investigate the effectiveness of implementing pyramidal training via telepractice and (c) to assess the generalization of interventionists' skills to untrained settings. The following research questions will be addressed:

1. What is the effect of preparing coaches in incidental teaching via telepractice on their implementation of incidental teaching strategies?

2. What is the effect of preparing coaches in incidental teaching via telepractice on their generalization of incidental teaching strategies to untrained settings?
3. What is the distal effect of preparing coaches to implement incidental teaching via telepractice on child requesting behavior?
4. What is the effect of preparing interventionists to implement incidental teaching via pyramidal training on their implementation of incidental teaching strategies?
5. What is the effect of preparing interventionists to implement incidental teaching via pyramidal training on their generalization of incidental teaching strategies to untrained settings?
6. What is the distal effect of preparing interventionists to implement incidental teaching via pyramidal training on child requesting behavior?

Method

Participants

Participants were recruited from a university supported autism clinic. All of the participants were referred to this study by the autism clinic director. Adult interventionists were eligible for this study if they (a) were currently providing behavioral therapy to children with ASD through a university-supported autism clinic, (b) provided informed consent to participate in the study, and (c) performed below the preset performance criterion of 90% accuracy of implementing incidental teaching during the baseline phase. The child participants were eligible for this study if they (a) had a diagnosis of ASD, (b) were currently receiving services through the university-

supported autism clinic, (c) had an identified requesting communication goal, and (d) their parents provided informed consent for them to participate

A total of eight adult interventionists participated in this study. Two interventionists were taught to implement incidental teaching by the first author (here after named "Specialist") and then served as a coach (here after named "Coach") during the interventionist teaching phase. The remaining six adult interventionists served as interventionists during the interventionist teaching phase. In addition to the eight adult interventionists, six children participated in this study after their parents provided informed consent. Demographic information for the adult interventionists, their previous educational experience, and experience implementing Applied Behavior Analysis (ABA) therapy is presented in Table 6. Demographic information for the child participants, description of their verbal abilities, and their requesting goal targeted as part of this study is presented in Table 7.

Specialist

Each of the Coaches worked with the same Specialist a Board Certified Behavior Analyst (BCBA). The Specialist was a 30-year-old female pursuing a doctorate in special education, had a master's degree in Educational Psychology, and had four years of experience implementing ABA therapy for children with ASD.

Setting and Materials

All of the study sessions occurred at a university-supported clinic that provides behavioral therapy to children with ASD. The clinic was modeled as a preschool and contained a large classroom (9 x 8 m) segmented into multiple play centers, a circle time

area, and a U-shaped table with 6 child sized chairs and one adult size chair. In addition to the main classroom, the autism clinic also had three rooms connected to the main room via a hallway. Two of the classrooms were used for direct one-on-one teaching (3 x 4 m) and the third classroom (3 x 8 m) contained a trampoline, child-sized tunnel, bean bags, and other sensory activities.

Prior to the start of this study, two settings within the clinic were identified for each Interventionist. One setting was used as the primary setting (i.e., setting in which the training was conducted) and the other setting was used as a generalization setting. Coach 2, Interventionist E, and Interventionist F all conducted their training sessions at the U-shaped table during snack time and their generalization sessions in the play centers. Interventionist A and Interventionist D conducted their training sessions in the play centers and their generalization sessions at the U-shaped table during snack time. Coach 1 conducted her training sessions at the U-shaped table during snack time and her generalization sessions in the trampoline room. Interventionist B conducted her training sessions in the trampoline room and her generalization sessions at the U-shaped table during snack. Interventionist C conducted the training sessions at the U-shaped table during snack and did not conduct generalization sessions due to time constraints.

Technology Equipment

To conduct this study a total of five different technologies were utilized. A 1.3 GHz iPad® mini was used to record each study session. The iPad® mini was connected to the wireless internet available at the autism clinic and the videos automatically uploaded to a Dropbox account with a Sookasa® add-on. Dropbox is a free online cloud

storage system that allows for file uploading and sharing. One Dropbox account was created for the purpose of this project and the account was password protected. Only the Specialist and Coaches had access to the account. The Sookasa® application was added to the Dropbox account to provide data encryption and provide an additional layer of security for the video files. Feedback sessions were conducted via Vsee® videoconferencing software and recorded for data collection using Camtasia® studio v8. VSee® is free video-conferencing software that allows for real time chat, text, and file transfer. Camtasia ® studio v8 is low cost software that allows for capturing and recording screen video and audio. Descriptions of the technologies and their purposes for this study are presented in Table 8.

Experiment Phases and Design

This experiment was conducted in three phases. First, using a multiple baseline design across coaches, Coaches were taught via telepractice to implement incidental teaching. Phase one conclude once the Coach met the preset performance criteria (i.e., 90% fidelity for three sessions and a minimum of five sessions). In Phase two, the Specialist introduced the coaching procedures to the Coaches during a one hour meeting conducted via telepractice using VSee. In the third phase of the study, Coaches taught three interventionists each to implement incidental teaching using a multiple probe design across interventionists.

Procedures

Pre-Assessment. Prior to the commencement of the study, the Specialist met with each participant face-to-face to discuss the purpose of the study and to review the

informed consent document. Upon receipt of the informed consent from the Coaches/Interventionists (and the parents of the child participant), the Specialist met with the Coach and Interventionists via VSee®. The purpose of this 20 min meeting was to test the use of VSee® with each adult participant and to identify the child participant's requesting goals to be targeted as part of this study. During the initial VSee® meeting, the Specialist and the adult participants also discussed the two settings in which the requesting goal would be targeted and the session termination criteria for each child.

Phase I – Preparation of Coaches to implement incidental teaching. Phase I included three conditions: baseline, teaching phase, and generalization phase. During the baseline phase, the Coaches were directed to work with their respective child participant on the identified requesting goal. Each session lasted 5 min and no direction or feedback was provided to the Coach/Interventionist during this phase. Coaches conducted baseline sessions in the two identified settings to allow for generalization probes after the initial training phase.

Following the baseline phase, the Coach completed the online Autism Internet Module on naturalistic instruction (Franzone, 2010). The purpose of this one hour internet module was to provide the conceptual knowledge concerning incidental teaching procedures and was also a requirement of all Interventionists at the university-supported center. The naturalistic instruction module contains case studies, instructional videos, assessments, step-by-step instructions, and a resource section with other supplementary materials. The Coach was instructed to focus on the incidental teaching procedures from the online module and to complete the module's knowledge assessment.

After the completion of the module, the Coach met with the Specialist via VSee® to plan how to implement incidental teaching with their child participant. The Coach was provided a step-by-step checklist (see Table 9) on how to implement incidental teaching and the Specialist facilitated the first meeting according to the steps provided in Appendix C. Following this initial meeting, the Coach videotaped a 5 min therapy session using incidental teaching procedures to target their child participant's requesting goal.

After the session, the Specialist and Coach met via VSee®. Immediately prior to the meeting, the Specialist instructed the Coach to review her video and rate her own adherence to the expected behaviors by completing the self-evaluation form (Appendix D). The Specialist also viewed the video and completed the evaluation form found in Appendix D concerning the Coach's implementation of the incidental teaching procedures. After both the Specialist and Coach had the opportunity to review and evaluate the video, they discussed the session during their VSee® meeting. The Specialist facilitated the session according to the procedures outlined in Appendix E. This training process (e.g., self-evaluation and videoconferencing) continued until the Coach implemented incidental teaching with greater than 90% fidelity for three sessions and a minimum of five sessions to meet quality standards for single-case research (Kratochwill et al., 2010).

After the Coach reached the preset performance criteria, the Specialist instructed the Coach to videotape a 5 min therapy session using incidental teaching in a second untrained setting. Following the session, the Coaches self-evaluated the videotape using

the self-evaluation checklist from the post-training phase (i.e., Appendix D). Following their self-evaluation they implemented a second session. This phase continued until the Coach implemented incidental teaching above 90% fidelity for three sessions and a minimum of five sessions. No feedback from the Specialist was provided during this phase.

Phase II – Preparing Coaches in teaching procedures. After the Coach reached the preset performance criteria for implementing incidental teaching, each Coach met with the Specialist via VSee® to review the teaching and feedback procedures. Prior to the meeting, Coaches watched a baseline session video from each of their Interventionists. During the VSee® meeting, the Specialist provided both verbal and written instruction. The written instruction consisted of procedural checklists for the first meeting (Appendix C), procedural checklists for the coaching sessions (Appendix E), a study schedule, and suggestions for how to arrange the environment to encourage child communication (Appendix F). The Specialist then verbally reviewed the written documents during the VSee® meeting and the Coach was encouraged to ask questions. This meeting lasted approximately an hour for each Coach.

Phase III - Preparation of Interventionists to implement incidental teaching. After the Phase II meeting, Coaches taught three Interventionists to implement incidental teaching according to the same procedures used to teach the Coaches during Step I of this study (i.e., baseline, telepractice instruction, and generalization phase). During this phase, The Specialist served a facilitative role by answering any questions the Coaches had via email but did not provide any direct feedback to the Interventionists.

Dependent Variables

Interventionist behavior. There were two dependent variables for Interventionists' behaviors. The first was the frequency of communication opportunities offered to the child by the Coach/Interventionist during each 5 min session. A Coach/Interventionist offered a communication opportunity by blocking access to a preferred object (e.g., placing all the toy cars in a see through child-proof container), placing desired objects out of reach (e.g., on a high shelf), or sabotaging a play activity (e.g., giving markers without paper). To ensure that the Coach/Interventionist captured the relevant motivating operation, a communication opportunity was operationally defined as the child initiating towards a restricted item. Child initiations included: verbal initiations (e.g., asking for the item with or without the target mand) or physical initiations (e.g., extending arm towards item or pointing at item). Multiple communication opportunities could be offered within a session and the frequency of the opportunities were reported for each session.

The second dependent variable was the percentage of incidental teaching steps performed correctly for a session. A procedural task analysis was prepared based on Franzone (2009) and Hart and Risley (1968) and is presented in Table 9. Adherence to the task analysis was calculated for each communication opportunity offered within a session by dividing the total number of procedural steps performed correctly by the total number of procedural steps for that opportunity and multiplying by 100 to obtain a percentage. As Interventionists offered multiple opportunities during a session, the resulting percentages of steps implemented correctly per opportunity were averaged

within the session to obtain an overall percentage of steps performed correctly within each session.

Child behavior. The child requesting behavior was individually defined for each child and was informed by the child's individualized therapy plan. Prior to beginning the study (during the pre-assessment phase), the Specialist worked with each Interventionist and Coach to identify an appropriate requesting behavior to be targeted as part of this study. Each child's requesting behavior is presented in Table 7. Data were collected on the frequency of the child requesting behavior per session.

Interobserver Agreement (IOA)

Interobserver agreement (IOA) data was collected for all three measures (i.e., percentage of steps performed correctly, number of opportunities, and child requesting), for 100% of all sessions, within each condition (i.e., baseline, telepractice training phase, and generalization), and for all participants. All sessions were video-recorded to facilitate data collection and both the first rater and the second rater coded data via the video-recorded sessions. The Specialist served as the first rater and was thus not blind to the study condition. The second rater, however, was blind to all study conditions. IOA was calculated using percent agreement by dividing the total number of agreements by the sum of the agreements and disagreements and multiplying by 100 to obtain a percentage. IOA was 100% across all participants for the number of communication opportunities and the number of child requesting behavior. See Table 10 for the resulting IOA percentages for the third measure of percentage of incidental steps performed correctly.

Treatment Integrity

Treatment integrity data was collected for the Specialist's and Coaches' adherence to the coaching procedures. Treatment integrity data was collected for at least 80% of sessions for each participant. All coaching sessions were video-recorded to facilitate data collection and both the first rater and the second rater coded treatment integrity via the video-recorded sessions. The Specialist served as the first rater and was not blind to the study conditions, while the second rater was blind to the study condition. Treatment integrity was calculated as the percentage of steps completed correctly. Treatment integrity was 100% for the Specialist across all sessions and both Coaches, 100% for Coach 1 across all sessions and all three Interventionists, and 100% for Coach 2 across all sessions and all three Interventionists. Reliability on the treatment integrity was 100% for all fidelity data collected.

Treatment integrity data were also collected for the Specialist's adherence to the procedures used to train the Coaches during Phase II (Appendix G). Data were collected for 100% of sessions for each participant. All sessions were video-recorded to facilitate data collection and both raters coded the treatment integrity from the video-recorded sessions. Treatment integrity was calculated as the percentage of steps completed correctly using the checklist found in Appendix G. Treatment integrity was 100% across all sessions and participants. Reliability on the treatment fidelity was 100% across all sessions and participants.

Data Analysis

The resulting data was analyzed using visual analysis supplemented by Tau-U effect size analysis. Resulting data were visually analyzed for: (a) level, (b) trend, (c) variability, (d) immediacy of effect, (e) overlap, and (f) consistency of data patterns across phases (Kratochwill et al., 2013). In addition, Tau-U effect size was calculated for each participant (Parker, Vannest, Davis, & Sauber, 2011) .While other nonparametric statistics consider only the non-overlap of data (e.g., percentage of all nonoverlapping data [PAND], nonoverlap of all pairs [NAP]), Tau-U considers level, trend, and the non-overlap of data. Tau-U follows an S-distribution, making it applicable to single-case data, and the resulting effect size ranges from -1 to 1 (with zero indicating no effect). Resulting Tau-U effect sizes above 0.93 can be interpreted as "large effects", effect sizes between 0.66 to 0.92 can be interpreted as "medium effects", and effect sizes less than 0.66 can be interpreted as "weak or small effects" (Parker & Vannest, 2009).

Social Validity Questionnaires

Following the completion of the study, participants completed either two (Interventionists) or three (Coaches) social validity questionnaires. First, participants completed a modified version of the *Treatment Evaluation Inventory – Short Form* (TEI-SF; Kelly, Heffer, Gresham, & Elliot, 1989). The modified survey consists of nine questions with responses ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Example questions include eight positively phrased questions (e.g., "I believe this approach is likely to be effective"), and one negatively phrased question ("I believe the child will experience discomfort during this approach").

Each Coach and Interventionist also complete a researcher developed questionnaire aimed at evaluating the feasibility of the training program (i.e., online instruction and coaching), acceptability of the online module, acceptability of the telecoaching, acceptability of the self-evaluative procedure, and acceptability of their Coach. There were 28 positively phrased questions with responses ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Questions on the questionnaire were organized into five categories (i.e., feasibility of the telepractice approach, feasibility and acceptability of the online module, feasibility and acceptability of the telecoaching, feasibility and acceptability of the self-evaluative procedure, and acceptability of the Coaches). There were also two open ended questions aimed at evaluating the advantages and disadvantages of teaching via telepractice and the use of a self-evaluation procedure. The researcher developed questionnaire is included as Appendix H.

Both of the Coaches also completed a research developed questionnaire aimed at evaluating the feasibility of the coaching procedures and acceptability of the Specialist. There were 12 positively phrased questions with responses ranging from 1 ("strongly disagree") to 5 ("strongly agree"). There were also two open ended questions aimed at evaluating the advantages and disadvantages of coaching via telepractice. The researcher developed questionnaire is included as Appendix I.

Results

Intervention Effects on Coaches' Incidental Teaching

Percentage of incidental teaching steps performed correctly. Figure 1displays the Coaches' implementation of incidental teaching (line graph). During the baseline

condition, the Coaches implemented incidental teaching at low and variable levels (*M=58% of steps correct*, range 40-71%). Following the first teaching session, the Coaches were able to meet the pre-set performance criteria and maintained consistent and high levels of implementation (*M*=97% *of steps correct*, range 91-100%). Both Coaches were able to generalize their implementation of incidental teaching with an average of 99% accuracy (range 96-100%). In complement to the visual analysis, the Tau-U effect sizes are presented in Table 11. The resulting effect sizes suggest large effects for both Coaches when comparing the teaching sessions to baseline sessions. When comparing the baseline generalization session to the post-teaching generalization sessions, the resulting effect sizes suggest large effects for Coach 1 and medium effects for Coach 2.

Frequency of communication opportunities offered. Within Figure 1, the gray bar graphs display the frequency of communication opportunities offered by the Coaches. During the baseline sessions, Coach 1offered an average of 3.7 communication opportunities (range 3-7). Although she did not immediately increase her communication opportunities after the first coaching session, Coach 1 did increase the number of opportunities offered overall within the teaching condition (*M* =8.2, range 3-10). She also increased the frequency of opportunities offered from a mean of 6.0 in the generalization baseline probe to 9.3 (range 7-12) in the post-teaching generalization sessions. The resulting effect sizes (Table 11) suggest medium to large effects for Coach 1 when comparing the teaching sessions to baseline sessions and when comparing the baseline generalization session to the post-teaching generalization sessions.

For Coach 2, the frequency of communication opportunities offered during baseline was moderate and variable (*M*=6.1, range 3-10). Slight gains were noted during the teaching sessions (*M*= 7.6, range 5-10) and a more consistent pattern was established. She maintained the frequency of communication opportunities offered in the generalization probes with a mean of 6.0 in the generalization baseline probe to a mean of 5.3 (range 5-6) in the post-teaching generalization phase. Tau-U effect sizes (Table 11) suggest small effects for Coach 2 when comparing the teaching sessions to baseline sessions and negative effects when comparing the baseline generalization session to the post-teaching generalization sessions.

Intervention Effects on Interventionists' Incidental Teaching

Percentage of incidental teaching steps performed correctly. Figures 2 and 3 display the percentage correct of the Interventionists' implementation of incidental teaching (line graphs). During the baseline condition, the Interventionists implemented incidental teaching at low but relatively stable levels (*M* =39%, range 0-72%). During the teaching condition, Interventionists made immediate improvements, reaching the 90% criterion in an average of 1.7 sessions (range 1-3 sessions). The Interventionists maintained this high level of implementation with an average of 95% accuracy of implementing incidental teaching during the teaching condition (range 78-100%). Tau-U effect sizes (Table 11) suggest large effects when comparing the Interventionists' baseline performance to their implementation of incidental teaching during the teaching sessions. Generalization data was available for five of the six interventionists (generalization data was not available for Interventionist P due to time constraints). The

Interventionists generalized their implementation of incidental teaching to a new setting with an average of 99.9% steps performed correctly (range 98.6-100%). Tau-U effect sizes suggest large effects when comparing the Interventionists' baseline generalization probes to their post-training generalization probes.

Number of communication opportunities offered. In Figures 2 and 3, the frequency with which Interventionists offered communication opportunities is represented by gray bar graphs. During the baseline sessions, Interventionists A, B, D, and E offered high but variable levels of opportunities across sessions (*M*= 5.8, range 1-14 opportunities). The frequency of communication opportunities offered by Interventionists C and F remained low or at zero levels during baseline sessions (*M* =0.6, range 0-2 opportunities). With the exception of Interventionist B, gains were noted during the teaching sessions for the Interventionists with consistently high frequencies (Interventionist A, Interventionist C, and Interventionist E; *M* =7.3, range 4-11 opportunities), or a variable but increasing frequency throughout the teaching condition (Interventionist C, Interventionist F; *M* =8.33, range 2-21 opportunities). Although a decrease in the frequency of communication opportunities was noted for Interventionist B during the teaching phase (*M*=7), the frequency of opportunities offered stabilized (range 6-8 opportunities) as compared to her baseline performance (range 4-14 opportunities). Tau-U effect sizes (Table 11) suggest large effects for Interventionist C, medium effects for Interventionist A, Interventionist D, and Interventionist F, small effects for Interventionist E, and negative effects for Interventionist B. The Interventionists generalized these effects to their new settings, with increased frequency

of opportunities offered during the post-training generalization phase (*M*=7.8, range 3-27 opportunities) as compared to the baseline probes (*M* = 3.3, range 0-12 opportunities). Tau-U effect sizes (Table 11) suggest large effects for generalization to a new setting for all Interventionists except Interventionist B who noted a slight decrease in the frequency of opportunities offered.

Intervention Effects on Child Communication

Children taught by Coaches. Figure 1 displays the frequency of the child's targeted communication (represented by the black bar graphs). During the baseline phase, the child working with Coach 1 (i.e., Child 1) never engaged in his target requesting behavior. Once Coach 1 entered the teaching phase, immediate increases are noted in Child 1's use of the targeted phrase with consistently high levels following the first teaching session (*M* =7.4, range 3-10). These effects generalized to a new setting from zero instances during the baseline generalization probe to an average of seven instances during the post-teaching generalization probes (range 3-9). Tau-U effect sizes (Table 11) also suggest large effects for both the baseline to teaching phase and the baseline generalization to post-teaching generalization probes.

During the baseline phase for Coach 2, Child 2 emitted his target phrase an average of 3.5 times (range 2-6) per session. This increased to an average 6.4 times per session (range 4-8) during the teaching phase. Increases were also noted between the generalization probe (2 instances of target communication goal) and the post-training generalization probes (*M* = 3.3, range 2-4). Tau-U effect sizes (Table 11) suggest medium effects for both the baseline to teaching phase and the generalization sessions.

Children taught by Interventionists. Figures 2 and 3display the frequency of target verbal requests for those children working with the Interventionists (represented by the black bars). Although the children's exhibited variability within the baseline condition, the overall frequency of their verbal requests was low (M = 1.7, range 0-8). There was a notable increase to an average 6.5 verbal requests (range 0-21) during the teaching phase. With the exception of Child A (who worked with Interventionist A), Tau-U effect sizes (Table 11) suggest medium and large effects for all children when comparing the baseline sessions to the teaching sessions. A small effect size was noted for Child A.

These effects were replicated in the generalization probes for five of the six Interventionists (post-teaching generalization data was not available for Interventionist C). During the baseline generalization phases, the children emitted an average of 1.5 verbal requests (range 0-8). This increased to an average of 7.2 verbal requests (range 2-27) during the post-teaching generalization probes. Tau-U effect sizes (Table 11) also suggest high effects when comparing the baseline generalization probes to their post-training generalization probes for all children.

Social Validity

All of the participants responded to either two (Interventionists) or three (Coaches) social validity questionnaires. Participant first responded to nine Likert-type questions on the TEI-SF regarding the acceptability of the incidental teaching procedure. Responses ranged from 4.4 to 5.0 with a maximum possible score of 5.0. The mean

rating was 4.8 across the participants indicating high acceptability of the incidental teaching procedures.

The second questionnaire was a researcher developed questionnaire that sought to evaluate the feasibility and acceptability of the training program. Results from this survey can be found in Table 12 and are organized according to the five categories found on the questionnaire (i.e., feasibility of the telepractice approach, feasibility and acceptability of the online module, feasibility and acceptability of the telecoaching, feasibility and acceptability of the self-evaluative procedure, and acceptability of the Coaches). Participant responses to the 28 positively phrased Likert-type questions ranged from 2 ("disagree") to 5 ("strongly agree") with a rating of 5 being the highest possible score. Participant responses were averaged for each question and ranged from 4.5 to 5.0 indicating high acceptability across all the categories.

Both Coaches also completed this research developed questionnaire aimed at evaluating the feasibility of the coaching procedures and acceptability of the Specialist. Coaches responded to all of the 12 positively phrased comments with a 5.0 or "strongly agree". As 5.0 was the maximum possible score, results indicate high acceptability of the Specialist and coaching procedures.

As part of the researcher developed questionnaires, participants responded to four open-ended questions. The open-ended questions were designed to identify the advantages and disadvantages of telepractice and the advantages and disadvantages of the self-evaluation procedure. In response to the question on the advantages of telepractice, participants more frequently noted flexible meeting times (N= 6) and the

flexible meeting locations (N=4). Participants wrote “telepractice [makes] it feasible for individuals who are busy and have a hard time coordinating schedules during the day” and “we were able to meet at times that were convenient for both of us”. Also noted was cost efficiency of telepractice (N=1) and the ability to receive individualized feedback in a safe environment (N=2). One participant wrote “I felt comfortable asking my coach questions and reflecting on my performance”. In response to the disadvantages of telepractice, most of the participants noted the potential for technology issues (N=5). One wrote “I could see it being problematic if there are technical difficulties or if an individual did not have access to computer/internet”. One participant wrote that it might be difficult “to find a private location” for the videoconferencing and one mentioned that it was “not as personable”. When asked about the advantages of using self-evaluation, most participants wrote they liked that the self-evaluation allowed them to see what they were doing right or wrong (N=7). “It [self-evaluation] forced me to reflect on my own performance, and pinpoint areas that need improvement”. Two participants liked the use of the checklist as it provided clear expectations for implementing incidental teaching, and one participant thought that self-evaluation allowed for “more buy-in”. When asked about disadvantages of the self-evaluation procedure, five of the participants wrote that there were none, while three had recommendations for the self-evaluation form (e.g., “add another category for most of the time” [to allow for more sensitive evaluation on the Likert scale]).

Time Spent Training

The total time spent videoconferencing with trainees was collected for the Specialist and both Coaches. The Specialist spent 155 mins total teaching the Coaches to implement incidental teaching (range 77 – 78 mins). The Specialist then spent a total of 81 mins (range 39 – 42 mins) preparing Coaches in the coaching protocol and answering email questions. The Coaches spent an average of 102 mins (range 94 – 114 mins) per Interventionist to teach the Interventionists to implement incidental teaching.

Discussion

The purpose of this study was to evaluate the effects of a telepractice training program, delivered via pyramidal training, on Coaches' and Interventionists' implementation of incidental teaching. This study also assessed the distal effects of the training program on child participants' requesting behavior. The telepractice training package consisted of an online module, interventionist video self-evaluation, and feedback provided on interventionist self-evaluation via videoconferencing. Following the telepractice training program, Coaches and Interventionists reached the preset performance criteria and implemented incidental teaching with high fidelity. Generalization probes indicated that both Coaches' and the Interventionists, for whom generalization was assessed, generalized their skills to a new setting. All of the child participants increased their requesting behavior above baseline levels.

The primary purpose of this study was to assess the effects of a telepractice training program in preparing ASD interventionists to implement incidental teaching. The telepractice program was associated with increased fidelity in implementing

incidental teaching for both the Coaches and the Interventionists. The Coaches reached the preset performance criterion after one session while the Interventionists reached the preset performance criterion in a maximum of three sessions. These results not only highlight the utility of telepractice in the dissemination of EBPs, but confirm previous research that identifies telepractice as an effective means of training interventionists in EBPs (i.e., Wainer & Ingersoll, 2013). In addition, these results suggest that previous experience in ABA may lead to reduced training times as the Coaches' were able to reach performance criteria in one session versus the one to three sessions necessary for the Interventionists.

This study also adds to the literature base by using telepractice to implement a pyramidal training model to disseminate the EBP within an organization. When considering training within an organization (i.e., clinic, school, community), research identifies that intervention effects are not sustained without ongoing individualized feedback (Haberlin et al., 2012). However, depending on a specialist to provide ongoing individualized feedback to all members of the organization is often time and cost prohibitive. In this study, the Specialist spent a total of 236 minutes (or approximately 4 hours) training two Coaches, with a resulting eight total individuals being trained within the organization. This study supports previous research in which coaches were first effectively trained in the intervention and then trained to teach others individuals within the organization (Haberlin et al., 2012; Kuhn, Lerman, & Vondran, 2003; Shore et al., 1995).

The second purpose of this study was to assess the ability of the training package to facilitate therapists' generalization of the incidental teaching procedures. In designing the training program, self-evaluation was identified as a training element as previous research supports the use of self-evaluation in promoting generalization of behavioral change (Keller et al., 2005). The results of this study confirm previous research and suggest that the training package (i.e., online module, self-evaluation, and feedback on the self-evaluation) could be a means for ensuring the generalization of interventionists' skill without specialist or coach support during the generalization phase. These results are important as use of an outside specialist to provide ongoing individualized feedback may be time and cost prohibitive for many organizations (Keller et al., 2005; Roscoe et al., 2006; Wright et al., 2012). Therefore, self-evaluation may be a means of supplementing restricted specialist services to ensure sustainable high-quality practice.

A third purpose of this study was to evaluate the distal effects of the training procedure on the requesting skills of the children with ASD. Results demonstrate that all of the children increased their requesting skills during intervention phase with large effects observed in five of the six children (small effects were observed for Child A working with Interventionists A). In particular, the increased requesting correlated with improvements in Interventionists' fidelity during the training phase. These results align with previous research establishing incidental teaching as an EBP for improving the communication skills of individuals with ASD (e.g., Hsieh et al., 2011). This study also extends previous research as it is the first to train Interventionists in incidental teaching via telepractice.

Although positive results were noted for Coaches' and Interventionists' implementation of incidental teaching, there were smaller effects on the frequency of communication opportunities offered within the incidental teaching sessions. Although some participants did increase the frequency of communication opportunities from baseline to intervention, the effects across were variable. A possible explanation for this variability may be that some Interventionists were not providing the required 20 s of access to the requested item. Rather, Interventionists were restricting access to the item at a faster rate than was intended. For example, Interventionist B actually decreased the frequency of communication opportunities she offered in the intervention phase, as compared to the baseline phase, when she began allowing 20 s of access following Child B's communication response. Although this resulted in negative effects for her frequency of communication opportunities offered, large effects were realized for the frequency of Child B's responding as contingent access to the requested natural consequence is an essential element of incidental teaching (McGee & Daly, 2007). Therefore, these results also confirm previous research supporting incidental teaching as an effective teaching procedure to increase child communication (e.g., Hsieh et al., 2011; Ryan et al., 2008).

Limitations and Suggestions for Future Research

There are several limitations to this study which should be addressed. The first limitation of this study is that individual training elements (i.e., online module, self-evaluation, and feedback on the self-evaluation) were not isolated. In particular, as both self-evaluation and feedback were elements in the training phase, it is unclear whether

the self-evaluation and the feedback are both active elements in the training package. It is possible that the feedback on the self-evaluation may have acted as performance feedback which has been demonstrated as an effective means of preparing educators in EBPs (e.g., Machalicek et al., 2009a; O'Reilly & Renzaglia, 1994). Future research might conduct component analyses to isolate the effects of self-evaluation from performance feedback.

A second limitation of this study is that Coaches and Interventionists were more experienced than typical parents or educators. In particular, both of the Coaches had at least one year of ABA experience and master's degrees. It is possible that the Coaches' level of education and previous ABA experience influenced their performance in this study. When considering the generalizability of this training program to other populations, it is possible that additional training may be necessary to ensure the effectiveness of the training program in other settings. In addition, as they voluntarily agreed to participate in this study, it stands that the participants were motivated to learn the principles and techniques necessary to implement incidental teaching. Future research might investigate potential factors that might moderate the effectiveness of a training program by considering the impacts of various coach characteristics (e.g., previous experience with ABA) or interventionist characteristics (e.g., educational experience, fluency with technology) on program effectiveness. In addition, future research might extend the use of telepractice to other populations, such as teachers, parents, and rural communities.

A third limitation is the amount of training time necessary for Coaches' and Interventionists' to achieve the preset performance criteria (i.e., 90% implementation fidelity for three sessions and a minimum of five sessions). Although the Coaches and the Interventionists rated the training procedure as highly acceptable, 102 minutes of individualized support per person may not be sustainable for other organizations or scalable. However, it might be possible that the same results (i.e., acquisition of the skill and generalization) may be acquired with fewer sessions. Future research might evaluate different performance criteria (e.g., one session above 90% implementation fidelity) to minimize the time investment. In addition, future research might evaluate the feasibility and effectiveness of providing training in small groups to maximize resources. Finally, future research might collect maintenance data to evaluate the sustainability of training effects as booster sessions or ongoing feedback may be necessary to ensure continued adherence to the incidental teaching procedures.

As the focus of this study was on skill acquisition, participants were not required to collect data during their implementation of incidental teaching. In addition, participants were not taught to graph their data nor were they taught how to interpret data for the evaluation of the program. Skilled interventionists should be able to not only implement a behavioral program, but collect data, graph data, and evaluate data to inform program goals. Future research might extend the research to identify the most effective means of preparing interventionists to perform these more complex tasks.

Continued research in the use of telepractice to prepare ASD interventionists is warranted given the positive results obtained to date. Research into various training

models and dissemination methods is needed to identify the most effective and efficient means of maximizing resources. Telepractice training programs, particularly those implemented via pyramidal training, may be an important tool in disseminating EBPs to populations whose access to resources is restricted due to time, monetary, or distance barriers. Increased skill level of interventionists can ensure that many more individuals with ASD benefit from quality assessments and interventions.

Implications for Practice

With the shortage of ASD interventionists and increasing need for access to quality training programs, the findings of this study have several implications for practice. Overall, this study adds to growing body of literature demonstrating the effectiveness of interventionist instruction delivered via telepractice. In particular, this study supports the use of an online module followed by individualized feedback and self-evaluation on fidelity of implementing incidental teaching. Results from social validity questionnaires highlight that satisfaction was high among participants further supporting this telepractice training package. Therefore, when practioners use telepractice to prepare ASD interventionists, they may consider instruction delivered via an online module with individualized feedback via self-evaluation and feedback on the self-evaluation. In particular, the results of this study confirm previous research that individualized training and feedback may be a necessary element for effective training programs (Alvero et al., 2001; Ward-Horner & Sturmey, 2012).

This study extends previous telepractice research by disseminating telepractice instruction via pyramidal training. This training model has important implications for

organizations in which multiple members of the organization require instruction but constrained resources allow for only a few to access the training. The potential benefits of this model include cost efficiency, enhanced sustainability of skills, and construction of a support system within an organization (Neef, 1995). Delivering pyramidal training through telepractice may be most applicable for organizations with multiple locations separated by distance, or organizations in which scheduling precludes meeting face-to-face. Organizations facing these barriers and providing services to individuals with ASD may consider pyramidal training delivered via telepractice to increase staff skills and improve the quality of behavioral services provided.

As elements of sustainable behavioral change, programming for maintenance and generalization of skills is an important consideration when designing training programs. This study highlights the potential for this training package to facilitate generalization of skills as participants generalized their skills without explicit instruction to the generalization setting. While these results are promising, previous research, including this study, has not evaluated the sustainability and maintenance of skills. Therefore, practioners may consider providing ongoing support through booster sessions delivered via telepractice to ensure adherence to the teaching procedures.

Despite the promising results of this study, the telepractice literature base for interventionist training is still developing and practitioners should exercise caution when choosing to use telepractice training. In particular, practioners should continue to rely on individualized instruction delivered face-to-face when feasible, and supplement with telepractice instruction where necessary. In addition, practioners should monitor their

training program by collecting ongoing interventionist fidelity data and modifying their training program to ensure effective practice.

Conclusion

There are numerous barriers (i.e., time, cost, and distance) to obtaining quality training for ASD interventionists. This study empirically demonstrated the effectiveness of a telepractice training program to teach incidental teaching to eight interventionists working with children with ASD. In addition, the pyramidal training approach used in this study allowed for dissemination of the training as Coaches were first taught by a Specialist and then trained other Interventionists within the organization. Although future research is necessary in this area, the results of this study add to the literature base identifying telepractice as a potentially effective method of delivering training in EBPs and pyramidal training as an efficient method for improving staff performance within an organization.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The prevalence of ASD has increased exponentially within the past decade, making ASD the most prevalent developmental disability in the United States (CDC, 2014b). The growing prevalence has led to an increased demand for ASD services. Unfortunately, there is a well-documented shortage of specialists available to support and teach individuals with ASD (Barton et al., 2012; Cancio et al., 2013; Stinnett et al., 2013). Telepractice has emerged as a means of addressing the increasing needs by delivering training to ASD interventionists to supplement the current services.

To further the literature base, this dissertation contained two studies. The purpose of the first study was to analyze the quality of the extant literature supporting the use of telepractice to train ASD interventionists. The purpose of the second study was to evaluate the effectiveness of a telepractice training program delivered via pyramidal training to teach interventionists to implement incidental teaching with children with ASD. The second study also aimed to evaluate the distal effects of the telepractice training program on the communication skills of six children with ASD. Following is a summary of the results of these studies and discussion of future research implications.

Study 1: Preparing Autism Spectrum Disorder Interventionists via Telepractice: A Review of Research Quality

Concerning the status of the extant literature, 12 studies were identified that utilized telepractice as a means of preparing ASD interventionists to implement EBPs.

Across the 12 studies, telepractice was used to deliver training to 83 ASD interventionists. Training programs included online modules, videoconferencing, and instruction delivered via DVDs. Training procedures included verbal and written instruction, modeling, role-play, performance feedback, question and answer, video examples, and interactive learning activities. Improvements in interventionists' skill were reported across all 12 studies. This review also assessed the research quality of nine of the 12 studies using researcher developed rubrics. None of the nine evaluated studies met all of the quality indicators for either group or single-case methodology.

Results of this review identify that further research is necessary to extend the use of telepractice to prepare ASD interventionists in EBPs. Although the literature base has developed within the past five years, the shear paucity of studies highlights a need for additional research in this area. In addition, the variability in training procedures, delivery methods, and outcomes assessed limits the conclusions that can be drawn from this literature base.

While there was considerable variability within the literature base, a training procedure utilized within 67% of the studies combined verbal/written instruction with performance feedback (Gibson et al., 2010; Heitzman-Powell et al., 2014; Suess et al., 2014; Vismara et al., 2009; Vismara et al., 2012; Vismara et al., 2013; Wacker et al., 2013a; Wainer & Ingersoll, 2014). This training package has been previously identified as an effective means of preparing ASD interventionists (Alvero et al., 2001; Ward-Horner & Sturmey, 2013). While this literature base supports previous research supporting the use of these training elements, the effects of these training elements

cannot be isolated from the training packages. As greater emphasis is placed on effective and efficient training for ASD interventionists, future research might seek to identify and isolate active training elements.

The overall results of this review also identified gaps in the extant literature and a need to enhance the methodological rigor of the literature base. As participant characteristics can moderate the effectiveness of training and inform the generalizability of results, future researchers should attend to providing comprehensive descriptions of study participants (Vismara et al., 2013; Wainer & Ingersoll, 2014). To enhance the conclusiveness of the results, group researchers and single-case researchers should rely on strong experimental designs capable of controlling threats to both internal and external validity.

Study 2: Implementation of Pyramidal Training via Telepractice to Prepare Interventionists in Incidental Teaching

The purpose of the second study was to evaluate the effects of a telepractice training program, delivered via pyramidal training, on Coaches' and Interventionists' implementation of incidental teaching. Effects of the training program were also assessed by evaluating the distal effects on child participants' requesting behaviors. The telepractice training program contained an online module, video self-evaluation, and feedback provided on the self-evaluation via videoconferencing. Following the training program, Coaches' and Interventionists' improved their implementation of incidental teaching. Generalization probes were collected for seven of the eight participants and indicated that Coaches and Interventionists' were able to generalize their skills to a new

setting. Increased requesting behavior above baseline levels was also noted for all the child participants.

The results of this study confirm previous research supporting the use of telepractice as a means of delivering training to ASD interventionists (e.g., Wainer & Ingersoll, 2014). This study also adds to previous literature by utilizing telepractice to implement a pyramidal training model to disseminate an EBP within an organization. When considering the monetary, distance, and time barriers to obtaining quality training, the use of telepractice and pyramidal training can provide access to quality training for populations for whom these barriers are significant. The results of this study also demonstrated that increased interventionist skills can lead to improved outcomes for individuals with ASD. In particular, the increased child requesting correlated with improvements in Interventionists' implementation of incidental teaching. These results align with previous research establishing incidental teaching as an EBP for improving the communication skills of individuals with ASD (e.g., Hsieh et al., 2011).

Results from this study also have implications for future research. First, a comprehensive training package (i.e., online module, self-evaluation, and feedback on the self-evaluation) was employed in this study. While the training package was effective, conclusions cannot be made concerning the active elements in the training package. Future research might conduct component analyses to isolate the effects of self-evaluation from performance feedback.

Future research might also consider extending this research by evaluating the effects of this training package on the teaching of other skills or tasks (e.g., discrete trial

teaching). Future research might also extend the research to other populations and investigate potential population characteristics on the program effectiveness (e.g., previous experience or participant fluency with technology). In addition, as this study did not evaluate maintenance of skills beyond the initial training, future research might collect maintenance data to evaluate the sustainability of the behavioral change.

Conclusions

Given the increasing need for ASD services, and the preliminary evidence supporting the use of telepractice as a means of delivering quality training, continued research into the use of telepractice is warranted. Results from this dissertation suggest that telepractice training programs may be important tools in the dissemination of EBPs to populations who might not typically have access due to time, monetary, or distance restrictions. By increasing the access to quality training, ASD interventionists can improve their skills resulting in more effective and efficient assessments and interventions for individuals with ASD.

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APPENDIX A

TABLES

Table 1

Group Design Quality Indicators Adapted from Reichow et al. (2008) and CEC (2014)

Group Quality Indicator Rubric			
Primary indicators	*Indicator Met "M""*	*Indicator Partially Met "PM"*	*Indicator Not Met "NM"*
Participant information for Trainees	1. Age and gender are provided for all of the interventionists (mean age is acceptable). Also included is the relationship between the interventionist and the individual with ASD. AND 2. Information concerning interventionist's previous experience with skills being targeted is provided AND 3. Information concerning the coach's role (i.e., person implementing the training, researcher, administrator, etc.). The ability to determine who implemented the training is a minimal criterion.	1. Age and gender are provided for all of the interventionists (mean age is acceptable). Also included is the relationship between the interventionist and the individual with ASD. AND 2. Information concerning the coach's role (i.e., person implementing the training researcher, administrator, etc.). The ability to determine who implemented the training is a minimal criterion.	1. Study does not provide age and gender for all of the interventionist participants. Study did not provide the relationship between the interventionist and the individual with ASD. OR 2. Study does not provide information concerning the coach's role (i.e., researcher, administrator, etc.). The ability to determine who implemented the training is a minimal criterion

Participant Information for Individuals with a Disability	1. Age and gender are provided for all of the individuals with disabilities (mean age is acceptable). AND 2. All participants' diagnoses are operationalized by including the specific diagnosis and diagnostic instrument (acceptable instruments for Autism diagnosis include ADOS, ADI-R, CARS, DSM-IV, and ICD-10) used to make the diagnosis or an operational definition of behaviors and symptoms of the participants. AND 3. If a study provides standardized test scores, the measures used to obtain those scores are indicated.	Study meets criteria 1 and 3	Study does not meet either criteria 1 or 3
Independent Variable	Independent variable (i.e., the training procedures) is operationalized to promote replicability. If the study utilized a manual, this criterion is met. AND Study describes the materials necessary to conduct the training (e.g., web camera, laptops, internet requirements for telepractice training) AND	Many of the training procedures and materials are defined but some details are omitted. AND The researcher controls and systematically manipulates the independent variable	Training procedures and materials are not defined in enough detail to promote replicability OR The researcher does not control and systematically manipulate the independent variable.

	The researcher controls and systematically manipulates the independent variable		
Control Condition	1. Study has a control condition in which the trainee's did not receive instruction regarding the targeted skill 2. The conditions for the control condition are operationally defined to promote replicability. 3. Description of the control condition must include descriptions of any other interventions the participants are receiving.	1. The conditions for the control condition are defined but are not operationally defined. More details could be needed to promote replicability.	1. Study does not have a control or comparison group 2. Study does not report the conditions for the comparison group
Dependent Variable	1. Expected trainee behaviors (i.e., assessment or intervention fidelity) are operationally defined 2. Enough details are provided on any included measures to promote replicability 3. Measures are linked to the dependent variables 4. Data is collected at appropriate times in the study	Study meets 3 of the 4 criteria	Study meets 2 or less criteria

Dependent Variable for Individual(s) with a Disability	1. Outcomes are reported for the participants with disabilities 2. Outcome variables are operationally defined 3. Enough details are provided on any included measures to promote replicability 4. Measures are linked to the dependent variables 5. Data is collected at appropriate times in the study	Study meets 4 of the 5 criteria	Study meets 3 or less criteria
Link Between Research Question and Data Analysis	1. Data analysis were strongly linked to the research question(s) 2. Data analysis used the correct units of measure (i.e., child, parent, teacher, etc.) for all variables	1. Data analysis were poorly linked to the research question(s) 2. Data analysis used the correct units of measure (i.e., child, parent, teacher, etc.) for majority of variables	1. Data analysis were poorly linked to the research question(s) 2. Data analysis used the correct units of measure (i.e., child, parent, teacher, etc.) for minority of variables
Use of Statistical Tests	1. Proper statistical analyses were conducted for each statistical measure with an adequate power and sample size greater than or equal to 10 (e.g., t tests, ANOVAs/MANOVAs, ANCOVAs/MANOVAs, hierarchical linear modeling, structural equation modeling).	1. Proper statistical analyses were conducted for 75% of the measures OR 2. Proper statistical analyses were conducted on 100% of outcome measures but with inadequate power or small sample size	1. Statistical analysis not done correctly, inadequate power, or small sample size

Secondary Indicators

	Indicator Met "1"	*Indicator Not Met "0"*
Random Assignment	Participants randomly assigned to groups	Participants not randomly assigned to groups
Interobserver Agreement	IOA was collected for 20% of sessions within each conditions and across all raters and participants with resulting percent agreement greater than 80%	IOA was collected for less than 20% of sessions within each condition OR IOA was not collected within all conditions, raters, and participants OR Resulting IOA measure was less than 80%
Blind Raters	Raters are blind the treatment condition	Did not specify that raters were blind to the condition
Fidelity	Training fidelity is assessed across all participants, conditions, and implementers, and has a measurement statistic above 0.80	
Attrition	Attrition was comparable across groups (within 10% difference) and attrition was less than 30%	The attrition differential was greater than 10% between groups (conditions) or attrition was greater than 30%
Generalization or Maintenance	Trainee's implementation of targeted skills were assessed after the initial acquisition data collection to assess for generalization or maintenance	There were no measures of trainee's implementation of targeted skills collected to assess for generalization or maintenance
Effect Size	Reported effect sizes (e.g., Cohen's d, Hedge's G, Glass's Δ) for all outcomes relevant to the review being conducted, even if the outcome is not statistically significant, or provides data from which appropriate effect sizes can be calculated for more than 75% of the outcome variables and effect sizes were greater than 0.20	Reported effect sizes (e.g., Cohen's d, Hedge's G, Glass's Δ) for less than 75% of the outcome variables or effect sizes were less than 0.20

Social Validity	Contains at least *four* of the following: (1) persons are trained in socially important assessments or interventions; (2) Time and cost efficient training; (3) Comparison between a group that does not receive training and the persons receiving training; (4) change in participant's procedural fidelity that is practically significant; (5) Participants are satisfied with the training results; (6) Training conducted by someone who would typically train the participant; (7) A natural context for training (i.e., home for parents, clinic for therapists, and classroom for teachers)	Contained *three or less* of the following: (1) persons are trained in socially important assessments or interventions; (2) Time and cost efficient training; (3) Comparison between a group that does not receive training and the persons receiving training; (4) change in participant's procedural fidelity that is practically significant; (5) Participants are satisfied with the training results; (6) Training conducted by someone who would typically train the participant; (7) A natural context for training (i.e., home for parents, clinic for therapists, and classroom for teachers)

Table 2

Single-case Quality Indicators Adapted from Reichow et al. (2008) and Informed by the CEC Criteria (2014)

Single-case Quality Indicator Rubric			
Primary Indicators			
	Indicator Met "M""	*Indicator Partially Met "PM"*	*Indicator Not Met "NM"*
Participant information for Trainees	1. Age and gender are provided for all of the interventionists (mean age is acceptable). Also included is the relationship between the interventionist and the individual with ASD. AND 2. Information concerning interventionist's previous experience with skills being targeted is provided AND 3. Information concerning the coach's role (i.e., researcher, administrator, etc.). The ability to determine who implemented the training is a minimal criterion.	1. Age and gender are provided for all of the interventionists (mean age is acceptable). Also included is the relationship between the interventionist and the individual with ASD. AND 2. Information concerning the coach's role (i.e., researcher, administrator, etc.). The ability to determine who implemented the training is a minimal criterion.	1. Study does not provide age and gender for all of the interventionist participants. Study did not provide the relationship between the interventionist and the individual with ASD. OR 2. Study does not provide information concerning the coach's role (i.e., researcher, administrator, etc.). The ability to determine who implemented the training is a minimal criterion

Participant Information for Individuals with a Disability	1. Age and gender are provided for all of the individuals with disabilities (mean age is acceptable). AND 2. All participants' diagnoses are operationalized by including the specific diagnosis and diagnostic instrument (acceptable instruments for Autism diagnosis include ADOS, ADI-R, CARS, DSM-IV, and ICD-10) used to make the diagnosis or an operational definition of behaviors and symptoms of the participants. AND 3. If a study provides standardized test scores, the measures used to obtain those scores are indicated.	Study meets criteria 1 and 3	Study does not meet either criteria 1 or 3
Independent Variable	Independent variable (i.e., the training procedures) is operationalized to promote replicability. If the study utilized a manual, this criterion is met. AND Study describes the materials necessary to conduct the training (e.g., webcamera, laptops, internet requirements for	Many of the training procedures and materials are defined but some details are omitted. AND The researcher controls and systematically manipulates the independent variable	Training procedures and materials are not defined in enough detail to promote replicability OR The researcher does not control and systematically manipulate the independent variable.

	telepractice training) AND The researcher controls and systematically manipulates the independent variable		
Dependent Variable for Trainees	1. Expected trainee behaviors (i.e., assessment or intervention fidelity) are operationally defined 2. Enough details are provided on any included measures to promote replicability 3. Measures are linked to the dependent variables 4. Data is collected at appropriate times in the study	Study meets 3 of the 4 criteria	Study meets 2 or less criteria
Dependent Variable for Individual(s) with a Disability	1. Outcomes are reported for the participants with disabilities 2. Outcome variables are operationally defined 3. Enough details are provided on any included measures to promote replicability 4. Measures are linked to the dependent variables 5. Data is collected at appropriate times in the	Study meets 4 of the 5 criteria	Study meets 3 or less criteria

	study		
Baseline	1. Study has a baseline phase that demonstrates the trainee's baseline performance for targeted skill 2. Baseline phase has a minimum of three data points 2. Data is stable 3. Data does not contain trend or counter-therapeutic trend 4. Baseline conditions are operationally defined and promote replicability	Study does not meet one of the criteria in a minimum of 50% of the baselines	Two or more criteria were not met in at least one baseline, or more than 50% of the baselines do not meet three of the criteria
Visual Analysis	1. 100% of the graphs have stable data (level and trend) 2. Contains less than 25% overlap of data between adjacent conditions (using NAP; Parker & Vannest, 2009) 3. Shows a large shift in level or trend between adjacent conditions that coincide between adjacent conditions that coincide with the implementation or removal of the IV. If delay in effect, the delay is acceptable if the delay is consistently observed in all the graphs	1. Meets 2 of the criteria in at least 66% of the graphs	Meets 2 or fewer criteria in less than 66% of the graphs

Experimental Control	1. Utilizes a single-case design capable of providing experimental control (i.e., ABAB, Multiple-baseline, alternating treatments, changing criterion) to evaluate the effects of the training procedure on the trainee's targeted skill 2. Three demonstrations of experimental effect at three different points in time. Phase must have a minimum of three data points to be considered (or 5 for alternating treatments) 3. Changes in DV vary with the systematic manipulation of the IV. If there was a delay in the effect with the manipulation of the IV, the delay must be consistent across all participants and conditions (+/- 50%).	1. At least 50% of the demonstrations of experimental effect meet the "H" criteria OR 2. There are two demonstrations of experimental effect at two different points in time and changes in the DV vary with the manipulation of the IV	1. Less than 50% of the demonstrations of experimental effect meet the "H" criteria OR 2. There are less than two demonstrations of experimental effect at two different points in time and changes in the DV vary with the manipulation of the IV

Secondary Indicators

	Indicator Met "1"	*Indicator Not Met"0"*
Interobserver Agreement	IOA was collected for 20% of sessions within each conditions and across all raters and participants with resulting percent agreement greater than 80%	IOA was collected for less than 20% of sessions within each condition OR It was not specified or not clear that IOA was collected within all conditions, raters, and participants OR Resulting IOA measure was less than 80%

Kappa	Kappa calculated on at least 20% of sessions within each all conditions and across all raters, and participants with a score greater than 0.60	Kappa was collected for less than 20% of sessions within each condition OR Kappa was not collected across all conditions, raters, and participants OR Resulting kappa was less than 0.60
Blind Raters	Raters are blind the treatment condition	Did not specify that raters were blind to the condition
Fidelity	Training fidelity is assessed across all participants, conditions, and implementers, and has a measurement statistic above 0.80	Did not specify that training fidelity was assessed across all participants, conditions, and implementers OR Resulting fidelity measure was less than 0.80
Generalization or Maintenance	Trainee's implementation of targeted skills were assessed after the initial acquisition data collection to assess for generalization or maintenance	There were no measures of trainee's implementation of targeted skills collected to assess for generalization or maintenance
Social Validity	Contains at least *four* of the following: (1) persons are trained in socially important assessments or interventions; (2) Time and cost efficient training; (3) Comparison between a group that does not receive training and the persons receiving training; (4) change in participant's procedural fidelity that is practically significant; (5) Participants are satisfied with the training results; (6) Training conducted by someone who would typically train the participant; (7) A natural training context for demonstration of skills taught or naturally occurring examples/scenarios in training (i.e., home for parents, clinic for therapists, and classroom for teachers)	Contained *three or less* of the following: (1) persons are trained in socially important assessments or interventions; (2) Time and cost efficient training; (3) Comparison between a group that does not receive training and the persons receiving training; (4) change in participant's procedural fidelity that is practically significant; (5) Participants are satisfied with the training results; (6) Training conducted by someone who would typically train the participant; (7) A natural training context for demonstration of skills taught or naturally occurring examples/scenarios in training (i.e., home for parents, clinic for therapists, and classroom for teachers)

Table 3

Intervention Studies to Train Interventionists for Individuals with ASD Through Telepractice

Article	Participant Characteristics	Dependent Variables	Telepractice Training Phases	Description of Training Program	Outcomes for Interventionists	Outcomes for Individuals with ASD
Gibson, Pennington, Stenhoff, & Hopper (2010)	*Interventionist*: One female preschool teacher with three years of teaching experience; teacher's age or previous experience with FCT[1] not provided *Individual with ASD*: One male; diagnosed with ASD; 4 years old	*Interventionist*: Fidelity implementing FCT[1] *Individual with ASD:* Percentage of intervals with challenging behavior (i.e., elopement)	One video-conferencing session	*Duration:* One 45 minute session prior to implementing FCT[1] with child participant *Procedure:* Session included written instructions on how to implement FCT[1], verbal instruction on FCT[1] procedures, modeling, role-play (teacher and teaching assistant role-played), and immediate feedback on role-play (i.e., descriptive verbal praise for correct implementation, corrective verbal feedback for errors, and opportunity for questions)	The teacher implemented FCT[1] with an average 90% fidelity during intervention sessions (range 87-100%)	Decreased elopement from an average of 96% of intervals during baseline condition (range 89-100%) to an average of 11% of intervals during FCT[1] condition (range 6-16%)
Hay-Hansson & Eldevik (2013)	*Interventionist:* Seven teachers*; no previous experience implementing DTT[2]; teachers' age and gender	*Interventionist*: Fidelity implementing DTT[2] *Individual with ASD*: Stated they collected data on	Three video-conferencing sessions	*Duration:* Three 15 minute sessions. Total training time = 45 minutes *Procedure:* Videoconferencing sessions during implementation of DTT with child participants.	Overall improvements in DTT[2] implementation fidelity; effect size was .99 from pre-test to post-test and	Not reported

provided but could not be extracted from overall sample description *Individual with ASD:* Four children; age provided but could not be extracted for telepractice group from the overall sample; gender not provided	child behaviors but did not define the behaviors		Sessions included verbal instruction, modeling, and performance feedback	.93 from pre-test to follow-up

Heitzman-Powell, Buzhardt, Rusinko, & Miller (2014)	*Interventionist:* Seven parents (from four families); *M* =37.3 (range 32-47); parents' gender not provided. Parents' demonstrated less than 50% of the targeted skills during pre-test. *Individual with ASD:* None	*Interventionist:* Parent fidelity implementing six behavioral skills: preference assessment, structuring the environment, reinforcement procedures, prompts and prompt fading, shaping, and general teaching procedures. *Individual with ASD*: Not applicable	(1) Eight online modules and (2) six video-conferencing sessions. Video-conferencing sessions held after modules two through seven	*Duration:* (1) Approximately 60 minutes per online module. (2) Each videoconferencing session ranged between 90-120 minutes. Approximate total training time= 17 – 20 hours. *Procedure:* (1) Eight online modules which consisted of interactive tutorials, followed by 20 minute knowledge assessments. Modules required active responding by trainees in the form of fill-in the blank, drag and drop, and multiple-choice questions. Immediate written feedback was delivered during online module. (2) Videoconferencing sessions included verbal instruction on module content, immediate performance feedback on parent implementation, and question and answer.	On the 48-item global pre- and posttests, parents improved from a mean pretest performance of 30.6% (range = 14%–46%) to a mean posttest performance of 71.8% (range = 51%–83%). The mean pre- to posttest skill gain across all parents and skills was 41.23 percentage points (range = 28%–59%). Gains ranged from a *M* = 61.20% for preference assessment gains to a *M* = 23.3% for prompting and fading prompts	Not applicable
Machalicek O'Reilly, Chan, Rispoli, Lang, Davis, Shogren,	*Interventionist:* Three teachers; no previous experience	*Interventionist:* Fidelity implementing paired-choice	(1) Written instructions provided prior to videoconferencing	*Duration*: Two hours to conduct preference assessments	Interventionists implemented paired-choice preference	The results of the paired-choice preference

Sorrells, Lancioni, Sigafoos, Green, & Langthorne (2009)	implementing a preference assessment; teachers' age or gender not provided *Individual with ASD*: Three male children; Two diagnosed with autism and one with PDD-NOS[3]; *M*= 4.94 years (range 2.8 – 7 years)	preference assessments *Individual with ASD*: Preference of tangible items	via email and (2) videoconferencing during implementation of preference assessment with child participants	*Procedure*: (1) written instruction included task analysis for paired-choice preference assessment (2) Videoconferencing session started with interventionist conducting a trial. Interventionists provided performance feedback following each trial (i.e., descriptive verbal praise for correct implementation and corrective verbal feedback for errors)	assessments with 100% fidelity	assessments produced a clear pattern of preferences for the three. A ranking of eight preferred items was obtained for each participant.
MachalicekO'Reilly, Rispoli, Davis, Lang, Hetlinger-Franco, & Chan (2010)	*Interventionist:* Six female teachers; *M*= 27 years (range 22-32 years); all teachers had a previous class concerning the assessment and treatment of challenging behavior but no experience implementing a FA[4] *Individual with ASD:* Six children (five with ASD and	*Interventionist:* Fidelity implementing FA[4] *Individual with ASD:* Challenging behavior was individually defined for the FA[4] although data was not collected on student behavior.	Videoconferencing during interventionist implementation of FA[4] with child participants	*Duration*: Average 75 minutes (range 60-95 minutes) *Procedure*: Videoconferencing sessions involved interventionist conducting a trial. In the event of an error, supervisor interrupted the trial and provided performance feedback (i.e., error identification, error correction and verbal praise)	Teacher implementation of functional analysis improved from a baseline median performance of 63.5% (range 20-100%) to a median of 100% (range 79-100%) during telecoaching. Teachers reached the predetermined performance criteria within	Not applicable

	one with "autistic-like" behaviors); *M* = 6 years (range 5-9 years); gender not provided				19 sessions.	
Suess, Romani, Wacker, Dyson, Kuhle, Lee, Lindgren, Kopelman, Pelzel, & Waldron (2014)	*Interventionist:* Parents of three children with ASD; *M*= 37 years; previous experience, gender, and number of parent participants not provided *Individual with ASD:* Three male children; two diagnosed with PDD-NOS[3] and one diagnosed with PDD-NOS[3] and ID[5] *M*=2.91 years (range 2 years 7 months – 3 years 3 months)	*Interventionist:* Fidelity implementing FCT[1] (FA[4] was conducted by parent but data was not taken on parent behavior) *Individual with ASD:* Percentage of intervals with challenging behavior (SIB, aggression, property destruction, elopement, crying/screaming, noncompliance)	(1) Didactic training via video-conferencing provided prior to implementation of FCT with child participants and (2) alternating conditions of FCT sessions conducted via video-conferencing and FCT sessions conducted independent of coach	*Duration:* (1) Two one hour didactic trainings plus (2) one hour coaching sessions per week. Approximate total training time= 10 to 16 hours *Procedure:* (1) First didactic training included written instruction and verbal instruction on the purpose of FA and FCT[1] procedures, and an overview of basic behavioral principles. Second didactic training included a 15 minute presentation on the FA[4] results, and review of FCT[1] procedures. The training also included verbal instruction on how to structure the environment and instruction on the function of a microswitch (2) Weekly coaching procedures began with the coach prompting the parent to implement FCT[1]. The coach then provided	FCT[1] treatment fidelity was lower at the beginning of the study and increased throughout the study with no real differences between independent and coached sessions.	Decreases in challenging behavior noted for all child participants

				performance feedback (i.e., verbal praise for correct implementation and verbal description of error with verbal instruction on how to correct error) Parents also conducted FCT sessions outside of the coaching sessions. No feedback was provided during these sessions but the parents did videotape them for data collection purposes.		
Vismara, McCormick Young, Nadhan, Monlux (2013)	*Interventionist:* Eight parents (seven mothers and one father); Parents' implemented ESDM[6] below performance criterion during baseline phase. Age not provided. *Individual with ASD:* Eight children with ASD; *M* = 27.5 months (range 18-51 months); no gender provided	*Interventionist:* Parent fidelity of implementing ESDM[6] *Individual with ASD:* Rate of child verbal utterances and joint attention skills	(1) Website with ten online modules and (2) 12 video-conferencing sessions. Interventionists completed one module per week and video-conferencing sessions were held after each module.	*Duration:* (1) Parents spent an average of 8 hours and 53 minutes (range 2 hours and 46 minutes – 26 hours and 24 minutes) on the website (2) Telecoaching occurred once a week for 12 weeks (1.5 hours/week) for approximately 18 hours. Average total training time= 27 hours (range 21-44 hours) *Procedure:* (1) Online website consisted of a social aspect (secure messaging service, calendar, photos, and message board), ten instructional modules (written and video-based instruction, step-by-step instructions, frequently	Fidelity of ESDM[6]: All parents were able to meet the fidelity criterion in an average of 7.33 weeks. Their overall mean fidelity during intervention was 3.68 (SD = 0.51) with six of the eight parents achieving scores of 4.00 or higher; whereas the other two parents (i.e., 04 and 15) made	Children increased their use of functional utterances but their bids for joint attention remained stable throughout the intervention.

				asked questions and video examples) and a self-monitoring tool for parents to track their usage. (2) Weekly videoconferencing began with discussion of the past week's topic. The coach then prompted the parent to begin a 10 minute demonstration of the targeted skill. Following the demonstration, the coach introduced a new topic, provided verbal instruction, the parent practiced the new skill with their child, and the coach provided performance feedback.	improvements but did not meet the threshold.	
Vismara, Young, & Rogers (2012)	*Interventionist:* Nine parents of children with ASD (eight completed the study); seven females and two males; previous experience was demonstrated with baseline condition (average of 2.62 on the ESDM[6] fidelity scale; SD = .44). Age	*Interventionist:* Parent fidelity of implementing ESDM[6] *Individual with ASD:* Frequency of spontaneous verbalizations, prompted verbalizations, and spontaneous imitation CBRS[8] measures: Attention and	(1) DVD with ten modules and (2) 12 video-conferencing sessions. Interventionists completed one module per week and video-conferencing sessions were held after each module.	*Duration:* (1) Each module took approximately 20 minutes, (2) 12 one hour telecoaching sessions. Approximate total training time= 15.3 hours *Procedure:* (1) DVD contained written instruction (readings; self-evaluation), independent activities, and video examples. (2) Weekly videoconferencing began	Fidelity of ESDM[6]: All parents were able to meet the fidelity criterion (at or above 4.00 fidelity rating) in an average of 6.41 weeks.	Children increased their use of spontaneous functional verbalizations, prompted verbalizations, and spontaneous imitation Statistical significant increases in attention and

	not provided *Individual with ASD:* Nine children with ASD (eight completed the study); eight males and one female; Six diagnosed with autism and three with PDD-NOS[3]; *M* = 28.89 months (range 16 - 38 months)	initiation Standardized assessments: MacArthur CDI vocabulary, MacArthur CDI comprehension, Vineland		with discussion of the past week's topic. The coach then prompted the parent to begin a 10 minute demonstration of the targeted skill. Following the demonstration, the coach introduced a new topic, provided verbal instruction, the parent practiced the new skill with their child, and the coach provided performance feedback.		initiation as measured by CBRS[8] Statistically significant increase as measured by MacArthur CDI vocabulary, MacArthur CDI comprehension, and the Vineland.
Vismara, Young, Stahmer, Griffith, McMahon, & Rogers (2009)	*Interventionist:* Five therapists[*]; all had previously read an article regarding the origins of the ESDM[6] model; age and gender not provided *Individual with ASD:* Cannot extract the total number of participants for the therapists who were trained via	*Interventionist*: Fidelity implementing ESDM[6] *Individual with ASD:* Functional verbal utterances, imitation, attention, and social initiations	(1) DVD for self-instruction, (2) didactic training delivered via video-conferencing and (3) two feedback sessions via video-conferencing	*Duration:* (1) No information provided on duration of self-instruction. (2) Ten hours for the didactic training (3) Two hour video-conferencing session + one hour follow up telephone call *Procedure:* (1) self-instruction using written instruction and video examples on a DVD (ESDM[6] treatment manual; ESDM[6] curriculum checklist and development of teaching objectives; ESDM[6] fidelity system for determining intervention adherence; 16	Therapist fidelity increased; however, only 50% of the sample was at the 85% fidelity threshold by the final training phase. When lowered to 80%, 90% of the therapists reached the fidelity threshold. Results	Cannot extract the child outcomes for the therapists who were trained via telepractice versus face-to-face condition

telepractice versus face-to-face condition. *M*= 33 months (SD = 7.7). Gender not provided.		video examples) (2) 10 hour didactic training seminar including: written instruction, verbal instruction, video examples, and small group application activities (3) team supervision via videoconferencing that included a review of video examples and performance feedback	revealed a significant main effect for training condition. Examination of planned comparisons within the training condition main effect revealed that treatment fidelity significantly improved between baseline and self-instruction conditions. Additional post-hoc comparisons revealed fidelity at the didactic and individual training conditions in combination were significantly higher than the self-instruction training condition.

Wacker, Lee, Dalmau Padilla, Kopelman, Lindgren, Kuhle,& Pelzel, Waldron (2013)	*Interventionist:* 20 parents (19 mothers and 1 father); *M* = 34 years; no formal training in behavioral assessment or intervention prior to their participation in the study *Individual with ASD:* 20 children with ASD; 13 participants were diagnosed with PPD-NOS and 7 with autistic disorder; *M* = 53.8 months (range 29-80 months); gender not provided	*Interventionist:* Fidelity implementing FA^4 *Individual with ASD*: Percentage of intervals with challenging behavior (elopement, aggression, property destruction, self-injury, screaming, elopement, repetitive behavior, dangerous behavior, or passive noncompliance)	(1) Pre-assessment meeting via video-conferencing and (2) coaching via video-conferencing	*Duration*: One hour pre-assessment meeting plus coaching sessions (average 4.9 hours, range 4 to 8). Total 5.9 hours (range 5 to 9 hours). *Procedure*: (1) Pre-assessment meeting included verbal and written instruction regarding introduction to the project's procedures, 16-page written manual that outlined behavior assessment and intervention procedures, and timelines for project completion. (2) coaching sessions included verbal instruction (consultant described the purpose of the FA^4 condition, prompted for when to reinforce and when to end reinforcement, and modeled prompting sequence for demand condition)	Fidelity across participants averaged 96% without corrections and 97% with corrections	Identified functions of the children's behavior for 18 of the 20 children
Wainer & Ingersoll (2013)	*Interventionist:* **Sample 1:** Six female therapists. No previous experience implementing RIT^9 Age not provided.	*Interventionist:* Fidelity implementing RIT^9 *Individual with ASD:* Rate of imitation (prompted and	Five online modules	*Duration:* The first four modules took between 4 and 12 min to view, while the final module, teaching object imitation, took approximately 40 min to view. The amount of time between the final baseline session and first post-	**Sample 1:** All therapists improved their implementation of RIT^6, but only four of the six therapists reached the performance	**Sample 1:** All children increased their imitation rates per minute **Sample 2**: All children increased their imitation rates

Sample 2: Three mothers of children with ASD. None had any previous experience implementing RIT[9]. Age not provided *Individual with ASD:* **Sample 1**: Five male children with ASD. *M* = 56.2 months (range 35-74 months) **Sample 2:** Three male children with ASD. *M* = 61 months (range 26-88 months)	unprompted imitation) per minute	training session was 19–40 days (M = 29 days) for therapists and 23–36 days (M = 30 days) for parents. *Procedure:* Five online modules which included PowerPoint with audio lecture, video examples, knowledge assessments, and interactive learning tasks	criterion ; **Sample 2:** All of the parents improved their implementation of RIT[9], but only two of the three parents reached the performance criterion	per minute	

Wainer & Ingersoll (2014)	*Interventionist:* Five mothers of children with ASD; previous experience provided in terms of a baseline phase with low and stable ratings of fidelity; age not provided *Individual with ASD:* Five children with ASD; *M*= 42.2 months (range 29 - 59 months); gender not provided	*Interventionist:* Fidelity of implementing RIT[9] *Individual with ASD:* Rate of spontaneous imitation per minute	(1) Four online modules and (2) three video-conferencing sessions. Interventionists completed all four online modules prior to the video-conferencing sessions.	*Duration:* (1) Average of 100 minutes for the online modules and (2) three, 30 minute coaching sessions. *Procedure*: (1) Four online modules consisting of written and verbal instruction (PowerPoint with text and a concurrent audio lecture), active learning tasks, video examples, and written feedback on learning tasks (2) Coaching sessions included collaborative problem solving, immediate verbal and written performance feedback, and question answering. One family was provided delayed performance feedback due to internet connectivity problems	Fidelity of implementing RIT[9]: mixed results for self-directed learning but four out of five reached criterion with telecoaching	Mixed results with two children demonstrating small increases and three no increase following online modules. During telecoaching, three children experienced immediate effects that returned to baseline levels and two children had no effects

[1]FCT = Functional Communication Training
[2]DTT = Discrete Trial Teaching
[3]PDD-NOS = Pervasive Developmental Disorder – Not Otherwise Specified
[4]FA = Functional Analysis
[5]ID = Intellectual Disability
[6]ESDM = Early Start Denver Model
[7]MBRS= Maternal Behavior Rating Scale
[8]CBRS = Child Behavior Rating Scale
[9]RIT = Reciprocal Imitation Training
[*]Only interventionists who received training via telepractice were included in this review

Table 4

Quality Indicator Ratings of Preparing Autism Spectrum Disorder Interventionists via Telepractice for Group Experimental and Quasi-experimental Research

	Hay-Hansson & Eldevik (2013)	Heitzman-Powell et al. (2014)	Vismara et al. (2009)
Primary Indicators			
Participant information for trainees	M	NM	NM
Participant information for individuals with disability	NM	N/A	NM
Independent variable	PM	M	M
Control condition	NM	NM	NM
Dependent variable for trainee	M	M	M
Dependent Variable for Individual(s) with a Disability	NM	N/A	PM
Link Between Research Question and Data Analysis	M	M	M
Use of Statistical Tests	NM	NM	PM
Secondary Indicators			
Random assignment	1	0	0
Interobserver agreement	0	1	0
Blind raters	0	0	1
Fidelity	0	1	0
Attrition	1	1	1
Generalization or maintenance	1	0	0
Effect size	0	0	0
Social validity	1	1	1

[1] Codes for quality ratings for primary indicators are as follows: M = met criteria, PM = partially met, and NM = criteria not met

[2] Codes for quality ratings for secondary indicators are as follows: 1 = criteria met, 0 = criteria not met

Table 5

Quality Indicator Ratings of Preparing Autism Spectrum Disorder Interventionists via Telepractice for Single-case Research

	Machalicek et al. (2010)	Suess et al. (2014)	Vismara et al. (2013)	Vismara et al. (2012)	Wainer & Ingersoll (2013)	Wainer & Ingersoll (2014)
Primary Indicators						
Participant information for trainees	M	NM	NM	NM	NM	NM
Participant information for individual with disability	NM	M	NM	M	NM	NM
Independent variable	M	M	M	M	M	M
Dependent variable for trainee	M	M	PM	PM	PM	M
Dependent variable for individual with a disability	N/A	M	M	PM	M	M
Baseline	PM	NM	PM	NM	PM	M
Visual analysis	PM	NM	NM	PM	PM	PM
Experimental control	NM	NM	NM	M	M	NM
Secondary Indicators						
Interobserver agreement	1	0	0	0	0	0
Kappa	0	0	0	0	0	0
Blind raters	0	0	1	1	0	1
Fidelity	1	0	1	1	0	0
Generalization or maintenance	1	0	1	1	0	0
Social validity	1	1	1	1	1	1

[1] Codes for quality ratings for primary indicators are as follows: M = met criteria, PM = partially met, and NM = criteria not met

[2] Codes for quality ratings for secondary indicators are as follows: 1 = criteria met, 0 = criteria not met

Table 6

Demographic Information for Coaches and Interventionists

Participant	Age/ Gender	Educational Experience	ABA Experience
Coach 1	32 yrs/ Female	Doctoral student in Educational Psychology, 2nd year of BCBA coursework	1 year experience with ABA therapy; no previous experience with IT
Coach 2	31 yrs/ Female	Doctoral student in Educational Psychology, 2nd year of BCBA coursework	1 year experience with ABA therapy; no previous experience with IT
Interventionist A	29 yrs/ Female	Master's student in Special Education, 1st year of BCBA coursework	No experience with ABA therapy; no previous experience with IT
Interventionist B	21 yrs/ Female	Undergraduate student in Special Education, Pre-service teacher, no BCBA coursework	No experience with ABA therapy; no previous experience with IT
Interventionist C	23 yrs/ Male	Master's student in Special Education; 1st of BCBA coursework	2 months of experience with ABA therapy; no previous experience with IT
Interventionist D	21 yrs/ Female	Undergraduate student in Kinesiology; no BCBA coursework	No experience with ABA therapy; no previous experience with IT
Interventionist E	25 yrs/ Female	Master's student in Special Education; In-service teacher; 1st year of BCBA coursework	2 months of experience with ABA therapy; no previous experience with IT
Interventionist F	20 yrs/ Female	Undergraduate student in Special Education; Pre-service teacher; no BCBA coursework	No experience with ABA therapy; no previous experience with IT

*BCBA = Board Certified Behavior Analyst; ABA = Applied Behavior Analysis; IT = Incidental teaching

Table 7

Demographic Information for Child Participants

Participant	Child Age/ Gender	Diagnosis	Verbal Abilities	Requesting Goal
Child 1	7 yrs, 9 mos/ Male	ASD	Communicated using 4 to 5 word phases but rarely initiated conversation. Typically demanded when requesting "I want that" or "Give me that"	Full sentence with the addition of the word "please"
Child 2	5 yrs, 8 mos/ Male	ASD and severe language disorder	Used speech to request in one to two word phrases	3 word request
Child A	3 yrs, 3 mos/ Male	ASD	Preschool Language Scales, Fifth Edition (PLS-5) with a total language raw score of 31 (1st percentile with an age-equivalent of 11 mos)	Any verbalization that is not a scream
Child B	4 yrs, 11 mos/ Female	ASD and moderate language disorder	PLS-5 with a total language raw score of 66 (1st percentile and age-equivalent of 2yrs, 11 mos)	3 word request
Child C	5 yrs, 8 mos/ Male	ASD and severe language disorder	Used speech to request in one to two word phrases	3 word request
Child D	5 yrs, 10 mos/ Male	ASD, severe mixed language delay, and moderate verbal apraxia	PLS-5 with a total language raw score of 65 (1st percentile and age-equivalent of 2yrs, 8 mos)	2 word request
Child E	5 yrs, 10 mos/ Male	ASD, severe mixed language delay, and moderate verbal apraxia	PLS-5 with a total language raw score of 65 (1st percentile and age-equivalent of 2yrs, 8 mos)	2 word request
Child F	6 yrs, 6 mos/ Male	Autism spectrum disorder and severe language disorder	Communicated using the Picture Exchange System by exchanging a picture for a requested item. Infrequently used one phoneme verbalizations (e.g., "bu", "wa" or "ah")	One phoneme verbalizations (e.g., "bu", "wa", or "ah")

Table 8

Included Technologies

Technology	**Description**	**Purpose**
Dropbox®	Online cloud storage system that allows for file sharing	Share documents and videos between research team members and between the research team and the Interventionists.
Sookasa®	Add-on Dropbox® application that allows for data encryption and meets requirements for HIPPA and FERPA compliance	Share documents and videos: 1. Between research team members 2. Between the research team and the Interventionists.
Vsee®	HIPAA secure videoconferencing technology that allows for real time chat, text, and file transfer.	Videoconference between Coach and Specialist to: 1. Test the videoconferencing technology 2. Provide feedback on coaching strategies
Camtasia® studio v8	Software suite with tool that allows for capturing and recording screen video and audio	1. Record sessions between Specialist and Coaches 2. Record coaching sessions between Coach and Interventionists
iPad® mini	1.3 GHz iPad® mini with built in microphone and camera	1. Record Interventionists implementation of incidental teaching 2. Transfer of videos to Dropbox®

Table 9

Expected Interventionist Behaviors During Incidental Teaching Procedure

Expected Interventionist Behavior
1. Interventionist arranges the environment to encourage learner to request assistance or materials
2. Interventionist follows the learner's lead
3. Interventionist restricts access to the stimulus
4. Interventionist waits for learner to initiate the request for 3s before initial prompting
5. If necessary, Interventionist presents a prompt for communication (model, mand-model, gestural/physical prompt depending on the learner's needs)
6. Interventionist delivers prompts only if the learner demonstrates interest in an item
7. Interventionist waits at least 3s between prompts
8a. If the learner emits the targeted response, Interventionist provides access to item for at least 20s (or one edible)
8b. If the learner does not emit the targeted response, Interventionist provides another model of the correct response
9. If the learner has not emitted the targeted response after the second prompt, Interventionist provides a final model of the correct response and provides access to the item
10. Interventionist adds a final model of mand and expands model to one level above learner's current level of communication (i.e., says "Can I have milk?" if current performance is "I have milk?"

Table 10

Resulting IOA for Percentage of Incidental Teaching Steps Performed Correctly

Participant	IOA Average	Range
Coach 1		
Baseline	99%	97-100%
Training	99%	97-100%
Generalization	94%	86-100%
Coach 2		
Baseline	93%	88-100%
Training	100%	100%
Generalization	100%	100%
Interventionist A		
Baseline	97%	95-100%
Training	99%	96-100%
Generalization	99%	98-100%
Interventionist B		
Baseline	97%	95-100%
Training	99%	98-100%
Generalization	98%	97-100%
Interventionist C		
Baseline	100%	100%
Training	96%	86-100%
Generalization	N/A	N/A
Interventionist D		
Baseline	96%	90-100%
Training	97%	94-100%
Generalization	100%	100%
Interventionist E		
Baseline	94%	87-100%
Training	100%	100%
Generalization	100%	100%
Interventionist F		
Baseline	99%	90-100%
Training	97%	93-100%
Generalization	99%	99-100%

Table 11

Tau-U effect Size Calculations for Dependent Measures

Contrast	Accuracy implementing incidental teaching	Frequency of communication opportunities	Frequency of child requesting
Coach 1			
Baseline vs. Teaching	1.0 (0.3<90%>1.0)*	0.8 (0.1<90%>1.0)	1.0 (0.3<90%>1.0)*
Baseline Probe vs. Generalization	1.0 (-0.2<90%>1.0)*	1.0 (-0.2<90%>1.0)*	1.0 (-0.2<90%>1.0)*
Coach 2			
Baseline vs. Teaching	1.0 (0.4<90%>1.0)*	0.5 (-0.09<90%>1.0)	0.85 (0.3<90%>1.0)
Baseline Probe vs. Generalization	1.0 (-0.2<90%>1.0)*	-0.8 (-1.0<90%>0.6)	0.7 (-0.6<90%>1.0)
Interventionist A			
Baseline vs. Teaching	1.0 (0.4<90%>1.0)*	0.8 (0.2<90%>1.0)	0.2 (-0.34<90%>0.9)
Baseline Probe vs. Generalization	1.0 (-0.2<90%>1.0)*	1.0 (-0.6<90%>1.0)*	1.0 (-0.2<90%>1.0)*
Interventionist B			
Baseline vs. Teaching	1.0 (0.4<90%>1.0)*	-0.6 (-1.0<90%>0.0)	0.8 (0.1<90%>1.0)
Baseline Probe vs. Generalization	1.0 (-0.2<90%>1.0)*	-0.33 (-1.0<90%>0.9)	1.0 (-0.2<90%>1.0)*
Interventionist C			
Baseline vs. Teaching	1.0 (0.4<90%>1.0)*	1.0 (0.4<90%>1.0)*	0.8 (0.2<90%>1.0)
Baseline Probe vs. Generalization	N/A	N/A	N/A
Interventionist D			
Baseline vs. Teaching	1.0 (0.4<90%>1.0)*	0.7 (0.1<90%>1.0)	1.0 (0.4<90%>1.0)*
Baseline Probe vs. Generalization	1.0 (-0.2<90%>1.0)*	1.0 (-0.2<90%>1.0)*	1.0 (0.2<90%>1.0)*
Interventionist E			
Baseline vs. Teaching	1.0 (0.4<90%>1.0)*	0.4 (-0.2<90%>1.0)	0.7 (0.1<90%>1.0)
Baseline Probe vs. Generalization	1.0 (-0.2<90%>1.0)*	1.0 (-0.2<90%>1.0)*	1.0 (0.2<90%>1.0)*
Interventionist F			
Baseline vs. Teaching	1.0 (0.4<90%>1.0)*	0.9 (0.3<90%>1.0)	1.0 (0.4<90%>1.0)*
Baseline Probe vs. Generalization	1.0 (0.1<90%>1.0)*	1.0 (0.1<90%>1.0)*	1.0 (0.1<90%>1.0)*

*Indicates large effects (Parker & Vannest, 2009)

Table 12

Social Validity Results For Feasibility and Acceptability of Training Program

	Mean	Range
Telepractice Feasibility		
The technology used in this training was easy to use	4.63	4-5
I liked the telepractice training procedure used	4.75	4-5
I found this training approach to be acceptable	4.75	4-5
I am comfortable with the technology used in this training	4.75	4-5
I believe this training approach to be cost efficient	4.50	2-5
Overall, I have a positive reaction to this approach	4.75	4-5
Online Module Feasibility and Acceptability		
The online module was helpful for learning incidental teaching	4.50	4-5
I liked the online module used in this training	4.50	3-5
The online module was easy to navigate	4.75	4-5
I believe the online module to be effective	4.50	3-5
I believe the online module to be cost effective training	4.63	2-5
Overall, I am satisfied with the time to complete the module	4.63	4-5
Telecoaching Feasibility and Acceptability		
The telecoaching was helpful for learning incidental teaching	5.0	5
I liked the telecoaching sessions	5.0	5
The telecoaching technology was easy to use	5.0	5
I found the telecoaching to be effective	4.88	4-5
The amount of coaching I received was sufficient	4.88	4-5
Self-evaluation Feasibility and Acceptability		
The self-evaluation was helpful for learning incidental teaching	4.88	4-5
I liked the self-evaluation procedure	4.75	4-5
The self-evaluation was easy to use	4.63	4-5
I found the self-evaluation to be effective	4.75	4-5
I believe the self-evaluation to be cost efficient training	4.63	3-5
Acceptability of Coaches		
The coach was interested in me	4.88	4-5
The coach understood me	4.88	4-5
The coach understood my client	5.0	5
I found the coach to be effective	5.0	5
I liked meeting with the coach	5.0	5

APPENDIX B

FIGURES

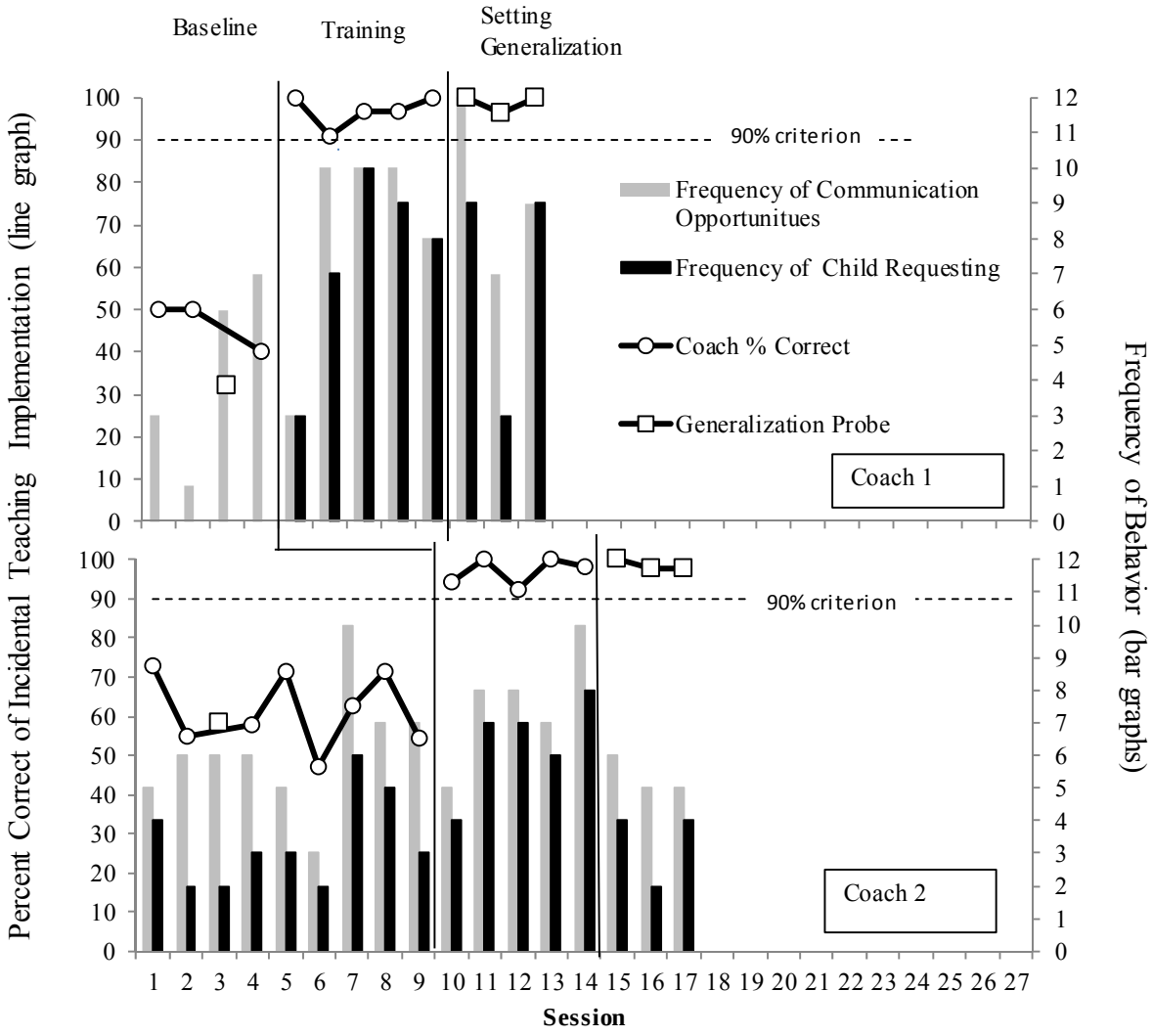

Figure 1. Coach percentage correct in implementing incidental teaching (line graph) and frequency of communication opportunities offered (gray bars). Frequency of child requesting behavior (black bars).

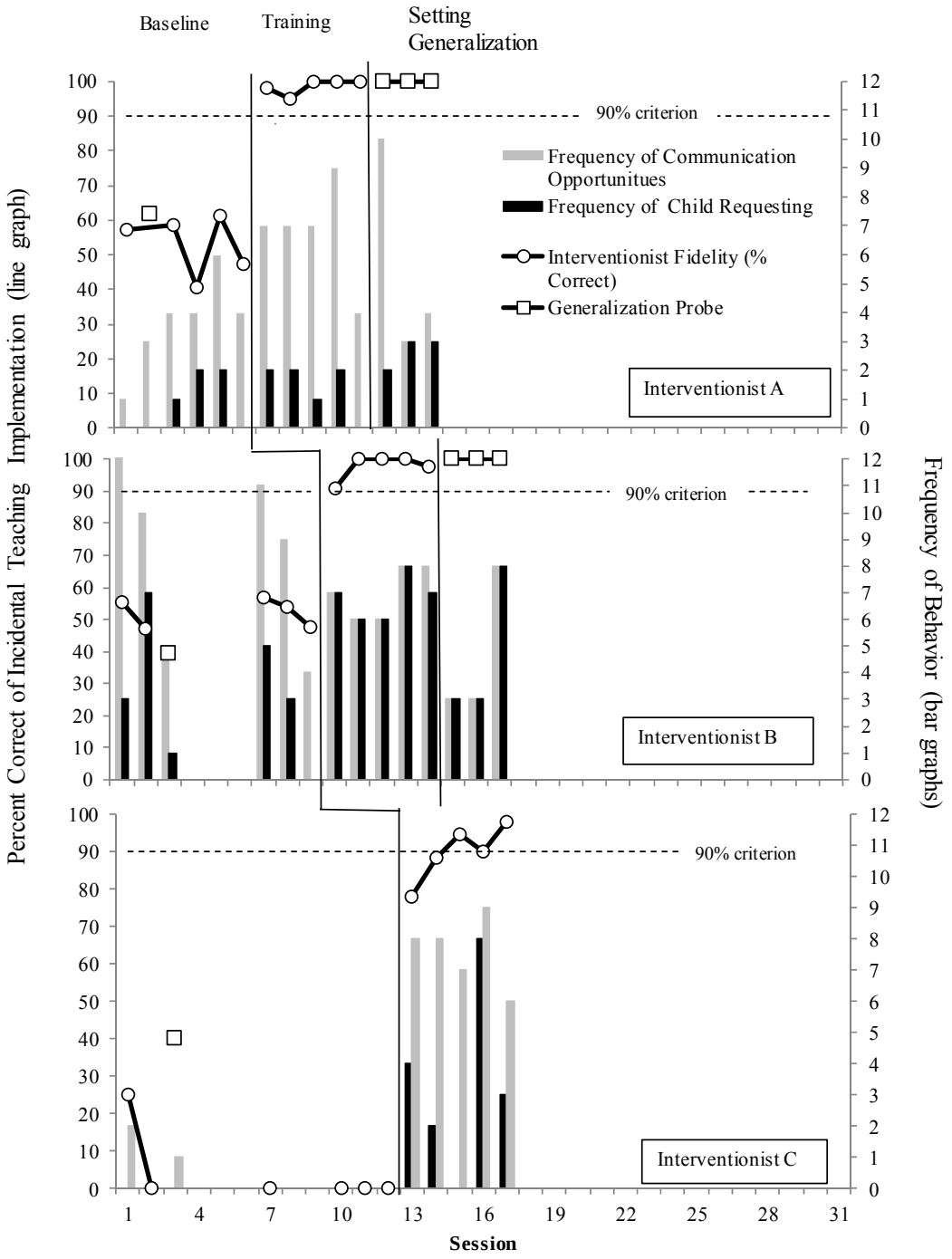

Figure 2. Cohort 1 percentage correct in implementing incidental teaching (line graph) and frequency of communication opportunities offered (gray bars). Frequency of child requesting behavior (black bars).

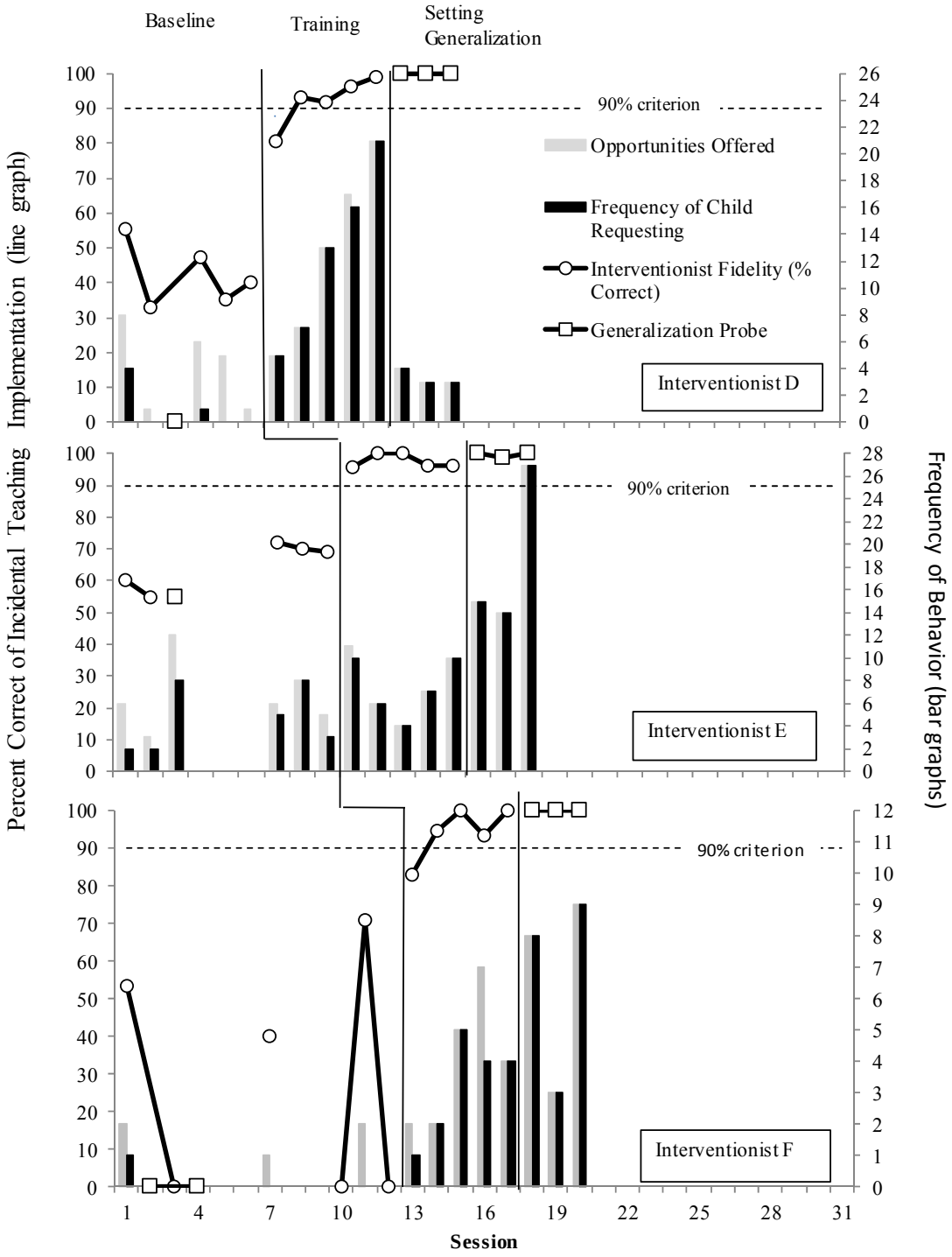

Figure 3. Cohort 2 percentage correct in implementing incidental teaching (line graph) and frequency of communication opportunities offered (gray bars). Frequency of child requesting behavior (black bars).

APPENDIX C

INTEGRITY CHECKLIST FOR FIRST MEETING

Expected Behavior	**"+" = behavior occurred** **"-" = behavior did not**
Specialist /Coach asks trainee (Coach/Interventionist) whether they have completed the online module	
Specialist /Coach only proceeds if trainee (Coach/Interventionist) completed the online module	
Specialist /Coach reviews the step-by-step procedures to implement incidental teaching	
Specialist /Coach highlights any steps that the trainee (Coach/Interventionist) performed correctly during baseline procedures	
Coach asks Interventionist if they have any questions	
Coach answers all questions that the Interventionist asks	
Percentage correct	

APPENDIX D

EVALUATION SHEET FOR INCIDENTAL TEACHING

Instructions: This checklist includes each step of the process of utilizing incidental learning. Within the table, record a "+" under the description of how you think you performed the step during your 5 minute session				
Expected Behavior	**All of the time**	**Half the time**	**Never**	**Not Applicable**
Interventionist arranges the environment to encourage learner to request assistance or [illegible]				
Interventionist follows the learner's lead				
Interventionist restricts access to the stimulus				
Interventionist waits for learner to initiate the request for 3s before initial prompting				
Interventionist presents a prompt for communication (model, mand-model, gestural/physical prompt depending on the learner's needs)				
Interventionist delivers prompts only if the learner demonstrates interest in an item				
If the learner emits the targeted response, Interventionist provides access to item for at least 20s (or provides one edible if using edibles)				
If the learner does not emit the targeted response, Interventionist provides another model of the correct response				
Interventionist waits at least 3s between prompts				
If the learner does not emit the targeted response after the second prompt, Interventionist provides a final model of the correct response and provides access to the item				
Interventionist adds a final model of mand and expands model to one level above learner's current level of communication (i.e., says "Can I have milk?" if current performance is "I have milk?"				

APPENDIX E

COACHING INTEGRITY CHECKLIST FOR INCIDENTAL TEACHING

Expected Behavior	**"+" = behavior occurred** **"-" = behavior did not**
Coach asks Interventionist if they have had a chance to review and evaluate their video.	
Coach only proceeds if Interventionist was able to review and evaluate video	
Coach provides an overall positive statement concerning Interventionists' performance	
Coach reviews each step of the self-evaluation sheet with Interventionist	
Upon instances of agreement, Coach provides descriptive praise and asks the Interventionist if they have any questions	
Upon instances of disagreement, Coach states in a neutral voice that they have a disagreement	
Coach provides rationale for any disagreements	
Coach asks Interventionist if they have any questions	
Coach answers all questions that the Interventionist asks	
Percentage correct	

APPENDIX F

SUGGESTIONS FOR ENVIRONMENTAL ARRANGEMENT

- have multiple parts (e.g., LegosTM, a shape sorter, or Mr. Potato HeadTM);
- are added onto another activity (e.g., adding Little People^{TM} into play with blocks, using puppets with a reading lesson);
- require adult assistance (e.g., having lid on bottle of bubbles so tight that learner must request help, holding puzzle pieces until the child requests them);
- encourage turn-taking (e.g., throwing a ball, placing puzzle pieces, sending toy cars down a ramp); and/or
- interrupt a routine (e.g., hide soap or put towels out of reach)

APPENDIX G

INTEGRITY CHECKLIST FOR PHASE II COACH TRAINING

Specialist Expected Behavior	**"+" = behavior occurred**
Specialist reviews schedule for training	
Specialist reviews the feedback procedures	
Specialist reviews the suggestions for environmental arrangement	
Specialist provides specific examples from the Interventionists the Coach will teach	
Specialist allows for questions	
Specialist answers all the Coaches' questions	
Percentage correct	

APPENDIX H

RESEARCHER DEVELOPED SOCIAL VALIDITY QUESTIONNAIRE

Tele-practice Training Social					
Directions: Please complete the following survey. There are no correct answers so please share your honest opinion.	Interventionist:				
	Date:				
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Technology Feasibility					
The technology used for this training was easy to use	5	4	3	2	1
I like the telepractice training procedure used in this training	5	4	3	2	1
I found this training approach to be an acceptable way of training	5	4	3	2	1
I am comfortable with the technology	5	4	3	2	1
I believe this training approach to be cost efficient training method	5	4	3	2	1
Overall, I have a positive reaction to this approach	5	4	3	2	1
Online module					
The online module (i.e., AIM module) was helpful for learning	5	4	3	2	1
I like the online module used in this training (i.e., AIM module)	5	4	3	2	1
The online module (i.e., AIM module) was easy to navigate	5	4	3	2	1
I found the online module (i.e., AIM module) to be effective	5	4	3	2	1
I believe the online module (i.e., AIM module) to be a cost efficient training method (time, cost, etc.)	5	4	3	2	1

Overall I am satisfied with the amount of time it took to complete the online module (i.e.,	5	4	3	2	1
Tele-coaching					
The tele-coaching sessions were helpful for learning	5	4	3	2	1
I like the tele-coaching sessions	5	4	3	2	1
The tele-coaching technology used (i.e., VSee) was easy to	5	4	3	2	1
I found the tele-coaching (i.e., VSee) to be effective	5	4	3	2	1
I believe the online module (i.e., AIM module) to be a cost efficient training method (time, cost, etc.)	5	4	3	2	1
The amount of coaching I received was sufficient for me to learn the intervention strategies	5	4	3	2	1
Self-evaluation					
The self-evaluation procedure was helpful for learning incidental	5	4	3	2	1
I like the self-evaluation procedure	5	4	3	2	1
The self-evaluation procedure was easy to use	5	4	3	2	1
I found the self-evaluation to be effective	5	4	3	2	1
I believe the self-evaluation to be cost efficient training method	5	4	3	2	1
Coaches					
The coach was interested in me	5	4	3	2	1
The coach understood me	5	4	3	2	1
The coach understood my client	5	4	3	2	1
I found the coach to be effective	5	4	3	2	1

I liked meeting with the coach	5	4	3	2	1

Please respond to the following questions:

1. What do you think are the advantages of training via telepractice? Why?

2. What do you think are the disadvantages of training via telepractice? Why?

3. What do you think are the advantages of using self-evaluation? Why?

4. What do you think are the disadvantages of using self-evaluation? Why?

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APPENDIX I

RESEARCHER DEVELOPED SOCIAL VALIDITY QUESTIONNAIRE FOR COACHES

Tele-practice Training Social Validity Questionnaire for Coaching					
Directions: Please complete the following survey. There are no correct answers so please share your honest opinion.	Coach:				
	Date:				
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Specialist/Researcher					
The specialist/researcher was interested in me	5	4	3	2	1
The specialists/researcher understood me	5	4	3	2	1
The specialist/researcher understood my clients	5	4	3	2	1
I found the specialist/researcher to be effective	5	4	3	2	1
The specialist/researcher answered all of my questions effectively					
Coaching Procedures					
The coaching procedures were effective to train interventionists to implement incidental teaching	5	4	3	2	1
The videoconferencing sessions were helpful for learning how to	5	4	3	2	1
The amount of support I received was sufficient for me to learn how to	5	4	3	2	1
I felt comfortable with the coaching procedures	5	4	3	2	1
The coaching procedures were easy to learn	5	4	3	2	1

I believe it is feasible to coach interventionists via telepractice (i.e., videoconferencing)	5	4	3	2	1
I would use videoconferencing to train my supervisees in the future	5	4	3	2	1

Please respond to the following questions:

1. What do you think are the advantages of coaching via telepractice? Why?

2. What do you think are the disadvantages of coaching via telepractice? Why?

CITATIONS:

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