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A Comparison of the Effectiveness, Efficiency, and Post-Training Outcomes of Traditional Behavioral Skills Training and Asynchronous Remote Training

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Abstract

While applied behavior analysis (ABA) is the most commonly recommended therapy for individuals with Autism spectrum disorders (New York State Department of Health, 1999; Surgeon General, 1999), there is a significant lack of board certified behavior analysts (BCBAs; Bethune & Kiser, 2017; Maglione, Kadiyala, Kress, Hastings, & O′Hanlon, 2016). Telehealth may help to increase the availability of training in behavior analytic procedures, however, BCBAs have been slow to adopt remote training measures (Tomlinson, Gore, & McGill, 2018). This may be due to the in-vivo training requirements of common behavior analytic training procedures. This research compares traditional, face-to-face behavioral skills training (BST) to remote training in order to determine if the success attributed to BST is replicable through remote education. This research also investigates how the post-training outcomes of traditional BST compare to asynchronous online training with video modeling and feedback. In order to evaluate this, the researcher trained two groups on multiple stimulus without replacement preference assessment procedures. The first group received traditional behavioral skills training in person with immediate feedback while the second group received all training through pre-recorded video with self-monitoring and delayed performance feedback. Results indicated that both methods were similarly effective with in-person training being slightly more efficient for trainees while remote training was significantly more efficient for the trainer. The research not only evaluated the post-training outcomes of both methodologies but also examined the social validity of both training models. Both procedures had high social validity indicating that these methods could be used in the future. These results not only add to the body of literature on remote training in behavior

analytic interventions, but also look at areas of improvement in order to make future training of behavior analysts more effective. More broadly, this research could help to disseminate ABA and remote education so people in more remote locations have equitable access to services.

Keywords: behavior analysis, applied behavior analysis, behavioral skills training, remote training, asynchronous training, telehealth

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Chapter 1: Introduction and Literature Review

The Centers for Disease Control currently states that one in 54 US children have a medical diagnosis of autism spectrum disorder (ASD), a significant increase from their previous estimate of one in every 69 children in 2012 (Centers for Disease Control, 2020). In 2012, over 450,000 school-aged students in the United States received special education services under the primary educational diagnostic category of autism (United States Department of Education, 2015). Applied behavior analysis (ABA) is the most often recommended intervention for ASD (Surgeon General, 1999; New York State Department of Health, 1999). This area of prominence has arisen as interventions based on behavior analytic principles comprise the majority of scientifically valid therapies available for the treatment of ASDs (Rogers & Vismara, 2008). Because of the heavy data-based evidence, ABA is one of the most recommended interventions for deficits associated with ASD (Kirkham, 2017).

Applied behavior analytic services require training and oversight by an individual with expertise in behavior analysis. In the United States, this expert is typically a Board Certified Behavior Analyst (BCBA; Shook & Favell, 2008). The BCBA credential is currently internationally recognized and is overseen by the Behavior Analysis Certification Board (BACB) while educational programs in behavior analysis are overseen by the Association for Behavior Analysis International (ABAI; BACB, 2019b). Despite the growing incidence rate of ASD, as of July 2019, there are only 34,471 BCBAs in the world. While the governing bodies represent behavior analysis

internationally, 91.5% of BCBAs live and practice within the US (BACB, 2019a). This means that there are significant shortages of behavior analysts outside of the US. Data indicates that approximately one in 100 children living in mainland China have ASD (Sun et al., 2019.) Despite the suggestion that there are millions of children with ASD in the country, there are only 16 BCBAs currently practicing in mainland China (BACB, 2019a). In December 2019, the BACB announced that they would be ending international credentialing outside of the United States and Canada effective January 2023. While the board encouraged other countries to create their own certification boards, it also acknowledged that some countries may lack the infrastructure to do quickly (BACB, 2019c). This may make access to reputable behavior analytic services more difficult to acquire in the near future.

While a high percentage of BCBAs practice within the United States, there are still significant shortages within the US. Current population estimates suggest that there are approximately 73.9 million children under the age of 18 within the US (US Census Bureau, 2014). If 1 in 59 children have a diagnosis of ASD, it can be estimated that there are approximately 1,252,542 children with ASD. The BACB recommends that behavior analysts providing comprehensive intervention packages have caseloads no larger than 12 individuals (BACB, 2014). In order to serve all the children estimated to have ASD within the caseload recommendations, there is a need for approximately 104,378 BCBAs within the US. As of September 2019, there are 31,555 (BACB, 2019a). Additionally, not all behavior analysts work with individuals with autism, therefore the statistics provided may underestimate the shortage of providers (Neely, Rispoli, Gerow, & Hong, 2016). These shortages are most common in rural and low-income areas (Bethune & Kiser,

2017; Maglione, Kadiyala, Kress, Hastings, & O′Hanlon, 2016). This is clearly illustrated in the US state of Iowa, where 78 of the 99 counties are considered rural and a significant proportion of the residents of these counties are considered low-income. As of October 2015, there were 74 BCBAs practicing within the state, with 78% (58) of these BCBAs living in cities. Families surveyed throughout Iowa reported traveling distances upwards of 340 miles one way to receive ABA services (Romani & Schieltz, 2017).

In order to further disseminate behavior analysis and allow for behavior analytic services in currently underserved areas, many training programs have moved online (Dixon, Reed, Smith, Belisle, & Jackson, 2015; Martinez-Diaz& Wilder, 2016). Little research has been conducted, however, on the post-training outcomes of online training programs and how they compare to traditional training in behavior analysis. While not indicative of skills, the BACB publishes the pass rates of first time BCBA exam test takers as well as information about their educational program structures. In 2018, all of the universities with a 100% pass rate offered courses face-to-face, while those with a pass rate below 40% consisted primarily of online, distance learning programs (BACB, 2018). Research within the field of higher education suggests that online education programs can have similar educational outcomes to face-to-face programs, however, these programs must be highly interactive in order to produce similar results. Additionally, online programs currently available vary greatly and produce a wide range of outcomes (Bowen et al., 2012). While program quality may vary, online training programs are key in providing behavior analytic services in more remote locations in order to serve a greater number of individuals with ASD.

Autism Spectrum Disorder and Behavior Analysis

ASD is referred to as a spectrum disorder as it presents differently among individuals. While ASD may present very differently amongst individuals, the following standardized core characteristics are considered essential aspects of ASD: (a) areas of improvement in social skills across multiple environments, (b) repetitive behaviors or restricted interests (c) symptoms must present early in the child's development, (d) symptoms must cause significant impairment of functioning, and (e) the characteristics previously described must not be better explained by the diagnosis of intellectual disability or global development delay. Intellectual disabilities and ASD frequently co-occur along with additional mental health diagnoses. The differential factor between intellectual disabilities and ASD is the presence of significant impairment to social interactions (American Psychiatric Association, 2013).

Intervention packages based in ABA principles are used to increase skills in the areas associated with these core characteristics (Fisher, Luczynski, Hood, Lesser, Machado, & Piazza, 2014). Problem behaviors, such as aggression, property destruction, self-injury, and stereotypy are also common in individuals with ASD (Oliver, Petty, Ruddick, & Bacarese-Hamilton, 2012). Functional intervention plans are necessary in order to decrease these behaviors. In order to determine the function of the targeted behavior, a functional behavior assessment (FBA) or functional analysis (FA) must be completed, to determine the most appropriate behavior intervention plan (BIP). These assessments require individuals to have expertise in behavior analysis. Additionally, programming to teach replacement behaviors and decrease skill deficits also require individuals with an expertise in behavior analytic principles (Durand, 1999). Due to the limited number of behavior analysts, services are commonly implemented by well-trained

individuals who are not BCBAs but are overseen by those with expertise in behavior analysis (BACB, 2014).

Tiered Service Delivery Models

Many agencies providing behavior analytic services operate under a tiered service delivery model. In this model, the BCBA oversees direct services provided by other individuals. This model allows for behavior analysts to serve more clients and allows clients to receive more hours of behavior analytic services. The tiered model also allows for behavior analytic services to be provided in underserved areas (BACB, 2014).

In order to provide high quality and ethical services, those implementing ABA must be highly trained. The BACB recommends that this training be specific and formal. Additionally, integrity checks should occur in order to monitor the quality of implementation. Those implementing behavior analytic services should receive frequent and consistent supervision. This supervision should involve observations as well as additional training (BACB, 2014).

While some funding sources require those implementing ABA to hold formal certification such as the Registered Behavior Technician (RBT) credential, the majority of individuals implementing ABA programming are non-certified direct support professionals, parents, caregivers, teachers, and para-professionals who receive training from a BCBA. As these individuals hold no certification and may have no background in behavior analysis, they require extensive training and supervision (Eikeseth, 2010; Smith, Donahoe, & Davis, 2001). Supervision is a key aspect to the implementation of any behavior analysis program as the efficiency and effectiveness of behavior analytic intervention greatly decreases when implemented by individuals who are not properly

trained and supervised (Eikeseth, 2010; Symes, Remington, Browns, & Hastings, 2006). Training in behavior analysis is commonly provided on site with the client using specific, behavior analytic protocols in order to ensure the efficiency and effectiveness of the training for the supervisee (Sellers, Alai-Rosales, & MacDonald, 2016).

Behavioral Skills Training

As behavior analysts must teach skills generalizable to a client's environment, it is important for people other than the behavior analyst to be able to implement the client's programming (Wainer & Ingersoll, 2015). Due to the importance of training on successful client outcomes, behavior analysts have been researching training outcomes since the 1980s (Miller & Lewin, 1980). Results of these studies have indicated that traditional classroom models of didactic training are not effective in producing measurable outcomes in terms of behavior analytic program implementation (Casey & McWilliam, 2011; Clark, Cushing, & Kennedy, 2004; Sturmey, 1998). Behavioral skills training (BST) is an evidence-based approach to training based on behavior analytic theory and is the strategy commonly used to train adults to implement behavior analytic programming (Sellers, Alai-Rosales, & MacDonald, 2016). Training programs utilizing BST have been shown to be more effective in training generalizable skills than didactic training alone (Casey & McWilliam, 2011).

BST involves four key components. (1) Initially, the trainer describes the targeted skill to be learned in observable and measurable terms. This description may also include a rationale for teaching the skill. The trainer also provides the learner with a written description of the skill or protocol. This written description may be given in advance in order to allow the learner additional time to read about the skills. (2) Next, the trainer

models the skill for the learner. (3) The trainer then requires the learner to perform the skill. (4) The trainer observes the implementation and provides feedback as the skill is practiced. This includes both corrective feedback for incorrect responses and praise for correct responses. The trainer collects data on the learner's implementation as well. The learner continues the cycle of practicing the skill in front of the trainer and receiving feedback until reaching a predetermined mastery criterion (Parsons, Rollyson, & Reid, 2012).

While knowledge on theoretical topics may be gained through BST, the primary goal of the protocol is to increase the learner's performance of specific skills (Parson & Reid, 2011). This means that the learners must be able to demonstrate the skills taught as opposed to describing them verbally. During BST, the learner must engage in the skill in the presence of the supervisor whom is able to give the learner feedback. Learners are required to demonstrate competency in the targeted skill. As the learners engage in the skill, the trainers collect data on their implementation. The learner continues practicing the skill until they reach competency with the skill. This competency is determined by a predefined mastery criterion (Reid et al., 2003). Because of this requirement, BST is referred to as a performance-based training model.

Initially, BST may be provided in a location other than the work site. The protocol may be used with a group or during one-to-one training. When the training is provided off site, the practice component of BST is done through role-playing where the learners repeat role-plays until reaching the mastery criteria (Parsons, Rollyson, & Reid, 2012). Despite reaching mastery criteria in the role-play situations, the learner still needs to be able to demonstrate the skill with a client before being able to implement it

independently. This is referred to as on-the job, or *in-vivo* training and practice. *In-vivo* training is essential as it increases the accuracy with which interventions are implemented during post-training conditions (Clark, Cushing, & Kennedy, 2004; Smith, Parker, Taubman, & Lovaas, 1992). This on-the-job training can be difficult to replicate when the trainee and trainer are in different locations and engaging in training remotely.

Remote Training

Telehealth refers to health services, including behavior or mental health services, provided remotely via technology. In the field of behavior analysis, telehealth and remote training can be used interchangeably as the consultation being provided is both a behavioral health service and a training model. Behavior analysts have been slow to adapt to remote training (Tomlinson, Gore, & McGill, 2018). This may be due to the in-vivo training requirements of BST. Currently, only 28 articles have been published on using remote training to train individuals to implement ABA programming (e.g., Barkaia, Stokes, & Mikiashvili, 2017; Machalicek et al. 2016; Suess et al. 2014; Vismara, Young, & Rogers, 2013; Wainer & Ingersoll 2015). All of these studies used some form of remote training but differed in their training procedures. While all of the studies indicate positive outcomes, the majority include methodological flaws such as lack of participant demographics (Gibson et al. 2010; Kuravackel et al. 2018; Lindgren et al. 2016) and impeding external variables that prevent the use of behavior analytic telehealth from being rated as evidence based (Ferguson, Craig, & Dounavi, 2019).

Real Time Coaching and Consultation

The majority of research on remote training has focused on real time consultation (e.g., Barretto, Wacker, Harding, Lee, & Berg, 2006; Gibson, Pennington, Stenhoff, &

Hopper, 2010; Machalicek et al., 2009a). In these situations, an expert in behavior analysis initially provides some background information. The majority of training is provided as coaching and live feedback via telecommunication technology as the implementer is implementing the programming. This procedure is also referred to as synchronous coaching. This model has been shown to be successful in allowing novice implementers to skillfully implement procedures, but it requires the behavior analyst to be corresponding live and does not evaluate the implementer's ability to perform the task without constant supervision (Barretto, Wacker, Harding, Lee, & Berg, 2006; Gibson et al., 2010; Machalicek et al., 2009a; Machaliceket al, 2016; Machalicek et al., 2009b; Suess, Wacker, Schwartz, Lustig, & Detrick, 2016, Wacker et al., 2013a; Wacker et al, 2013b).

Machalicek et al. (2010) expanded upon their previous research on remote training and explored the effects of remote training with performance feedback on implementer's accuracy and maintenance of skills following intervention. Similar to previous studies, Machalicek et al. involved a BCBA providing live consultation and performance feedback to implementers in real time. Once learners were able to implement the protocol with fidelity, the researchers stopped observing sessions. Later the researchers explored how these skills maintained post-training and saw that while there was a slight decrease in accuracy from the highest levels attained during intervention, the skills still occurred at a level that was above baseline following a one to three week period without training (Machalicek et al., 2010).

Video Modeling

Another method of remote training involves video modeling. Video modeling refers to situations in which training videos are pre-recorded for learners. The learners then watch these videos, implement the interventions, and are provided some type of coaching or feedback. Methods for implementing video modeling and feedback vary greatly. Pre-recorded videos may include explanations, rationales, and models (Fisher et al., 2014; Wainer & Ingersoll, 2014). As the videos are pre-recorded, the learner is able to watch the videos outside of pre-determined, scheduled times, a method known as asynchronous training. Some protocols involve the trainer meeting with the learner in-person first, providing the learner with pre-recorded lessons on the topic, and then providing live coaching and feedback following completion of the lessons (Knowles, Massar, Raulston, & Machalicek, 2017). Other models involve learners watching pre-recorded video lessons and then taking knowledge assessments. While the results of these assessments have shown that video lessons can increase one's knowledge of behavior analysis, they do not assess the learner's ability to implement the behavior analytic procedures (Buzhardt & Heitzman-Powell, 2005; Heitzman-Powell, Buzhardt, Rusinko, & Miller, 2014; Jang, Dixon, Tarbox; Granpeesheh, Kornack, & de Nocker, 2012).

Fidelity Assessment and Generalization

While the results of research utilizing live coaching and video modeling have shown that remote training can be effective, there are limitations to both methods. Live coaching requires the trainers and learners to be available simultaneously. Video modeling research focuses more on knowledge acquisition than skill acquisition. Additionally, few studies have explored the post-training outcomes of these procedures, meaning that they have not determined whether or not the learners were able to

implement the interventions when the consultant was no longer present (Barretto, Wacker, Harding, Lee, & Berg, 2006; Gibson, Pennington, Stenhoff, & Hopper, 2010; Machalicek, O'Reilly, Chan, Rispoli, Lang, Davis et al., 2009; Machalicek, Lequia, Pinkelman, Knowles, Raulston, Davis, et al, 2016; Machalicek, O'Reilly, Chan, Lang, Rispoli, M., Davis, Didden, et al., 2009; Suess, Wacker, Schwartz, Lustig, & Detrick, 2016, Wacker et al., 2013a; Wacker et al, 2013b).

One method to assess the learners' ability to implement interventions independently is for the trainers to observe the learners implementing protocols post-training and score their fidelity via a rubric. This can be done via live stream, where no corrective feedback is given and only data are collected (Fisher et al., 2014; Wainer & Ingersoll, 2014). This method allows skills to be scored quickly and retraining to be provided in a timely manner. It also still requires both parties to be available at the same time. Additionally, the learner may perform differently due to the fact they are being observed, a phenomenon known as reactivity (Kazdin, 1977).

Another method to assess post-training fidelity is to have the learners record videos of themselves implementing the intervention, send them to the trainer, and have the trainer score the videos. This method is commonly referred to as video feedback (Suess et al., 2014). While this method may be more time effective, social validity surveys suggest that learners may prefer more immediate feedback or coaching (Wainer & Ingersoll, 2015).

Hybrid Methods

Due to the varying needs of specific settings and clients, recent research has included the methodologies described combined in variety of ways, creating hybrid

methods that use aspects of multiple methodologies. In these studies, participants are provided some type of initial training, typically via a video model or lesson. In some instances, learners are provided with written instruction as well. Learners then record themselves conducting the protocol. Trainers score these videos. Additional training and coaching is provided via real-time video conferencing. Hybrid models have been shown to increase skill acquisition (Fisher et al., 2014; Suess et al., 2014; Wainer & Ingersoll, 2014), however, there is no data comparing these methods to other remote training models or traditional behavioral skills training. Additionally, component analyses may be needed in order to determine which aspects of the training packages are essential in skill acquisition.

Limitations, Delayed Feedback, Video Self Evaluation

While all of the described studies using remote training procedures were successful in showing that learners can increase their knowledge or skills in behavior analysis via remote training, the body of research is small and there are limitations to the research conducted. One major limitation is the necessity for live or immediate performance feedback. While learners may prefer this feedback, as indicated via social validity research, and it may be successful, the process is prohibitive (Wainer & Ingersoll, 2015). Immediate performance feedback can be inhibited by the time and scheduling constraints of the trainer. Additionally, when supervision is being provided internationally, there may be time zone issues that prevent immediate feedback. This results in delayed feedback being provided to the learner, which may slow the skill acquisition process (Neely, Rispoli, Gerow & Hong, 2016).

One method to assist with easing the effects of delayed feedback may be video self-evaluation (Neely, Rispoli, Gerow & Hong, 2016). Video self-evaluation, also referred to as self-monitoring, involves the learners recording themselves engaging in the skill, reviewing their video following implementation, and scoring themselves performing the skills using a pre-defined criterion or a rubric (Nelson & Hayes, 1981). This process allows learners to determine their mistakes and correct their behavior. Data on video self-evaluation indicates that the procedure allows learners to acquire new skills and maintain previously learned skills (Keller, Brady, & Taylor, 2005).

Applications of Remote Training

Remote training in behavior analysis has been used to train parents, teachers, and paid interventionists (Barkaia, Stokes, & Mikiashvili, 2017; Gibson et al., 2010; Suess et al., 2014). While a variety of different types of people have been trained via this model, the elements of ABA on which individuals were trained are limited. Initial research on remote training focused on novice persons conducting behavioral assessments, such as functional analyses (Baretto, Wacker, Harding, Lee, & Berg, 2006; Machalicek et al., 2009a; Machalicek et al., 2010; Suess et al, 2014; Suess et al., 2016; Wacker et al., 2013). This focus may have occurred due to the complex nature of functional analyses protocols as well as the significant impact they can make on dangerous problem behaviors such as self-injury. Additional research has focused on teaching general ABA principles (Heitzman-Powell et al., 2014); functional communication training (Gibson et al., 2010; Suess et al., 2013; Suess et al., 2014; Wacker et al, 2012), discrete trial teaching (Barkaia, Stokes, & Mikiashvili, 2017; Hay-Hansson & Eldevik, 2013), and preference assessments (Higgins et al., 2017; Machalicek et al., 2009a). Each focus area, however, is limited to

less than five studies involving remote training. Training in the area of preference assessments is particularly limited despite the prevalence and importance of the procedure in everyday applications of behavior analysis.

Preference Assessments

One of the key ways through which behavior analysts impact behavior is through the use of reinforcement. Reinforcement refers to the process in which a stimulus following a behavior increases the likelihood of the behavior occurring in the future (Skinner, 1969). In order to determine which stimuli may be reinforcers, behavior analysts frequently conduct preference assessments. These assessments allow practitioners to systematically identify items and activities (eg. toys, edibles, game play) that may serve as reinforcers (DeLeon & Iwata, 1996). Frequent assessment and use of highly preferred reinforcers allow for faster acquisition of skills by those receiving services (Wallace, Iwata, & Hanley, 2006).

Multiple methods of assessing preference have been identified. These methods include, but are not limited to, parental interviews, single stimulus presentations, pair-stimulus presentations, multiple stimulus with replacement, and multiple stimulus without replacement (MSWO). Systematic evaluation of the different types of preference assessment indicates that the MSWO procedure is effective in predicting potential reinforcers and is more efficient than other types of preference assessments as it takes significantly less time to conduct than other types of preference assessments (DeLeon & Iwata, 1996). While remote training has been used to teach the implementation of the MSWO protocol, the training methods have the same limitations of other remote training

studies, specifically their dependence on live coaching and synchronous training methods (Higgins et al., 2017).

Significance and Purpose of Study

Due to the need for more highly trained individuals with expertise in behavior analysis and ASD, there is a need to further investigate remote training options. While initial research in the area has shown that remote training can be used to teach background concepts in behavior analysis as well as related skills, it is important to determine the efficacy and evaluate post- training outcomes for training on essential elements of behavior analysis such as preference assessments. It is also important to assess whether these inventions have social validity and will be usable in the future.

The purpose of this study is to compare outcomes of traditional BST and asynchronous remote training in behavior analysis. As training programs have moved online, supervision of those implementing behavior analytic programs has begun to occur remotely (Dixon et al., 2015; Turner, Fischer, & Luiselli, 2016). With this shift, it has become more difficult to engage in traditional BST procedures, which require *in-vivo* practice. It is important to evaluate the outcomes as well as the efficiency and effectiveness of online training programs and compare them to traditional BST outcomes in order to determine if the success attributed to BST is replicable through remote education. This research aims to investigate how the post-training outcomes of traditional BST compares to online training with video modeling and delayed feedback. The research will compare the benefits of both models for both the trainers and trainees and will also examine the social validity of both models. This will add to the body of literature on behavior analytic training. More importantly, it will evaluate remote training

procedures and examine areas of improvement in order to make future training more effective for those implementing behavior analytic services. More broadly, this research will help disseminate ABA and remote education to provide people in isolated locations with equitable access to services.

Critical Research Questions

1. How do the outcomes of traditional behavioral skills training compare to remote training?
2. How efficient and effective are both behavioral skills training and remote training? How do they compare?
3. What is the social validity of traditional behavioral skills training and remote training? How do they compare?

Chapter 2: Methods

This research utilized single subject design as it is common in behavior analytic research. This study evoked a multiple probe across participants design. Additionally, the results of two groups of participants are compared in order to more closely evaluate the advantages and disadvantages of the two training models.

Participants

Participants were recruited from a group of current students in a Midwest university. Purposive sampling was used to create a homogenous sample, meaning the demographics and characteristics of the participants met specific criteria. All participants were at least 18 years of age, had a high school diploma, and had no prior experience with ABA. All participants signed consent forms (see Appendices A, B, and C) prior to participating in the research study. The study involved two groups of participants, subsequently referred to as Group A and Group B. Both groups consisted of three people. Group A consisted of three participants, Robyn, Kate, and Angela. Group B consisted of three additional participants, Kayla, Mike, and Beth. All participants were trained to implement an MSWO procedure. Group A received traditional BST using the face-to-face model. Group B received asynchronous remote training. Participants were randomly assigned to each group.

Additional participants were required in order for the participants to have individuals with whom to practice the MSWO protocol. From this point on, these additional participants will be referred to as confederates. Confederates were recruited rather than children with ASD in order to protect children from receiving poor quality preference assessments and to minimize harm. Confederates were initially recruited from

a group of current students in a Midwest university. Due to a need for university classes to move off campus for health reasons, a new group of confederates were recruited mid-study. These new confederates were members of the participants' household which allowed the participants to practice the MSWO procedure within their own homes. All confederates were at least 18 years of age. They received specific training as well as scripts that determined how they were to respond to the participants during interactions.

Research Design

This study utilized a concurrent multiple-probe design (Horner & Baer, 1978) across participants, a variation of a multiple-baseline design. Multiple-baseline designs allow for strong internal validity. This design was chosen, as opposed to a reversal design, as the skill being taught was not something that could be unlearned. If the intervention were to be removed after a few trials, the participant may have already learned the skill and may still be able to implement it without the intervention in place, making the procedure inappropriate for a reversal design. The multiple probe design demonstrates that changes in behaviors have occurred because of intervention, meaning it is unlikely that anything other than the independent variable is impacting the dependent variable, without the need for a reversal (Barlow & Hersen, 1984). Initially, baseline data were collected on all six participants implementation of the MSWO. Prior to beginning baseline, participants were given a brief explanation of the procedure (see Appendix A) and asked to perform the task with the confederate. They only had access to these instructions for 5 minutes prior to the initial baseline probe.

For Group A, once the first participant's baseline probes were conducted, the intervention phase was initiated. While intervention was implemented with the first

participant, baseline data continued to be collected for the remaining two participants in that group. Once an upward trend was observed for the first participant, the intervention began for the second participant, while continuing to collect baseline data for the third participant. When an upward trend was observed for the second participant, the intervention for the third participant began. The same procedure was used for Group B. As the two groups are completely independent of one another, the protocols for each group were run simultaneously.

Graphs were created for each group as well as their respective participants. The graphs allowed the research to visually inspect the intervention results. The x-axis of the graph represents the data collection sessions. The y-axis of the graph represents the percentage scored on the MSWO rubric (see Appendix B). The graphs for each participant contain a baseline phase, intervention phase, identify when mastery occurred, and contain maintenance data points after mastery. Additional graphs represent trials to criterion for each participant as well as the amount of time involved in training. Social validity data is also displayed via graph.

Settings

Group A participants met with the researcher at the university for the baseline and intervention phases and all sessions were conducted in a reserved conference room. Maintenance probes were conducted in the participants' homes and were recorded and sent to the researcher. Group B participants never met directly with the researcher or assistants in person. All correspondence was conducted via telecommunication. Sessions were conducted in a location that was convenient for both the participant and the

confederate. Originally, these sessions occurred on campus but eventually moved to the participants' homes.

Dependent Measures

The first dependent measure was the percentage of steps correct as recorded by the rubric the researcher created. This rubric broke down the MSWO procedure described in Appendix A into discrete, observable steps (see Appendix B). Responses were recorded as correct or incorrect (+/-) or not applicable (N/A). Correct responses were defined as responses that match the steps as outlined in the rubric and occur in the correct order. Incorrect responses were defined as steps that do not match the definitions in the rubric or steps that are completed out of order. The researcher and assistants used this datasheet to score all MSWO session videos. The participants also used this rubric to score themselves immediately following each MSWO session. A percentage was calculated by dividing the number of steps completed correctly by the total number of steps completed.

Additionally, the researcher measured the number of training sessions needed for the participant to reach the training mastery criterion. This trial to criterion data served as the second dependent variable and was used to evaluate the effectiveness of each training method. Additionally, the researcher recorded and analyzed how many times the MSWO procedure was modeled for each participant. With Group A, the researcher recorded how many times the participants ask the research to model the skill. For Group B, the number of times the participants watched the videos will be recorded via the video streaming app, Box. The researcher also recorded and analyzed the number of hours needed to complete

the training as well as the number of days needed to reach mastery in order to evaluate the efficiency of each methodology.

A secondary measure was an electronic social validity survey (see Appendix C) sent to all participants following the final maintenance probe. The survey included both rating scales and multiple-choice questions. This survey explored the benefits of the training methods and how the participants found the user friendliness of the training methodology.

The researcher created a rubric on the steps of BST (see Appendix D) to monitor the procedural fidelity of the traditional BST protocol implemented with Group A. The checklist was completed by a research assistant at least once with each participant in order to ensure the training procedures are implemented with fidelity. The researcher created additional rubrics on the steps of the remote training protocol (see Appendices E and F) to monitor the procedural fidelity of the training implemented with Group B. The checklists were completed by as research assistant at least once with each participant.

In order to ensure that all confederates were responding to the MSWO consistently, the researcher created a script for the confederates to use (see Appendix G). The scripts instructed the confederate on how to respond to the participant. There were four scripts. Each confederate used the same scripts in the same order in order to ensure data were reliable and that all participants are exposed to the same behavior from the confederates. Confederate scripts included common behavioral issues as well as lack of responding. The researcher reviewed the confederate's adherence to the script at least once with each confederate. All confederates followed the scripts as intended with minor retraining.

Data Analysis

Data were inspected visually in order to determine the effect of the video training package and the traditional BST training package. Participants reached mastery criteria on the MWSO protocol when the skill is performed at or above the accuracy level (80% or higher) across three consecutive data points. Graphs were created for each group and each participant in order to allow for visual inspection. The percentages of accuracy of implementation during baseline was compared to intervention and maintenance phases.

Efficiency and Effectiveness

The researcher measured the number of training sessions needed for the participant to reach the training mastery criteria. This trial-to-criterion data was analyzed in order to evaluate the effectiveness of each training method as fewer training sessions implied that the methodology is effective in training novel participants. The researcher also reviewed the duration of videos and calculate the total number of hours needed to complete the training as well as the number of days needed to reach mastery in order to evaluate the efficiency of each methodology.

Social Validity

Social validity was completed following the final maintenance probe. Each participant was provided with a survey that was composed of ten prompts with a Likert scale. The Likert scale ranged from 1-4 with one being strongly disagree, two being disagree, three beings agree, and four being strongly agree. This survey was anonymous and explored the benefits of the training methods and how the participants found the user friendliness of the training methodology. Data were analyzed visually and via statistical analysis.

Experimental Control Procedures

Inter-observer agreement

Interobserver agreement data were collected by research assistants. These assistants viewed videos of the MSWO sessions and scored them using the scoring rubrics (see Appendix B). These rubrics were then compared to the scoring rubric used by the researcher to collect data on the sessions. The researchers used point-by-point agreement ratio in which the number of total agreements is divided by the number of agreements plus disagreements then multiplied by 100 (Kazdin, 1982). Observations were considered reliable if a score of 80% or greater is achieved. During baseline, IOA averaged 94%. During the training phase, IOA averaged 93%. During maintenance, IOA averaged 97%. A total of 30 sessions were scored for IOA data collection.

Procedural Fidelity

The researcher was observed via video by a research assistant in order to ensure that the treatment procedure was being implemented as written. This was done during the intervention phase and utilized the procedural fidelity checklists (see Appendices D, E, and F). Fidelity data was completed at least once per participant. Procedural fidelity data were collected on how the face to face BST was implemented, how the remote training was implemented, and how remote feedback was provided. Data were calculated by totaling the number of steps of the procedure the implementer implemented as written divided by the total number of steps. Additional data were collected on confederate adherence to the scripts.

Procedure

Group A

Group A consisted of three individuals who met the participant requirements. Prior to beginning baseline, the participants received no information about the MSWO procedure they would be implementing. Each participant was paired with a confederate. Participants in the group received traditional BST face-to-face from the researcher. Initially, they met with the researcher and a confederate on campus to practice the MSWO. The confederate was an individual the participant was unfamiliar with who was following a script provided by the researcher. Following the training phase, the university moved to all online learning due to a global health crisis. This resulted in the need for new confederates to be trained. These new confederates followed the same scripts, however, were members of the participants' household in order to comply with social distancing regulations.

Baseline Group A. During baseline, the researcher met with the participant and the confederate. The researcher provided the participant with a brief explanation of the MSWO protocol that states the rationale of the procedures as well a brief overview of the process (see Appendix A). They had access to this explanation for five minutes prior to the first baseline probe. The researcher then asked the participant to implement the MSWO procedure. No feedback for correct or incorrect performance was given. The session was recorded, and the researcher collected data per the rubric (see Appendix B). This was repeated at least three times prior to beginning the intervention phase.

Intervention Group A. During intervention, the researcher met with the participant and confederate and used the BST model (see Appendix D) to train the participant on the MSWO protocol. The participant was instructed that they may ask the researcher to model the procedure as many times as they would like. Following training,

the participant was instructed to run the MWSO protocol with the confederate. The participant conducted the MSWO and collected data on the MSWO data sheet (see Appendix G). The participant scored their performance on the rubric (see Appendix B). The researcher collected data on the same rubric (see Appendix B) and provided feedback, which was given to the participant immediately following the trial. Reinforcement was provided in the form of behavior specific praise for correct response (eg. “Great work allowing them to test the items prior to making a choice!”). Corrective feedback was given for incorrect responses (eg. “Make sure to remove the item from the array after it has been chosen, as putting it back may skew the data.”). The participant had the opportunity to practice the skill or ask questions following feedback. The modeling and feedback portions of the training procedure were able to be repeated multiple times during a session, however, training sessions could last no more than 30 minutes.

The participant repeated the training process until mastery of 80% or higher across three consecutive data points. After reaching the mastery criteria, the researcher conducted at least three maintenance probes. For these maintenance probes, the participant and the confederate met without the researcher and recorded a video in which the participant ran the MSWO. This video was uploaded to Box. Brief feedback was provided via the rubric (see Appendix B). Retraining was provided if the fidelity scores drop below 70%. Following the final maintenance probe, the social validity survey (see Appendix C) was sent to the participant. This process was repeated with each participant in Group A.

Group B

Group B consisted of three individuals who met the participant requirements. Prior to beginning baseline, the participants received no information about the MSWO procedure they would be implementing. Each participant was paired with a confederate. Group B received all of their training remotely. Kayla conducted all of her baseline probes on the university campus working with an unfamiliar confederate. Training and maintenance probes were then completed in the home with a familiar confederate. Both Participants 5 and 6 did all of their baseline and training in their homes with confederates that were familiar to them as they were household members in order to comply with social distancing regulations.

Baseline Group B. Prior to beginning, the researcher emailed the participants a link for their video and document storage accounts. Videos and materials were stored via a secure platform called Box. The researcher ensured that each participant was able to access videos by requiring the participants to watch a sample video, upload a sample video, and upload a sample photo. Assistance with the Box application from the researcher was available via telephone if necessary.

During baseline, the researcher scheduled a meeting between participant and the confederate. The researcher provided the participant with a brief explanation of the MSWO protocol (see Appendix A) via the Box account. This explanation was available for five minutes and then disappeared. A separate instructions sheet included directions for the participant to implement the MSWO procedure and record it via video. No feedback was given for correct or incorrect performances. The session was recorded and uploaded to the participants Box account. The researcher reviewed the videos and collected data per the rubric (see Appendix B).

Intervention Group B. During the intervention phase, the researcher uploaded the training video as well as the scoring rubric (see Appendix B). The training video consisted of the trainer modeling the MSWO procedure as well as providing the explanation and rationale. The researcher emailed the participant and ask that they view the video at least once. The video remained available for the participant to watch as many times as they would like. The researcher scheduled sessions between the participant and the confederate. The participant recorded each trial. During each trial, the participant conducted the MSWO procedure once.

Following the trial, the participant watched the video of their session and scored themselves via the rubric. The video was then uploaded to the participants' Box account. The participant was welcome to ask any questions of the researcher via the uploaded rubric. The researched required the participant to upload the video within 30 minutes of the session. The reviewer watched the video and scored the performance via the rubric (see Appendix B) following the feedback procedure (see Appendix E). Feedback was sent via email and Box to the participant between 24 to 72 hours following the video's upload. Reinforcement was provided in the form of behavior specific praise for correct response (eg. "Great work allowing them to test the items prior to making a choice!"). Corrective feedback was given for incorrect responses (eg. "Make sure to remove the item from the array after it has been chosen, as putting it back may skew the data.").

The participant repeated the training process until mastery of 80% or higher across three consecutive data points. After reaching mastery criteria, the researcher conducted at least three maintenance probes. This means the participant and confederate met once a week for at least three weeks following the intervention phase. The participant

was instructed via email to run the MWSO protocol with the confederate. The video was then be uploaded to the participants Box account.

The reviewer watched the video and scored the performance via the rubric. Feedback was sent via email and Box to the participant between 24 to 72 hours following the video's upload.

An additional training video was provided if the fidelity scores drop below 70%. Following the final maintenance probe, the social validity survey (see Appendix C) was sent to the participant. This process was repeated with each participant in Group B .

Conclusion

This research allowed the researcher to investigate the efficacy and post-training outcomes of both traditional BST and remote training with delayed feedback. Through the design of the study, the researcher was able to compare and contrast the training methodologies. Additionally, through the social validity assessment, the researcher was able to compare the preferences of the trainees as well as the accessibility of the training materials.

Chapter 3: Results

This research examined three questions outlined in Chapter 1 (1. How do the outcomes of traditional behavioral skills training compare to remote training? 2. How efficient and effective are both behavioral skills training and remote training? How do they compare? 3. What is the social validity of traditional behavioral skills training and remote training? How do they compare?) Those three questions will be answered here, however, the group and participant data will be discussed individually prior to making any comparisons.

Group A

Robyn

As shown in Figure1, Robyn completed three baseline probes with a mean average of 7% of the steps of the MSWO procedure completed correctly. During the training phase, Robyn completed an average of 99% of the steps correctly and mastered the procedure after three training sessions. Robyn did not ask the researcher to repeat any modeling during the training phase. During the maintenance phase, the participant completed a mean average of 100% steps of the MSWO correctly.

Kate

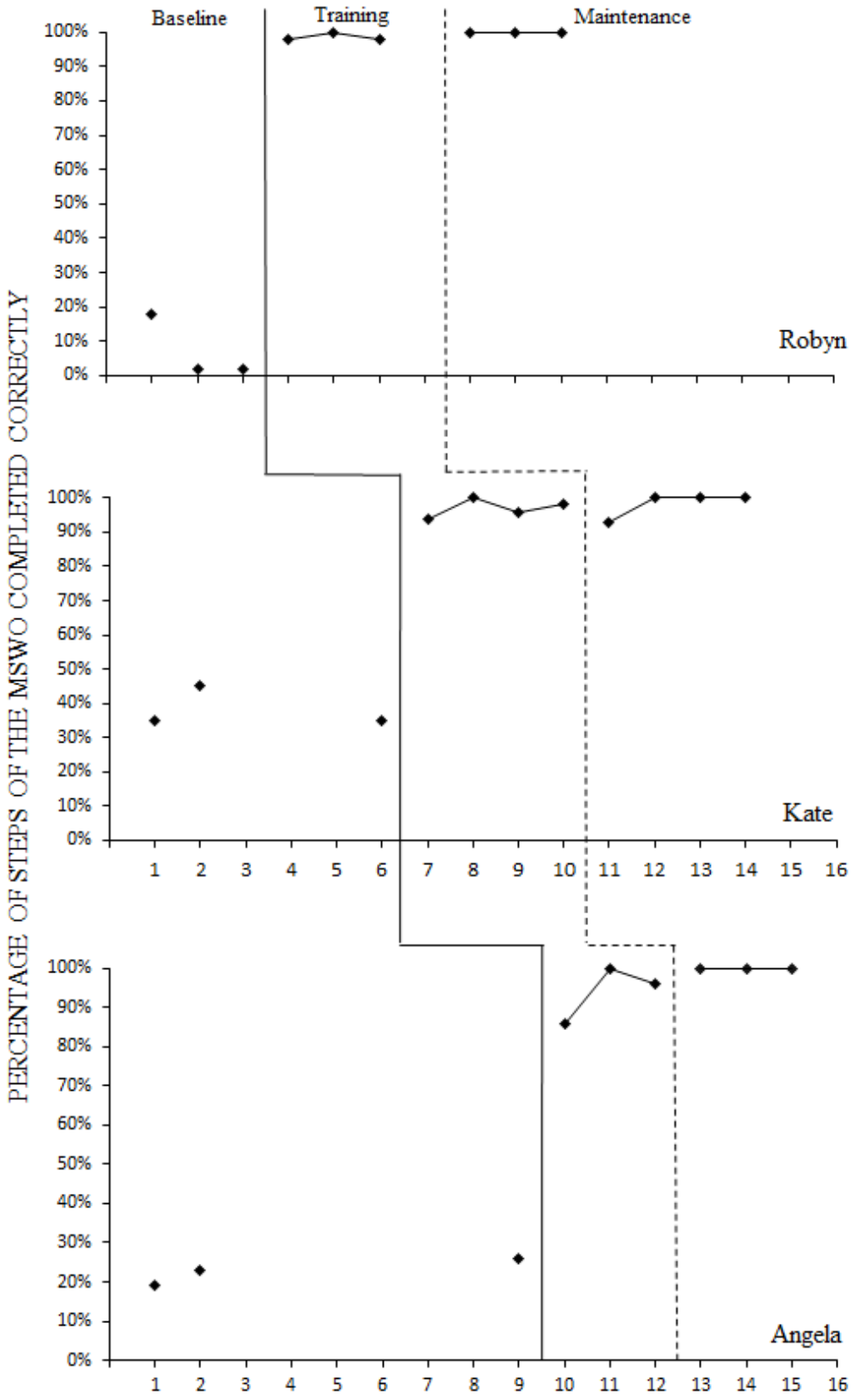
Kate completed three baseline probes with a mean average of 38% of the steps of the MSWO completed correctly, as displayed in Figure 1. During the training phase, Kate completed a mean average of 97% of the steps correctly and mastered the procedure after three training sessions. A fourth session was completed, however, as the confederate completed the scripts out of order and another trial was necessary to ensure the correct sequencing. Kate asked for the researcher to repeat a model once during training. During

the maintenance phase, the participant completed a mean average of 98% steps of the MSWO correctly.

Angela

Angela completed three baseline probes with a mean average of 23% of the steps of the MSWO procedure completed correctly. As shown in Figure 1, during the training phase, Angela completed a mean average of 94% of the steps correctly and mastered the procedure after three training sessions. Robyn did not ask the researcher to repeat any modeling during the training phase. During the maintenance phase, the participant completed a mean average of 100% steps of the MSWO correctly.

Figure 1. Percentage of steps of the MSWO completed by Group A



Group B

Kayla

Four baseline probes were conducted with Kayla with a mean average of 36% steps of the MSWO completely correctly. As shown in Figure 2, following baseline, Kayla watched the training video and began completing training trials. During the training phase, Kayla completed a mean average of 89% steps correctly and mastered the procedure after 3 training sessions. Kayla watched the training video nine times during the training phase. During the maintenance phase, the participant completed a mean average of 95% steps of the MSWO correctly.

Mike

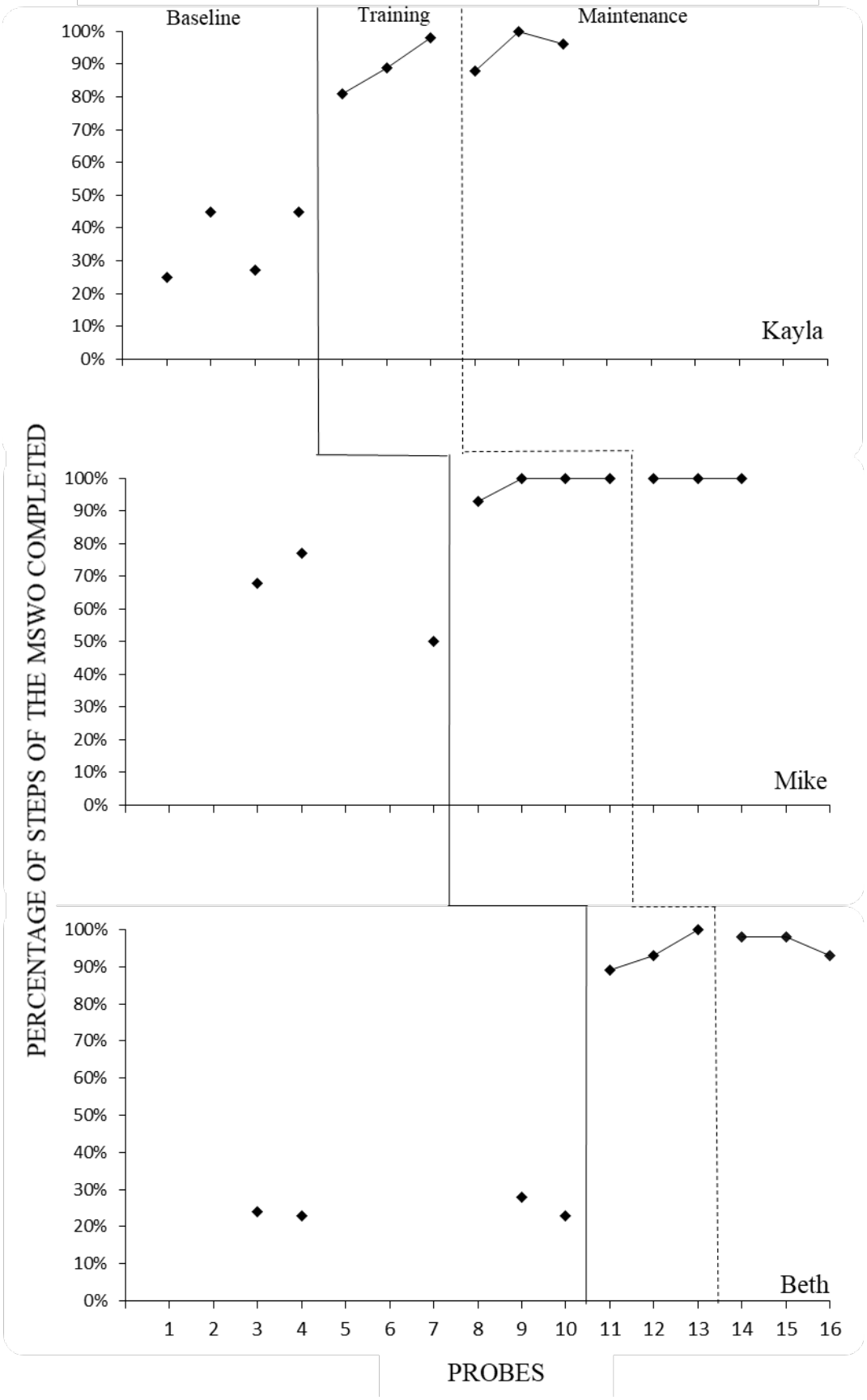
Mike completed three baseline probes with a mean average of 65% steps of the MSWO completed correctly, as shown in Figure 2. During the training phase, Mike completed a mean average of 98% steps correctly and mastered the procedure after three training sessions. A fourth session was completed, however, as the confederate accidentally completed the scripts in the wrong order and another trial was necessary to ensure the correct sequencing. Mike watched the training video one additional time after the initial training during the training phase. During the maintenance phase, the participant completed a mean average of 100% steps of the MSWO correctly.

Beth

As shown in Figure 2, four baseline probes were conducted with Beth with a mean average of 25% steps of the MSWO completely correctly. It should be noted that during baseline, the confederate completed the scripts out of order and an additional probe was needed to ensure proper sequencing. Following training, Beth completed a

mean average of 94% steps of the MSWO correctly and mastered the procedure after three training sessions. Beth watched the training video one additional time after the initial training during the training phase. During the maintenance phase, the participant completed a mean average of 96% steps of the MSWO correctly.

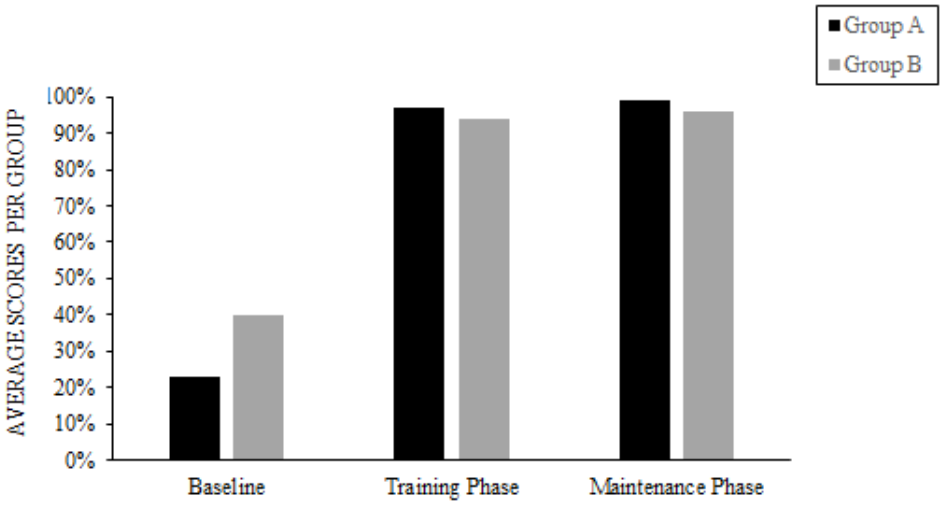
Figure 2. Percentage of steps of the MSWO completed by Group B



Comparison of Training Outcomes

The average scores during the intervention phase for Group A were 97% while the average scores for participants in Group B in the same phase were 94%. During the maintenance phase, group A completed an average of 99% of the MSWO procedure correctly. During the maintenance phase, Group B completed an average of 97% of the MSWO procedure correctly. While the differences were slight, scores were higher for participants in Group A in both the training and maintenance phases.

Figure 3. Comparsion of Groups A and B



Effectiveness of the Training Methodology

In order to evaluate the effectiveness of the training methodologies, the researcher looked at the number of training trials needed to reach the mastery criterion. In both Group A and Group B, all participants only required three trials to reach the mastery criterion. This indicates that both procedures were equally effective in teaching participants the skills. The average scores during the intervention phase for Group A were 97% while the average scores for participants in Group B in the same phase were 94%. These scores indicate how many of the steps of the MSWO the participants implemented

as trained. While Group A's scores were slightly higher than Group B 's, this did not impact how many sessions were needed to reach the mastery criterion.

Efficiency of the Training Models

In order to evaluate the efficiency of each training methodology, the researcher reviewed the time that participants in both groups spent engaged in the training process. The researcher calculated the total amount of time in minutes that the participants were engaged with the training materials. The researcher also evaluated the number of the days that each participant was in the training phase.

Time Spent in Training

For group A, the time spent in training was calculated by totaling the time from the beginning to end of each training session. As all communication regarding training took place during these sessions, no additional time was added into the totals. For Group B , the total time spent in training was calculated by adding together the amount of time the participant spent watching the training video (provided by the Box application), the length of each practice sessions double as the participant had to watch the video after completing it in order to complete the self-monitoring sheet, and the time it took for a person to read the feedback sent by the researcher.

Table 1
Participant Time Spent Engaged in Training

Participant	**Minutes in Training**
Group A	
Robyn	31:28
Kate	*37:12
Angela	35:02
Average	34:34
Group B	
Kayla	**186:46
Mike	43:46
Beth	*61:28
Average	97:20

*Participants completed an additional session due to confederate
**Time may have been incorrect as the participant viewed the video 8 times during a two-hour window which made indicate that the participant was not watching the video each time it played

The average amount of time spent in training for Group A was 34 minutes and 34 seconds while the average amount of time spent in training Group B was 97 minutes and 20 seconds. All participants in Group B spent more time engaged in training than participants in Group A. This was due to the fact that the participants in the remote training group could watch the training video multiple times. While the participants in Group A were told they could ask for any part of the training to be repeated, this was only requested once by one participant, however, all participants in Group B watched the training video more than once. It should be noted that Kayla spent substantially more time engaged in training than all other participants. This was due to the fact that this participant watched the training video a total of 10 times. The application indicated that the participant viewed the training video eight times during a two-hour window. This

may indicate that the participant was not watching the video each time it played and had to restart the video multiple times which added to the training time total.

For both groups, the time spent in training was impacted by confederate script adherence errors which are described in further detail below. In these situations, participants were sometimes required to do an additional session because their confederates did the scripts out of order. For these participants, their total time was calculated with and without the error session. For Kate, the time spent in training with the error session removed decreased to 32:20. For Beth, the time spent in training with the error session removed decreased to 58:08.

Time spent providing training. While not a measure of the study, the researcher also monitored the time the researcher spent providing training. For Group A, the total time the researcher spent providing training was equal to the amount of time the participants spent engaged in training as all training was provided face to face by the researcher. For Group B, the total time the researcher spent providing training was shorter than the time the participants spent engaged in training. This was because the researcher only had to record the training video once regardless of how many times the video was watched. Additional time spent providing training was only necessary for reviewing the videos uploaded by the participants and providing feedback on the uploaded videos.

Table 2
Researcher Time Spent Providing Training

Participant	**Minutes in Training**
Group A	
Robyn	31:28
Kate	37:12
Angela	35:02
Total time:	103:42
Group B	
Initial Video Creation	*30:00
Kayla	15:07
Mike	10:07
Beth	15:58
Total time:	70:12

*This time is approximate as there were several interruptions while the researcher was editing the video so total time may have been less.

Days Needed to Complete the Training

The total number of days needed to complete training was calculated from the day of the first training session until the day of the last training session and included days on which training session did not occur. For example, if the first training occurred on a Monday, the second training occurred on a Wednesday, and the last training occurred on that Friday, the total number of days needed to complete training would be five. All in-person training sessions were scheduled per the participant's and confederate's availability. For the remote training sessions, the participants chose which days they would do their training sessions in their home with confederates. All trainings had to be at least 24-48 hours apart to allow for delayed feedback.

Table 3
Participant Days in Training Phase

Participant	**Days in Training**
Group A	
Robyn	5
Kate	4
Angela	5
Average	4.7
Group B	
Kayla	8
Mike	6
Beth	5
Average	6.3

As seen in Table 1, the mean number of days in training for Group A was 4.7 while the mean number of days in training for Group B was 6.3. While Beth was able to complete their training in a time frame that was more comparable to Group A, Group B on average needed more days in the training phase to complete the training.

Social Validity

A social validity survey was completed by each participant following the final maintenance probe. This survey was completely anonymously, so individual participant data was not available. Data were analyzed via statistical analysis as well as visually.

Group A

All three participants in group A either agreed or strongly agreed with all prompts indicating that the in-person training has strong social validity. Each prompt had a mean score between 3 and 4 as can be seen in *Table 3*. The prompts that received the highest scores were: “this training took a reasonable amount of time,” “the feedback I received

was helpful," "the feedback I received was timely," and "the feedback I received allowed me to change my practice." The prompts that received the lowest scores were: "I would recommend this training to other people" and "this training was not too technical." The mean of the summed scores for group A was 34 with an average standard deviation of .46.

Table 4
Group A Social Validity Survey Results

Survey Prompts	**Mean**	**SD**
1. This training was easy to access.	3.33	0.58
2. This training took a reasonable amount of time.	3.67	0.58
3. This training fit my learning preferences.	3.33	0.58
4. This training allowed me flexibility.	3.33	0.58
5. I would like to do this training method again in the future.	3.33	0.58
6. I would recommend other people complete this training.	3.00	0.00
7. The feedback I received was helpful.	3.67	0.58
8. The feedback I received was timely.	3.67	0.58
9. The feedback I received allowed me to change my practice.	3.67	0.58
10. This training was not too technical.	3.00	0.00
Sum	34.00	

Group B

All three participants in Group B either agreed or strongly agreed with all of the prompts, with the exception of two individuals who each disagreed with one prompt. The high level of agreement indicated that there was also strong social validity with the remote training procedure. Each prompt had a mean score between 3 and 4, the with exception of prompt 3 ("this training fit my learning style") which had a mean of 2.67, as can be seen in *Table 3*. The prompts that received the highest scores were: "the feedback

I received was helpful," "the feedback I received was timely," and "this training allowed me flexibility." The prompt that received the lowest scores was: "this training fit my learning preference." It should be noted that the average standard deviation for this group was .52, however, prompt 10 ("this training was not too technical") has a standard deviation of 1.15. This was because two participants strongly agreed with this prompt and one person disagreed with this statement. The mean of the summed scores for Group B was 33.

Table 5
Group B Social Validity Results

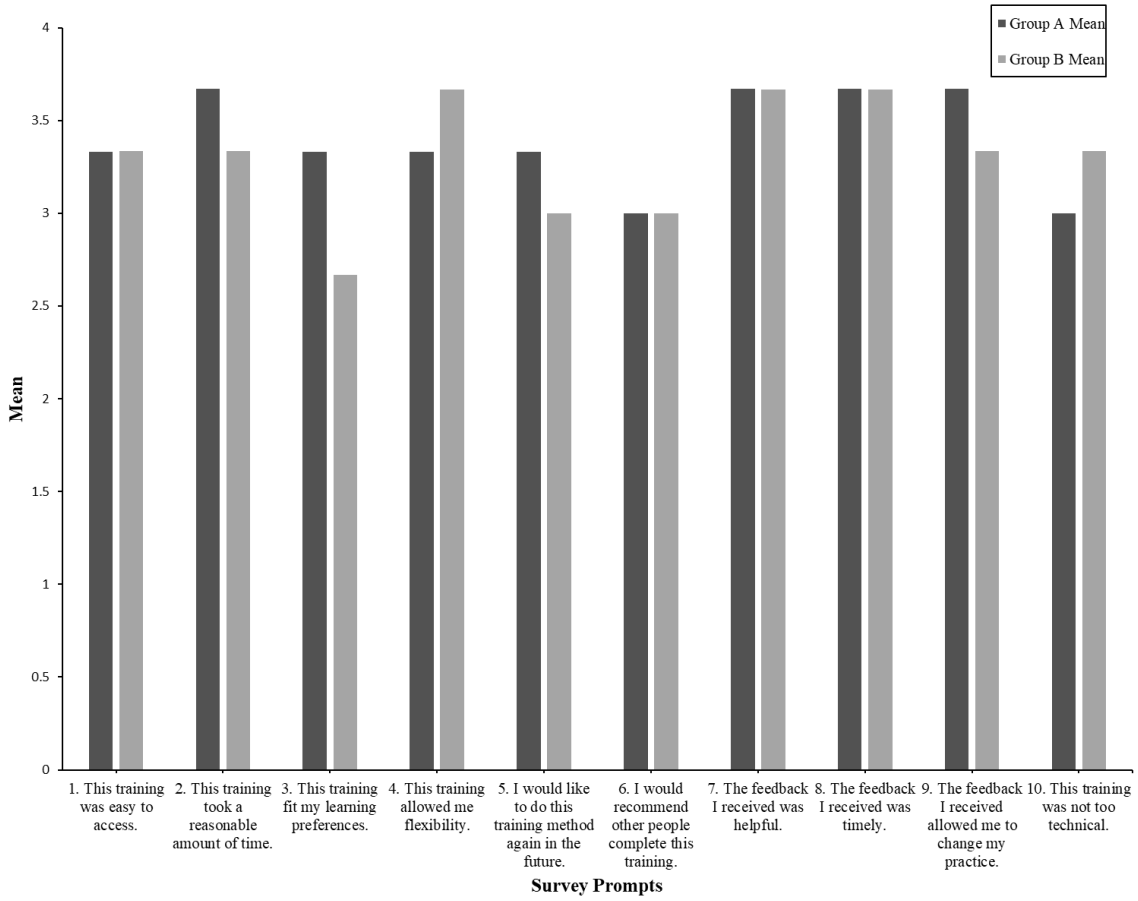
Survey Prompts	**Mean**	**SD**
1. This training was easy to access.	3.33	0.58
2. This training took a reasonable amount of time.	3.33	0.58
3. This training fit my learning preferences.	2.67	0.58
4. This training allowed me flexibility.	3.67	0.58
5. I would like to do this training method again in the future.	3.00	0.00
6. I would recommend other people complete this training.	3.00	0.00
7. The feedback I received was helpful.	3.67	0.58
8. The feedback I received was timely.	3.67	0.58
9. The feedback I received allowed me to change my practice.	3.33	0.58
10. This training was not too technical.	3.33	1.15
Sum	33.00	

Comparison of Groups

The sum of the averages for Group A was 34 and the sum of the average for Group B was 33. The maximum sum that could have been achieved had every

participant strongly agreed with all prompts was 40. This indicated that both methodologies had strong social validity while Group A was slightly higher. While the overall scores were similar between the groups, scores varied between the specific prompts. Group A had higher scores on four prompts as seen in *Figure 4* while Group B had higher scores on two prompts. The groups had the same average scores on the remainder of the prompts. The largest discrepancy was seen on prompt 3 ("this training fit my learning style") where Group A had an average of 3.33 and Group B had an average of 2.67.

Figure 4. Graph of means of social validity scores by prompt



Procedural fidelity

In person training sessions were recorded via video and then watched and scored in order to measure procedural fidelity. One training session was watched per participant and all sessions scored 100% per the scoring rubric (see Appendix D). Remote training fidelity measured the extent to which the training video met the predetermined criteria for remote training. This fidelity was scored by the researcher and the research assistants and involved watching the training video and scoring it per the scoring rubric (see Appendix E). All three researchers scored the video at 100% with 100% IOA between observers. Remote feedback was provided via email as well as the Box application. Procedural fidelity was scored via the scoring rubric (see Appendix F). The feedback was viewed by both the researcher and the researcher assistants at least once per participant and fidelity data were collected. The mean average of the fidelity scores was 100% with IOA of 100%. Percentages were calculated by totaling the number of steps of the procedure the implementer implemented as written divided by the total number of steps.

Script Adherence

The researcher reviewed each session for confederate adherence to the scheduled script. Script adherence was high, averaging 90%. Each confederate made multiple mistakes, however. Small errors, such as grabbing two items more than once, were corrected via retraining. The most common mistake was doing scripts out of order. If the script conducted was near in order to the script that was supposed to be conducted and would occur during the same phase, the scripts were simply run out of order. For example, if during baseline, the confederate ran script one first but was supposed to run script three first, the trial with script one was the first probe and the trial with script three was the second probe. The scripts were run, but out of order. If the scripts were run out of

order during a time when the participant would be moving from one phase to another, however, say on the last trial of the training phase, the researcher had the pair conduct an additional probe in order to ensure that they started the next phase of the research on the correct script. Each participant had a confederate conduct a script sequencing error once. No participant had this error occur more than once.

Chapter 4: Discussion

Summary of Findings

Both training methodologies were equally effective at training individuals as members of both groups only required three training trials to reach the mastery criterion. Group A had slightly higher, yet similar scores to Group B during both the training and maintenance phases indicating that the outcomes of the two methodologies were very similar for participants. These results indicate that both in person training and remote training are viable methods for providing training on behavior analytic procedures to implementers.

Time Spent in Training

In person training was slightly more efficient in terms of the amount of time required than remote training, however, this may have been due to the structures of the training methodologies. Efficiency was measured by the amount of time the participant was engaged in training. The length of in person sessions was limited to thirty minutes. While participants were told that they could have instructions repeated at any time, only one participant asked for a model to be repeated one time. Very few questions were asked, and no sessions took the full 30 minutes. This may have been due to the social pressures of completing training in person with a peer present as this has been shown to decrease one's likelihood of asking questions of trainers (So & Brush, 2008).

As the remote training group watched the training videos on their own time and were not within meeting time limits, all participants watched the models more than once. This time was calculated via the Box application and led to an increase in the total amount of time the participants spent engaged in training. The lack of structured training

times as well as the ability to re-watch the training models without social factors may have led to the increased amount of time and the decreased efficiency of the training model. While the ability to re-watch the videos may have increased the time in training, prior research has indicated that the ability to pause and re-watch videos is part of their training efficacy (Salina et al., 2012).

Additionally, the measures used in the section may have been flawed. The participants in Group B could have spent additional time reviewing the feedback, however, there was no way for the researcher to monitor this. It should also be noted that while the participant may have played the video, there is no way for the researcher to confirm that the participant watched the video while it was playing. Participants may have started a video, gotten distracted, stopped watching the video, and restarted the video at a later time, however, there is no way to determine this via the application that was used to track the data.

Days Needed for Training

Efficiency was also measured by number of days the participant spent in the training phase. In person training sessions were scheduled by the researcher around the participant and the confederate's shared schedules while the remote training sessions were scheduled by the participant with their household member on their own schedule. This led to the Group B having more sporadic scheduling while participants in Group A tended to meet on a regular schedule. This scheduling also led to participants in Group A completing the training in a timelier manner than participants in Group B. While the less structured scheduling led to a decrease in efficiency, it may indicate that participants in Group B were able to schedule training sessions at a time that was more convenient for

them and their families. While less efficient, it should be noted that the training was still able to be completely in a relatively timely manner. The sporadic scheduling availability may be similar to what is available to families who need training in behavior analysis so it is important to note that training can still be effective when it does not occur on a regular schedule.

Additionally, it should be noted that the sporadic scheduling posed some issues for the researcher as it was difficult to conclude when training sessions would be completed. This made it difficult to determine when to schedule time to watch the videos and provide feedback. In practice, sporadic scheduling may cause issues for behavior analysts with very complicated schedules and could impact their ability to provide feedback in a timely manner.

Social Validity

Overall social validity scores were similar between the two groups but there were discrepancies between the individual prompts. Group A had a higher mean score on the prompt indicating that the training fit their learning preference than Group B which may indicate that participants preferred in person learning to remote learning, however, this information is limited by the wording of the prompt. The prompt specifically asked if the training fit the participant's learning preferences but did not compare one training methodology to another. Participants in Group B had a higher mean score than participants in Group A on the prompt regarding training flexibility indicating that the remote training protocol may have allowed for a greater degree of flexibility for participants. This is important to note as training flexibility is an important determining factor for whether one completes training procedures (Strambi &

Bouvet, 2003).

Additional social validity data reflected other aspects of the study. Group A had a higher mean score on the prompt regarding feedback allowing one to change their practices. This may be related to immediate versus delayed feedback, however, this relation is unclear. Group B had a higher mean score on the prompt indicating that the training was not too technical. Two participants said that they strongly agreed with this prompt while one other participant said that they disagreed. This may have occurred as one participant had significant technology issues that may have impacted their responding to this prompt. Most participants in Group A said that the training took a reasonable amount of time while participants in Group B indicated lower agreement with this statement which mirrors that data regarding training method efficiency. Most importantly, both training methods had high social validity with scores averaging between agree and strongly agree with all prompts. This indicates that both methodologies were socially valid for participants and could be used again in the future with other trainees.

Other Findings

While the remote training phase may have taken more time and been less efficient for participants, as was the measure of this study, the remote training phase was highly time efficient for the researcher providing the training. Rather than repeating the training procedure for each participant, which took approximately 15 minutes, the researcher was able to provide the training only once, via video, which took approximately 30 minutes with editing. This training was then distributed to each participant. They were able to watch it as many times as they wanted without the researcher having to repeat

themselves. The researcher then watched the video recorded session and scored the participant, as they did with the participants from Group A as part of the self-monitoring procedure, however this was able to be completed on their own time as long as it was within the boundaries of 24-72 hours following the session. To provide training for the three participants in Group A, it took 103 minutes, 7 seconds, not including the additional time needed for commuting and scheduling. To provide the training for Group B, it took 70 minutes, 12 seconds with no additional time required of the trainer. As creating the training video took the most time and the video could be used over and over, the remote training procedure would only become more efficient the more times the video was used. Additionally, the session for participants in Group B did not require the trainer to drive to any locations or be available at any particular time as materials could be uploaded in advance and scored later. This allowed for additional flexibility while the in-person training required the trainer to be available at specific times per the participant's availability.

Implications for Practitioners

The results of this study, while limited, show that both in-person and remote training are effective methodologies for training individuals to conduct MSWOs. While remote training did take longer for the learner, it had similar outcomes to in-person training which shows that it could be a viable method for training. While this training took more time for the learners, it took less time than traditional face to face training for the trainer which may be beneficial for behavior analysts with limited availability.

Behavior analysts working as practitioners typically have busy schedules with the average behavior analyst seeing more than the BACB recommendation of a maximum of

12 individuals (BACB, 2014; Roscoe et al., 2015). The fact that the remote training described in the research study is asynchronous would allow behavior analysts to provide training without specific time constraints. This would allow for trainees to record sessions simultaneously based on what was convenient for them and their schedule and would also allow for supervision across time z0nes. Additionally, practitioners could use this training methodology to train parents in distant locations when it is impractical to be able to travel to these locations. This would minimize the need for both practitioner and family drive time, making the methodology more efficient for both parties. These benefits may allow behavior analysts to be able to provide training to a greater number of individuals and decrease the shortages many areas currently experience.

Limitations

While there were multiple issues that may be seen as limitations within this study, it should first be noted that during this study, there was a global pandemic. When the research study began, the issue was not significant in the area where the research was being conducted, however, it became significantly more impactful during the course of the study. It is impossible to determine what impact this had on participants and the data; however, it should be noted that there may have been an impact on the outcomes, and this will be discussed further below.

Impacts on Days in Training

Participants in Group A were in the training phase when the global pandemic began more seriously impacting the area. As there was a quite a bit of uncertainty about what would happen, many events were cancelled, as were classes. This led to increased participant and confederate availability and also an increased sense of urgency amongst

the participants to complete their training. All participants in Group B completed their training in their homes during a mandated stay-at-home period. This may have caused participants in Group B to be less willing to complete their training more quickly, however, the impacts are unclear.

Changes in Confederates

Due to the global pandemic, there was a change in confederates for participants one through four. For participants in Group A, during baseline, they met with the researcher and a confederate on campus. The confederate was an individual the participant was unfamiliar with who was following a script provided by the researcher. Following the training phase, the university moved to all online learning due to a growing crisis situation. This resulted in the need for new confederates to be trained. These new confederates followed the same scripts, however, were members of the participants' household in order to comply with social distancing regulations. It is unclear how this change in confederates impacted the results of the study.

Working within the Home

As both groups were required to record some sessions from their home, there were challenges that occurred due to the uncontrolled setting. Occasionally the participants' children or other relatives would interrupt their preference assessments. One child frequently tried to talk into the camera while the participant was recording. During multiple videos, cats attempted to take toys being used in the preference assessment. While it is unclear if this impacted the way in which the participants implemented the MSWO, it was clear that the setting was less controlled than a university conference room or classroom would have been. While this setting was less controlled, it mirrored

the real-life settings of possible implementers or families who may receive remote training in the future. Despite there being less control, participants were still able to learn the skill and were able to implement the procedure with a high level of fidelity. This indicates that while there may have been some barriers with the less controlled setting, it did not significantly impact one's ability to acquire skills via remote training.

Confederate Script Errors

As discussed in the results, confederate script errors were frequent despite the average procedural fidelity of 90%. The most common error was completing scripts in the incorrect order. Prior to beginning the study, the researcher randomly generated a sequence for the scripts and gave this sequence to each confederate. This was to ensure that participants were exposed to the scripts in the same order. When confederate did not do the scripts in the correct order, it may have impacted in the internal validity. In order to minimize these risks, the researcher had the confederate and participant repeat the procedure to stay on sequence if the scripts were run out of order during a time when the participant would be moving from one phase to another. While these steps were taken to minimize the risk, it is unclear what impact the script sequence adherence errors had on the internal validity.

Possible Errors with Time in Training Calculations

The researcher used the Box application to calculate the time participants in Group B spent watching the training video. While the application tracked when the participants played the video, there was no way to determine if the participants were watching the video while it was playing. This issue was illustrated by Kayla. Participant's 4 total time in training was 186 minutes and 46 seconds. This was 125 minutes and 18

seconds longer than the next highest participant. This increased amount of time came from fact that this participant viewed the training video eight times in a two-hour period prior to a training session. While the participant may have watched the full video eight times, this is unlikely. What is more likely is that she began the video and then for one reason or another, stopped watching the video, and had to restart it. This was not explained via the data collected by the application. When the researcher asked the participant, she was unsure what had happened as some time had passed. This is a limitation of the application and different data collection procedures may have eliminated this error.

Technology

While access to and understanding of technology were not assessed via this research study, they could be external variables that played a role within the research. All the participants were traditional undergraduate college students with some level of comfort with technology. This population and their comfort level with technology may be very different from families needing training on behavior analytic procedures or those in other countries with limited access to training. Additionally, all the participants had smart phones as well as computers and internet within their homes. Technology may be less accessible in rural communities, low income communities, and developing countries (Warschauer, Knobel, & Stone, 2004; Gong, 2020) which are the same areas that also see a shortage of trained behavioral professionals and may need access to remote training (Bethune & Kiser, 2017; Maglione, Kadiyala, Kress, Hastings, & O′Hanlon, 2016).

Future Research

A need still remains for more research comparing the outcomes of traditional training to remote training in behavior analysis. While this study showed that the two methodologies were both effective, the research is still limited in this area. Additionally, as mentioned earlier, it is unclear how the global pandemic impacted, or potentially informed, this research. Also, following the pandemic, more researchers, practitioners, and consumers may be interested in remote training which may yield an additional need for more research on the topic. There is also a need to compare asynchronous remote training to synchronous remote training. As described earlier, much of the research on remote behavior analysis focuses on synchronous models (Barretto, Wacker, Harding, Lee, & Berg, 2006; Gibson, Pennington, Stenhoff, & Hopper, 2010; Machalicek et al., 2009a). This has made synchronous training serve as the standard while asynchronous training may be just as effective and may allow more flexibility for trainers and trainees.

Future researcher should look at conducting similar research with different populations. All participants in this study were undergraduate students. While these participants may be similar in demographics to the average paid ABA implementer, it would be beneficial to see how this research generalized to parents of children with disabilities or those not trained in ABA in other countries with limited access to training as opposed to college students. Additionally, it would be interesting to repeat this research with children as opposed to confederates. This could be done with parental consent or as an additional phase, after participants have mastered the skill with confederates. Additionally, all participants in this study were from the same area. Future research could look at expanding the participant pool to include participants across time zones, regions, and countries to determine if additional issues arise. Future research

should also consider including a measure for monitoring trainer efficiency as opposed to solely efficiency from the trainee's perspective.

Additional skills should also be targeted for training in future research. The MSWO was targeted in this study as it is a common preference assessment and preference assessments are a very crucial skill for those implementing behavior analytic services to have. It would be beneficial to repeat this research with additional skills such a teaching one how to conduct discrete trial instruction, how to implement behavior reduction strategies, or how to conduct functional analyses as these skills are also very important. Additionally, preference assessments are very controlled procedures involving a student sitting calmly with an instruction. It may be beneficial to not only focus on more complex skills but on more complex environments, possibly targeting skills like natural environment teaching. While MSWOs are common procedures, they may be easier to teach than other skills and it is important to determine if remote training is applicable across skills.

Conclusion

While the need for remote training in behavior analysis was evident prior to this research study through the shortage of behavior analysts in rural and low-income areas (Romani & Schieltz, 2017), the COVID-19 global pandemic highlighted the importance of this area of research. In a matter of days, training was forced to shift online in order to allow for social distancing despite telehealth being previously uncommon in behavior analysis (Tomlinson, Gore, & McGill, 2018). There is a significant need to further explore additional ways to provide training on behavior analytic topics aside from the traditional face to face behavioral skills training. This research highlights that while

remote training may take more time for the learner and be slightly less efficient, remote training is just as effective and has similar outcomes to traditional face to face behavior skills training when teaching one to conduct a preference assessment such as an MSWO. Future research should consider this area as it has strong implications for the future of behavior analysis.

References

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th edn.). Washington, DC: APA.

BACB. (2014). Applied behavior analysis treatment of Autism Spectrum Disorder: Practice guidelines for healthcare funders and managers. Retrieved from https://www.bacb.com/wp content/uploads/2017/09/ABA_Guidelines_for_ASD.pdf

BACB. (2018). BCBA examination pass rates for verified course sequences. Retrieved from https://www.bacb.com/wp-content/uploads/BCBA-Pass-RatesPercent_190813.pdf

BACB. (2019a). Annual data reports. Retrieved from https://www.bacb.com/about/bacb-certificant-annual-report-data/

BACB. (2019b). BCBA requirements (January 1, 2020). Retrieved from https://www.bacb.com/bcba-eligibility-requirements-january-2022/

BACB. (2019b). BCBA requirements (January 1, 2020). Retrieved from https://www.bacb.com/global-certification-january-2020/

Barkaia, A., Stokes, T. F., & Mikiashvili, T. (2017). Intercontinental telehealth coaching of therapists to improve verbalizations by children with autism. *Journal of Applied Behavior Analysis, 50(3)*, 582–589. https://doi.org/10.1002/jaba.391.

Barlow, D.H. and Hersen, M. (1984) Single-Case Experimental Designs: Strategies for Studying Behavior Change. 2nd Edition, Pergamon Press, New York.

Barretto, A., Wacker, D. P., Harding, J., Lee, J., & Berg, W. K. (2006). Using

telemedicine to conduct behavioral assessments. *Journal of Applied Behavior Analysis, 39(3),* 333–340. https://doi.org/10.1901/jaba.2006.173-04.

Bethune, K. S., & Kiser, A. (2017). Doing more with less: innovative program building in ABA and special education in a rural setting. *Rural Special Education Quarterly, 36(1)*, 25–30. https://doi.org/10.1177/8756870517703395

Bowen, W. G., Lack, K. A., Chingos, M., & Nygren, T. I. (2012). Interactive Learning Online at Public Universities: Evidence from Randomized Trials. https://doi.org/10.18665/sr.22464

Buzhardt, J. & Heitzman-Powell, L. (2005). Training behavioral aides with a combination of online and face-to-face procedures. *Teaching Exceptional Children, 37*. 10.1177/004005990503700503.

Casey, A. M., & McWilliam, R. A. (2011). The characteristics and effectiveness of feedback interventions applied in early childhood settings. *Topics in Early Childhood Special Education, 31(2)*, 68–77. https://doi.org/10.1177/0271121410368141

Centers for Disease Control. Autism Spectrum Disorder (ASD). (2020). Retrieved from https://www.cdc.gov/media/releases/2020/p0326-autism-prevalence-rises.html

Clark, N. M., Cushing, L. S., & Kennedy, C. H. (2004). An intensive onsite technical assistance model to promote inclusive educational practices for students with disabilities in middle school and high school. *Research and Practice for Persons With Severe Disabilities, 29(4)*, 253–262

DeLeon, I. G., & Iwata, B. A. (1996). Evaluation of a multiple-stimulus presentation

format for assessing reinforcer preferences. *Journal of Applied Behavior Analysis, 29(4)*, 519-32; quiz 532-3.

Dixon, M. R., Reed, D. D., Smith, T., Belisle, J., & Jackson, R. E. (2015). Research rankings of behavior analytic graduate training programs and their faculty. *Behavior Analysis in Practice,* 8(1), 7–15.

Durand V. M. (1999). Functional communication training using assistive devices: recruiting natural communities of reinforcement. *Journal of Applied Behavior Analysis, 32(3)*, 247-67.

Eikeseth, S. (2010). Examination of qualifications required of an EIBI professional. *European Journal of Behavior Analysis, 11*, 239–246.

Fisher, W. W., Luczynski, K. C., Hood, S. A., Lesser, A. D., Machado, M. A., & Piazza, C. C. (2014). Preliminary findings of a randomized clinical trial of a virtual training program for applied behavior analysis technicians. *Research in Autism Spectrum Disorders, 8(9)*, 1044–1054. https://doi.org/10.1016/j.rasd.2014.05.002.

Ferguson, J., Craig, E. A., & Dounavi, K. (2018). Telehealth as a model for providing behaviour analytic interventions to individuals with autism spectrum disorder: A systematic review. *Journal of Autism and Developmental Disorders.* https://doi-org.ezproxy.umsl.edu/10.1007/s10803-018-3724-5

Gibson, J. L., Pennington, R. C., Stenhoff, D. M., & Hopper, J. S. (2010). Using desktop videoconferencing to deliver interventions to a preschool student with autism. *Topics in Early Childhood Special Education, 29(4)*, 214–225. https://doi.org/10.1177/0271121409352873.

Hay-Hansson, A. W., & Eldevik, S. (2013). Training discrete trials teaching skills using videoconference. *Research in Autism Spectrum Disorders, 7(11)*, 1300–1309. https://doi.org/10.1016/j.rasd.2013.07.022.

Heitzman-Powell, L. S., Buzhardt, J., Rusinko, L. C., & Miller, T. M. (2014). Formative evaluation of an ABA outreach training program for parents of children with autism in remote areas. *Focus on Autism and Other Developmental Disabilities, 29(1)*, 23–38. https://doi.org/10.1177/1088357613504992.

Higgins, W. J., Luczynski, K. C., Carroll, R. A., Fisher, W. W., & Mudford, O. C. (2017). Evaluation of a telehealth training package to remotely train staff to conduct a preference assessment. *Journal of Applied Behavior Analysis, 50(2)*, 238–251. https://doi.org/10.1002/jaba.370.

Horner, R. D., & Baer, D. M. (1978). Multiple-probe technique: a variation on the multiple baseline. *Journal of Applied Behavior Analysis*, *11*(1), 189–196. doi:10.1901/jaba.1978.11-189

Jang, J., Dixon, D. R., Tarbox, J., Granpeesheh, D., Kornack, J., & de Nocker, Y. (2012). Randomized trial of an eLearning program for training family members of children with autism in the principles and procedures of applied behavior analysis. *Research in Autism Spectrum Disorders, 6(2)*, 852–856. https://doi.org/10.1016/j.rasd.2011.11.004.

Kazdin A. E. (1977). Artifact, bias, and complexity of assessment: the ABCs of reliability. *Journal of applied behavior analysis, 10(1)*, 141-50.

Kazdin, A. E. (1982), The token economy: A decade later. *Journal of Applied Behavior Analysis, 15*, 431-445. doi:10.1901/jaba.1982.15-431

Keller, C. L., Brady, M. P., & Taylor, R. L. (2005). Using self evaluation to improve student teacher interns' use of specific praise. *Education and Training in Developmental Disabilities, 40(4)*, 368–376. Retrieved from https://ezproxy.umsl.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ754178&site=ehost-live&scope=site

Kirkham, P. (2017). 'The line between intervention and abuse' – autism and applied behaviour analysis. *History of the Human Sciences, 30(2)*,107126. https://doi.org/10.1177/0952695117702571

Knowles, C., Massar, M., Raulston, T. J., & Machalicek, W. (2017). Telehealth consultation in a self-contained classroom for behavior: A pilot study. *Preventing School Failure, 61(1)*, 28–38. https://doi.org/10.1080/1045988X.2016.1167012.

Kuravackel, G. M., Ruble, L. A., Reese, R. J., Ables, A. P., Rodgers, A. D., & Toland, M. D. (2018). COMPASS for Hope: Evaluating the Effectiveness of a Parent Training and Support Program for Children with ASD. *Journal of Autism and Developmental Disorders*, *48*(2), 404–416. Retrieved from http://search.ebscohost.com.ezproxy.umsl.edu/login.aspx?direct=true&db=eric&AN=EJ1169119&site=ehost-live&scope=site

Lindgren, S., Wacker, D., Suess, A., Schieltz, K., Pelzel, K., Kopelman, T., et al. (2016). Telehealth and autism: Treating challenging behavior at lower cost. *Pediatrics, 137(S2)*, S167–S175. https://doi.org/10.1542/peds.2015-28510.

Machalicek, W., O'Reilly, M., Chan, J. M., Rispoli, M., Lang, R., Davis, T., et al. (2009).

Using videoconferencing to support teachers to conduct preference assessments with students with autism and developmental disabilities. *Research in Autism Spectrum Disorders, 3(1)*, 32–41. https://doi.org/10.1016/j.rasd.2008.03.004.

Machalicek, W., O'Reilly, M., Chan, J. M., Lang, R., Rispoli, M., Davis, T., Didden, R. et al. (2009b). Using videoconferencing to conduct functional analysis of challenging behavior and develop classroom behavioral support plans for students with autism. *Education and Training in Developmental Disabilities, 44(2)*, 207–217. Retrieved from http://daddcec.org/Publications/ETADDJournal.aspx.

Machalicek, W., O'Reilly, M. F., Rispoli, M., Davis, T., Lang, R., Franco, J. H., & Chan, J. M. (2010). Training teachers to assess the challenging behaviors of students with autism using video tele-conferencing. *Education and Training in Autism and Developmental Disabilities, 45(2)*, 203–215. Retrieved from http://daddcec.org/Publications/ETADDJournal.aspx.

Machalicek, W., Lequia, J., Pinkelman, S., Knowles, C., Raulston, T., Davis, T., et al. (2016). Behavioral telehealth consultation with families of children with autism spectrum disorder. *Behavioral Interventions, 31(3)*, 223–250. https://doi.org/10.1002/bin.1450.

Maglione, M., Kadiyala, S., Kress, A., Hastings, J., & O'Hanlon, C. (2016). Potential Shortage Areas. In *TRICARE Applied Behavior Analysis (ABA) Benefit: Comparison with Medicaid and Commercial Benefits* (pp. 51-54). RAND Corporation. Retrieved from http://www.jstor.org/stable/10.7249/j.ctt1b67wmj.10

Martinez-Diaz, J. A., & Wilder, D. A. (2016). Conceptualization and development of the

behavior analysis programs at the Florida institute of technology. *The Behavior Analyst, 39(1)*, 149-56. doi:10.1007/s40614-016-0060-y

Miller R., Lewin L. M. (1980). Training and management of the psychiatric aide: A critical review. *Journal of Organizational Behavior Management*. 2:295–315.

Neely, L., Rispoli, M., Gerow, S., & Hong, E. R. (2016). Preparing interventionists via telepractice in incidental teaching for children with autism. *Journal of Behavioral Education, 25(4)*, 393–416. https://doi.org/10.1007/s10864-016-9250-7.

Nelson, R. O., & Hayes, S. C. (1981). Theoretical Explanations for Reactivity in Self-Monitoring. *Behavior Modification, 5(1*), 3–14. https://doi.org/10.1177/014544558151001

New York State Department of Health, Early Intervention Program. (1999). Clinical practice guideline: Report of the recommendations. Autism/pervasive developmental disorders. Assessment and intervention for young children (age 0–3 years). Albany: Author.

Oliver, C., Petty, J., Ruddick, L., & Bacarese-Hamilton, M. (2012). The Association between repetitive, self-injurious and aggressive behavior in children with severe intellectual disability. *Journal of Autism and Developmental Disorders, 42(6)*, 910–919. Retrieved from https://ezproxy.umsl.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ967937&site=ehost-live&scope=site

Parsons, M. B., & Reid, D. H. (2011). Reading groups: a practical means of enhancing professional knowledge among human service practitioners. *Behavior Analysis in Practice, 4(2)*, 53-60.

Parsons, M. B., Rollyson, J. H., & Reid, D. H. (2012). Evidence-based staff training: a guide for practitioners. *Behavior Analysis in Practice, 5(2)*, 2-11.

Reid, D. H., Rotholz, D. A., Parsons, M. B., Morris, L., Braswell, B. A., Green, C. W., & Schell, R. M. (2003). Training human service supervisors in aspects of PBS: Evaluation of a statewide, performance-based program. *Journal of Positive Behavior Interventions, 5(1)*, 35-46. http://dx.doi.org/10.1177/10983007030050010601

Rogers, S.J., Vismara, L.A. (2008). Evidence-based comprehensive treatments for early autism. *Journal of Clinical Child and Adolescent Psychology, 37,* 8-38.

Romani, P. W., & Schieltz, K. M. (2017). Ethical considerations when delivering behavior analytic services for problem behavior via telehealth. Behavior Analysis (Washington, D.C.), 17(4), 312–324. doi:10.1037/bar0000074

Salina, L., Ruffinengo, C., Garrino, L., Massariello, P., Charrier, L., Martin, B., Favale, M. S., & Dimonte, V. (2012). Effectiveness of an educational video as an instrument to refresh and reinforce the learning of a nursing technique: a randomized controlled trial. Perspectives on medical education, 1(2), 67–75. https://doi.org/10.1007/s40037-012-0013-4

Sellers, T. P., Alai-Rosales, S., & MacDonald, R. P. (2016). Taking full responsibility: the ethics of supervision in behavior analytic practice. *Behavior Analysis in Practice,* 9(4), 299-308. doi:10.1007/s40617-016-0144-x

Shook, G. L., & Favell, J. E. (2008). The behavior analyst certification board and the profession of behavior analysis. *Behavior Analysis in Practice,* 1(1), 44-8.

Skinner, B. F. (1969). *Contingencies of reinforcement: A theoretical analysis.* Englewood

Cliffs, N.J: Prentice Hall.

Smith T, Donahoe P. A, Davis B. J. (2001). The UCLA Young Autism Project. In: Handleman J. S, Harris S. L, editors. Preschool education programs for children with autism. Austin TX: Pro-Ed; 2001. (Eds.)

Smith, T., Parker, T., Taubman, M., & Lovaas, O. I. (1992). Transfer of staff training from workshops to group homes: A failure to generalize across settings. *Research in Developmental Disabilities, 13(1)*, 57-71. http://dx.doi.org/10.1016/0891-4222(92)90040-D

Sturmey, P. (1998). History and contribution of organizational behavior management to services for persons with developmental disabilities. *Journal of Organizational Behavior Management, 18(2-3)*, 7-32. http://dx.doi.org/10.1300/J075v18n02_02

Suess, A. N., Romani, P. W., Wacker, D. P., Dyson, S. M., Kuhle, J. L., Lee, J. F., et al. (2014). Evaluating the treatment fidelity of parents who conduct in-home functional communication training with coaching via telehealth. *Journal of Behavioral Education, 23(1)*, 34–59. https://doi.org/10.1007/s10864-013-9183-3.

Suess, A. N., Wacker, D. P., Schwartz, J. E., Lustig, N., & Detrick, J. (2016). Preliminary evidence on the use of telehealth in an outpatient behavior clinic. *Journal of Applied Behavior Analysis, 49(3)*, 686–692. https://doi.org/10.1002/jaba.305.

Sun, X., Allison, C., Wei, L., Matthews, F., Auyeung, B., Wu, Y., … Brayne, C. (2019). Autism prevalence in China is comparable to Western prevalence. *Molecular Autism*, *10*(1), 1–19. Retrieved from http://search.ebscohost.com.ezproxy.umsl.edu/login.aspx?direct=true&db=eoah&AN=48752094&site=ehost-live&scope=site

Surgeon General. (1999). Mental health: A report of the Surgeon General. Bethesda, MD: U.S Public Health Service. Retrieved from the Web 06/01/2014 http://profiles.nlm.nih.gov/ps/retrieve/ResourceMetadata/NNBBHS.

Symes, M., Remington, B., Brown, T., & Hastings, R. (2006). Early intensive behavioral intervention for children with autism: Therapists' perspectives on achieving procedural fidelity. *Research in Developmental Disabilities, 27*, 30–42.

Tomlinson, S.R.L., Gore, N. & McGill, P. J (2018). Training individuals to implement applied behavior analytic procedures via telehealth: a systematic review of the literature. *Journal of Behavioral Education, 27*, 172-222. https://doi.org/10.1007/s10864-018-9292-0

Turner, L. B., Fischer, A. J., & Luiselli, J. K. (2016). Towards a Competency-based, ethical, and socially valid approach to the supervision of applied behavior analytic trainees. *Behavior Analysis in Practice,* 9(4), 287-298. doi:10.1007/s40617-016-0121-4

U.S. Census Bureau. (2014). *America's Families and Living Arrangements: 2014* (Report No. P70-140). Retrieved from https://www.census.gov/data/tables/2014/demo/families/cps-2014.html

U.S. Department of Education. (2013). National Center for Education Statistics. (2015). Digest of Education Statistics, 2013 (NCES 2015-011), Table 204.30.

Vismara, L. A., Young, G. S., Stahmer, A. C., Griffith, E. M., & Rogers, S. J. (2009). Dissemination of evidence-based practice: Can we train therapists from a distance? *Journal of Autism and Developmental Disorders, 39(12)*, 1636–1651. https://doi.org/10.1007/s10803-009-0796-2.

Vismara, L. A., Young, G. S., & Rogers, S. J. (2012). Telehealth for expanding the reach of early autism training to parents. *Autism Research and Treatment,* 2012, 1–12. https://doi.org/10.1155/2012/121878.

Wacker, D. P., Lee, J. F., Dalmau, Y. C. P., Kopelman, T. G., Lindgren, S. D., Kuhle, J., et al. (2013a). Conducting functional communication training via telehealth to reduce the problem behavior of young children with autism. *Journal of Developmental and Physical Disabilities, 25(1)*, 35–48. https://doi.org/10.1007/s10882-012-9314-0.

Wacker, D. P., Lee, J. F., Dalmau, Y. C. P., Kopelman, T. G., Lindgren, S. D., Kuhle, J., et al. (2013b). Conducting functional analyses of problem behavior via telehealth. *Journal of Applied Behavior Analysis, 46(1)*, 31-46. https://doi.org/10.1002/jaba.29.

Wainer, A. L., & Ingersoll, B. R. (2015). Increasing access to an ASD imitation intervention via a telehealth parent training program. *Journal of Autism and Developmental Disorders, 45(12)*, 3877–3890. https://doi.org/10.1007/s10803-014-2186-7.

Wallace, M. D., Iwata, B. A., & Hanley, G. P. (2006). Establishment of mands following tact training as function of reinforcer strength. *Journal of Applied Behavior Analysis, 39, 17-24.*

Warschauer, M., Knobel, M., & Stone, L. (2004). Technology and Equity in Schooling: Deconstructing the Digital Divide. Educational Policy, 18(4), 562–588. https://doi.org/10.1177/0895904804266469

Appendix A

MSWO Overview

MSWO Overview We are going to be practicing a multiple stimulus without replacement (MSWO) preference assessment. This is an assessment commonly used to determine a client's preferences. These preferences are helpful in determining what items may serve as reinforcers. In an MSWO, the implementer places an array of items in front of a client and prompts them to select one. The implementer repeats this process until there are no items left.

Appendix B

	Choice 1	Choice 2	Choice 3	Choice 4	Choice 5
Sit across from the client at a table, on the floor, or wherever is most natural and comfortable					
Put out all toys and let the client sample each for approximately 5 seconds. Demonstrate the toys if they are unfamiliar.					
Place all targeted items in a straight line within the client's reach in any order.					
If the client begins to grab at the items prior to your direction to make a selection, block the items.					
Remove your blockade if applicable and say, "Which one do you want?"					
Allow the client to choose an item.					
Record your data.					
If the client reaches for more than one item, block access to both items, and say, "Just one." Represent.					
Allow the client to consume the edible item or play with the toy for 30 seconds. Block all access to the remaining items during this time.					
While the client is playing with the toy or eating the snack, move the item on the left to right and scoot over all the other items.					
After the time is up or the client has consumed the edible, remove the chosen item and put it out of sight. Do not replace the chosen item in the array.					
Minimize communication outside of specific prompts of the MSWO.					
Repeat steps until there are no items left or until the client refuses to make any further choices.					
Score					

Appendix C

Below are the survey prompts. Each item will be rated on a Likert scale from 1-4 with one being strongly disagree, 2 being disagree, 3 beings agree, and 4 being strongly agree.

1. This training was easy to access.
2. This training took a reasonable amount of time.
3. This training fit my learning preferences.
4. This training allowed me flexibility.
5. I would like to do this training method again in the future.
6. I would recommend other people complete this training.
7. The feedback I received was helpful.
8. The feedback I received was timely.
9. The feedback I received allowed me to change my practice.
10. This training was not too technical.

Appendix D

Traditional BST Rubric

	+/-	Notes
Rationale provided		
Instructions provided		
Modeling (Correct response)		
Asking if the participant has any questions		
Practice Opportunity		
Feedback		
Repeated until proficiency		
Modeling (Incorrect response and error correction)		
Asking if the participant has any questions		
Practice Opportunity		
Feedback		
Repeated until proficiency		
Directions are easy to understand and in language applicable for implementers		
Provided praise throughout		
PERCENT CORRECT		

Appendix E

Remote Training Rubric

	+/-	Notes
Rationale provided		
Instructions provided		
Modeling (Correct response)		
Modeling (Incorrect response and error correction)		
Trainer addresses commonly asked questions		
Directions are easy to understand and in language applicable for implementers		
PERCENT CORRECT		

Appendix F

Remote Training Feedback Rubric

	+/-	Notes
Feedback provided on video		
Questions answered		
Participant asked to repeat to proficiency		
Reviewed self-monitoring data and compared to researcher data		
Feedback given on data		
Feedback given within time frame		
Provided praise at least once in feedback		
PERCENT CORRECT		

Appendix G

Confederate Scripts

Script 1: MSWO without any issues

- The participant will place six items out in front of you. They will give you time to play with the items. Interact with each for approximately five seconds. They will then begin the assessment.
- Participant: “Chose one.”
- Confederate: Pick one item up. Play with it or eat it if applicable.
- Participant: Asks for the item back. They will not ask for it back if it was food but may ask you to swallow.
- Confederate: Give the item pack to the participant.
- Participant: Puts the previously chosen item out of sight and ask you to pick another item.
- Confederate: Pick one item up. Play with it or eat it if applicable.
- Participant: Ask for item back,
- Confederate: Hand item back to participant.
- The participant will repeat this process until all items are chosen. You should follow all participant instructions and continue calmly selecting items.

Script 2: Choosing more than one item at a time

- The participant will place six items out in front of you. They will give you time to play with the items. Interact with each for approximately five seconds. They will then begin the assessment.
- Participant: “Chose one.”
- Confederate: Pick one item up. Play with it or eat it if applicable.
- Participant: Asks for the item back. They will not ask for it back if it was food but may ask you to swallow.
- Confederate: Give the item pack to the participant.
- Participant: Puts the previously chosen item out of sight and ask you to pick another item.
- Confederate: Attempt to grab two items, one with each hand.
- Participant: Blocks you reaching from grabbing and repeats the instruction to choose an item.
- Confederate: Pick one item up. Play with it or eat it if applicable.
- Participant: Ask for item back,
- Confederate: Hand item back to participant.
- The participant will repeat this process until all items are chosen. You should follow all participant instructions and continue calmly selecting items.

Script 3: Refusal to choose as item

- The participant will place six items out in front of you. They will give you time to play with the items. Interact with each for approximately five seconds. They will then begin the assessment.

- Participant: “Chose one.”
- Confederate: Pick one item up. Play with it or eat it if applicable.
- Participant: Asks for the item back. They will not ask for it back if it was food but may ask you to swallow.
- Confederate: Give the item pack to the participant.
- Participant: Puts the previously chosen item out of sight and ask you to pick another item.
- Confederate: Do not pick any items.
- As soon as you refuse, the participant should end the session. If participant does not end the session and continues to prompt you to make a choice, do not pick up any items. You may ignore them or verbally refuse.

Script 4: Confederate picks an item outside the specified amount of time

- The participant will place six items out in front of you. They will give you time to play with the items. Interact with each for approximately five seconds. They will then begin the assessment.
- Participant: “Chose one.”
- Confederate: Pick one item up. Play with it or eat it if applicable.
- Participant: Asks for the item back. They will not ask for it back if it was food but may ask you to swallow.
- Confederate: Give the item pack to the participant.
- Participant: Puts the previously chosen item out of sight and ask you to pick another item.
- Confederate: Count to 15 seconds and then pick an item.
- As soon as you pick up the item outside of the designated time frame, the participant should end the session. If participant does not end the session and continues to prompt you to make a choice, wait at least 15 to 20 seconds before making a choice.

Confederate scripts are adapted from:

Higgins, W. J., Luczynski, K. C., Carroll, R. A., Fisher, W. W., & Mudford, O. C. (2017).

Evaluation of a telehealth training package to remotely train staff to conduct a preference assessment. *Journal of Applied Behavior Analysis, 50(2)*, 238–251. https://doi.org/10.1002/jaba.370.

Appendix H

MSWO Datasheet

Item Selected	Item Location
1.	X X X X X X
2.	X X X X X
3.	X X X X
4.	X X X
5.	X X
6.	