The Effects of training modality on acquisition of therapeutic skills using Behavior Skills Training (BST): In-vivo vs. tele-training modality

Sabrena Samuel

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The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In-vivo vs. Tele-Training Modality

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Table of Contents

List of Figures ...........................................................................................................iii
Abstract ....................................................................................................................iv

I. Introduction ..............................................................................................................1
   Statement of Issue .................................................................................................1
   Statement of Need ................................................................................................3

II. Literature Review .................................................................................................7
   Remote Training ....................................................................................................7
      Telehealth .........................................................................................................7
      Desktop Videoconferencing ..........................................................................8
      In Vivo vs. Distance Learning ......................................................................9
      E-Learning ........................................................................................................11
   Training Types ....................................................................................................13
      Behavioral Skills Training ............................................................................13
      Functional Analysis ......................................................................................14
      Preference Assessment .................................................................................15
      Functional Analysis & Functional Communication Training ..................17

III. Method ..................................................................................................................20
   Participants ..........................................................................................................20
   Setting ..................................................................................................................20
   Materials .............................................................................................................21
   Procedure ............................................................................................................21
   Experimental Design ..........................................................................................22
   Inter-observer Agreement ..................................................................................22

IV. Results ...................................................................................................................23

V. Discussion ..............................................................................................................31

VI. Appendix A: PECS Phase 1 Participant Responses ...........................................36
VII. Appendix B: PECS Phase 2 Participant Responses ..........................................37
VIII. Appendix C: PECS Phase 3 Participant Responses .........................................38
IX. Appendix D: PECS 10-item quiz .....................................................................39
XI. References ..........................................................................................................40
List of Figures

Figure 1: Implementation of the First Three Phases of PECS: Poppy’s results ..................28

Figure 2: Implementation of the First Three Phases of PECS: Braxton’s results ...............29

Figure 3: Implementation of the First Three Phases of PECS: Ziya’s results ..................30

Figure 4: Trials to Criterion across Phases of PECS .................................................33

Figure 5: Pre- and Post-Quiz Results Across Conditions .............................................34

Figure 6: Post-Training Results for In-Person and Tele-Training Conditions ..................35
Abstract

With the small number of Board-Certified Behavior Analysts (BCBA) located outside of the United States, there is a continually increasing demand for applied behavior analysis (ABA) services across the globe. It is critical, therefore, to develop widely accessible, ethically compliant and effective ways to train clinicians to implement ABA procedures and interventions. With advancements in technology, online modalities can be an efficient and effective alternative to train clinicians across a wide range geographically. This study compared the effectiveness of a behavioral skills training (BST) training package used to teach the implementation of the first three phases of the picture exchange communication system (PECS) across two training modalities: in-person and tele-training. The primary research question explores if using BST to train PECS, does the training modality matter? Moreover, are we doing no harm with enlisting tele-training as a modality? The secondary research question explores if there are any items that may be differentially impacted by the training modality. Moreover, will the Task Analysis (TA) of target responses reveal any systematic effects between the training modality at the item by item level? The experimenter provided in-vivo coaching for the in-person condition and provided coaching from a different room within the same building for the tele-training condition. A comparison design was used to evaluate the effectiveness of the tele-training BST training package relative to in-person BST training. All participants in both the tele-training and in-person conditions demonstrated significant improvements in the implementation of the first three phases of PECS relative to baseline. Regarding the first research question, the participant in the tele-training group exhibited similar rates of acquisition to the in-person training group, therefore demonstrating that tele-training was as effective as in-person training. Regarding the secondary research question, when examining responding at the item-by-item level, there were no consistent pattern of errors throughout any particular phase of PECS, across participants, or across either modality, therefore demonstrating that no items on the TA were differentially impacted by the training modality. The study demonstrated that tele-training can be utilized as an effective model to provide training across a wide range of skills and across various regions around the world.

Key Words: applied behavior analysis services (ABA), behavioral skills training, comparison design, picture exchange communication system, tele-training, comparison design
Introduction

Statement of Issue

Applied Behavior Analysis is a burgeoning field. There are several advantages to a field that is expanding including exploring new and innovative treatments and procedures across a variety of environments. Despite the proven effectiveness of ABA, one of the biggest pitfalls of the field is the limited number of trained clinicians to meet the demand for these treatments globally. According to Granpeesheh, Tarbox, Dixon, Feeters, Thompson & Kenzer (2010), for behavior analytic services, there are several levels of providers and the costs associated with each vary by level. A behavior analyst (BCBA) is an independent practitioner who provides behavior analytic services and is charged with designing intervention and assessment plans. A registered behavior technician (RBT) works under close supervision of a BCBA and is a paraprofessional that is responsible for the direct implementation of behavior analytic services. According to BACB, as of October 2019, there are 39,853 BCBA and BCaBAs worldwide, of that 36,272 BCBAs are located within the United States. That leaves 3,581 BCBA’s and BCaBA’s to serve the rest of the world. Due to the small number of BCBA’s outside of the United States, one of the biggest issues faced by the field is the high demand for service availability to the remaining nations across the globe.

Technology has opened up a way to tackle this demand with the creation of telehealth services globally. However, with the rise in the implementation of remote technology the main question remains is if the use of telehealth in the training and implementation of Applied Behavior Analysis (ABA) treatments can not only bridge the gap of service availability to remote areas of the world in a sustainable way but also if the trainings and procedures explored via telehealth services can not only adhere to the field’s ethical code of conduct but can also be as effective as the services implemented in-person.
The general guidelines regarding healthcare services is to increase the accessibility of these services and decrease the costs associated with these services while maintaining positive outcomes (Romani & Shieltz, 2017). According to Romani & Shieltz (2017), Telehealth services are defined as providing healthcare services through electronic modalities and platforms. In terms of behavior analytic services, limiting factors for service provision include accessibility of these services to rural areas as well as the high costs associated with the services provided by a Board-Certified Behavior Analyst (BCBA). In their study, Lindgren, Wacker, Suess, Shieltz, Pelzel, Kopelman, Lee, Romani & Waldron (2016) evaluated the treatment costs associated with three models of ABA service delivery including in-home, in-clinic telehealth and in-home telehealth services and demonstrated that the mean cost per child, including staff, facility and family costs, decreased with each model of service-delivery. The mean cost per child for in-home service delivery started at $5,949.97 and decreased to an average of $2,145.64 per child for in-home telehealth services. The implications of this reduction could mean not only the availability of services to rural areas, but the low costs associated with the telehealth models increases the availability of these services to low-income households as well.

When developing telehealth services, an important factor to consider is if these services are done so in compliance to the ethical standards and guidelines already outlined in the field of ABA. Not only must client information and dissemination of client information be in compliance with the Healthcare Insurance and Portability Act (HIPAA) and/or the Family Educational Rights and Privacy Act (FERPA), but they must also adhere to the guidelines for service delivery outlined in the Behavior Analyst Compliance Board (BACB)’s Ethical and Compliance Code and American Psychological Association (APA)’s Ethics code (Romani & Shieltz, 2017). According to the BACB’s Ethical and Compliance Code, code 8.04 regarding media presentations and services, and the APAs Ethics code 4.01 regarding maintaining confidentiality, it’s the BCBA’s duty to determine web-based modalities and communication platforms that best maintain and protect their client’s privacy and confidentiality (Romani & Shieltz, 2017).
Statement of Need

An important primary consideration for the BCBA is if telehealth services are appropriate for that particular client. Wacker and colleagues (2016) evaluated possible factors to consider when determining if telehealth services would be an appropriate avenue. In their model, Wacker et al (2016) addressed five important considerations. First, (1) if the target problem areas addressed for the client can be safely treated through telehealth services, (2) if the internet connection between the two sites would be sufficient enough for telehealth service delivery, (3) if after a cost-analysis of these services, including reimbursement from insurance companies and travel costs, if it would it be appropriate to deliver these services for that client through this modality, (4) the most beneficial setting for the client’s treatment goals such as a more naturalistic setting characteristic in telehealth settings or a clinic setting, and finally (5) if in-person support would be required for the case (Wacker et al, 2016). These considerations could, therefore, guide BCBA’s decision to providing the most appropriate and ethical form of service delivery rather than the most convenient.

As seen above, various providers are incorporating technology into the implementation of their services. This gives rise to a new avenue of issues relating to technology and ethics. Lee, Schieltz, Suess, Wacker, Romani, Lindgren, Kopelman & Padilla Dalmau (2014) further delve into these issues and possible guidelines for troubleshooting problems relating to telehealth services during a behavioral consultation project between the National Library of Medicine (NLM) and University of Iowa Children’s Hospital (UICH) for the treatment of children with severe problem behavior. Lee and colleagues (2014) identified various equipment and connection needs as potential technological issues that may arise. This problem became especially apparent when moving telehealth services from a secure network between outpatient clinics to moving to delivering services to home sites (Lee et al., 2014). For delivering ABA telehealth services, essential components are a secure and reliable connection speed, a connection that would best permit two-way video and audio transmissions, maintaining acceptable audio-video quality while
also maintaining reasonably cost equipment, and equipment that would best promote scalability across a wide range geographically such as state-wide (Lee et al., 2014).

In terms of security, when providing telehealth services, the selection of videoconferencing software is an important decision as well. Technology has made a wide range of information easily accessible. It is, therefore, extremely important to choose software that does not pose a potential threat to the client’s individual privacy and security. Skype is a videoconferencing platform that is easily accessible to a wide range of people and provides the best price-performance ratio, however, it is not compliant to the Health Insurance Portability and Accountability Act (HIPAA) and, therefore, does not guarantee the client’s security (Lee et al., 2014). Lee et al (2014), therefore, had their participants sign consent to use Skype in their study and outlined the potential HIPAA violations that may occur with the use of that particular platform. When enlisting the use of a videoconferencing platform, it is, therefore, important to research platforms that are HIPAA compliant or if enlisting the use of a low-cost platform that is not HIPAA compliant, such as Skype, it is extremely important to not only get written consent from the client but to also communicate the potential risks to security associated with that particular platform.

Another potential problem outlined by Lee and colleagues (2014) is the difficulties with building rapport between the client and the service provider through a video feed. For in-person consultation services, the face-to-face connections may aid in building rapport and building a close relationship between the service provider and client (Lee et al., 2014). With a video feed, however, the rapid movements may make it more difficult for either party to discern cues relating to facial expressions (Lee et al., 2014). Since telehealth therefore relies more heavily on good vocal communication skills more so than modeling the procedures, the BACB’s Ethics and Compliance code and APA’s Ethics code regarding describing behavior-change program objectives (BACB code 4.05) and explaining assessment results (BACB code 3.04 and APA code 9.10) states that it is the duty of the BCBA or Registered Behavior Technician (RBT) providing
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

the telehealth services to best vocally communicate information to their client, and, furthermore, it is important that their client is able to follow vocal-only instructions (Romani & Shieltz, 2017).

Aside from that, another issue surrounding rapid movements in telehealth behavioral services is that a client is often engaging in rapid movements such as running or engaging in other behaviors that consist of rapid movements. Adequately observing each instance of these behaviors requires the provider and the client to have higher connection speeds for acceptable video quality (Lee et al., 2014). To tackle the potential problems such as field of vision, autofocus, and microphone placement, Lee and colleagues (2014) had the participants use an external webcam during their sessions. A potential guideline when using telehealth services, as outlined by Lee and colleagues (2014), is to have a readily available IT specialist to provide technological support if any issues arise, assess the type and level of equipment needed for that case such as connection level, secure platforms, conducting real-time observations, and securely and properly storing video and audio files of observation and training sessions.

Providing direct ABA services through telehealth is an interesting and worthy venture. This approach, however, may not be viable in the long run for several reasons. In terms of direct service delivery, the number of clients that can be served is limited by the caseload of a BCBA. That is a single BCBA overseeing clients will be necessarily limited in the total number of clients that can be served (Granpeesheh, Tarbox, Dixon, Feeters, Thompson & Kenzer, 2010). This becomes particularly problematic when considering the long-term increase in demand for services. As outlined above, the high costs associated with direct service delivery from a BCBA can also be a limiting factor. A method to control these high costs as well as service availability can be to increase the number of clinicians available to provide direct service. A positive consequence of having more trained clinicians is that services may then be available to areas in which technology may be a barrier. That is, there are many geographic locations that access to the necessary technology for telehealth is not a viable option (e.g., cost, infrastructure). Tele-training
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

of individuals to provide the direct services, therefore, may be a longer-term solution to increase the number of qualified technicians to meet the demand for service delivery in areas where a BCBA may not be physically available. Which would effectively create a tiered model (Fisher, Luckzynski, Hood, Lesser, Machado & Piazza, 2014), in which a trained professional (BCBA) creates and undersees treatment protocols and procedures across multiple cases and clients and the behavior technician (RBT) provides the direct service to each case at a lower cost.

Quality behavior technicians, therefore, are an essential component to effective service delivery (Granpeesheh et al, 2010). An important component to the effectiveness of ABA services is the fluency and foundational knowledge of the clinicians (RBTs) delivering the services. Methods used to train behavior technicians to increase both fluency and foundational knowledge of ABA principles are written instructions, video modeling, role playing, lectures and in-vivo feedback.

While an understanding and knowledge of the treatments and procedures of a client is an essential component to training, Granpeesheh and colleagues (2010) stated that another critical component to successful service delivery is a background of the academic and conceptual knowledge of ABA. Conceptually systematic means that the procedures and treatments that are being trained must be directly related to the foundational principles of ABA. A seminal study in the field of ABA, published by Baer, Wolf & Risley (1968), states that one of the seven dimensions that are integral to effective treatments in the field of ABA are that the treatments must be conceptually systematic. Clinicians with foundational knowledge can, therefore, make connections between successful treatment packages and the basic principles at play. Which can also greatly aid in problem solving at the level of Registered Behavior Technicians (Granpeesheh et al, 2010). Behavior technicians must be wary of implementing procedures without the approval of their Board-Certified Behavior Analyst (BCBA), however, problem solving in the moment may be an integral lens to look through when certain behaviors of high intensity and frequency may arise in sessions. While it is important for the BCBA to provide training to Behavior
Technicians to aptly prepare for any situations that may arise, a well-rounded knowledge base, however, can greatly supplement a technician’s insight during these situations. This is especially important if these behaviors occur in different environments such as in-home or in-community settings where a direct supervisor may not be present to provide aid. Problem solving may include an analysis of issues that may arise in regard to the magnitude of reinforcement, delays in reinforcement, inadvertent sources of stimulus control, satiation to reinforcement, stimulus over selectivity, etc. (Granpeesheh et al, 2010). This type of analysis is important to understand and relay to the BCBA. Due to the one-on-one nature of services provided by clinicians, an adequate analysis from a behavior technician can provide the BCBA with more insight into what components of a treatment package are successful, what are not, where the issues lie, and ways to address these issues. Having a conceptual framework, therefore, is crucial to providing this insight.

In summary then, given these considerations, telehealth services may greatly aid in not only bridging the gap of service availability across the globe but can also be used as an alternative modality to provide training to future technicians. By increasing the number of well-trained technicians across the globe this can greatly aid in meeting the demand for in-person service delivery to remote areas in which telehealth services may not be a viable option.

**Literature Review**

**Remote Training: Telehealth**

To further explore the benefits of online platforms to provide training to staff, Barkaia, Stokes & Mikiashvili (2017) examined the use of telehealth and its effects of intercontinental coaching in Georgia-Sakartvelo using telehealth services conducted in Virginia. Barkaia and colleagues (2017) explored the improvements in verbalizations by children with autism as well as examined the effectiveness of telehealth coaching on therapists’ skills. Observations were
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

conducted in both Virginia and Georgia-Sakartvelo. As outlined in the study, there were only two qualified Board-Certified Behavior Analyst’s (BCBA) and five clinics providing services for children diagnosed with Autism Spectrum Disorders (ASD) in Georgia-Sakartvelo. Due to the limited number of BCBA’s and the lack of availability of ABA services globally, there is a need to bridge the gap of service delivery to these remote areas. To further add to difficulties, the services that are available globally come at a high cost, which is not sustainable to a large population around the world. To target this divide, telehealth is rendered a less expensive option in comparison to in-person treatments as well can provide services to those in remote areas or areas with limited services.

Barkaia et al (2017) explored the use of enlisting inexpensive available communication technology in the use intercontinental telehealth coaching. The researchers enlisted the use of a concurrent multiple-baseline across participants. The baseline included the coach instructing the therapist to implement the intervention, after 15-minutes the coach then provided general feedback about the therapist’s activity and recommendations regarding general behavior management but provided no specific feedback regarding their specific instruction delivery. In the coaching treatment phase, however, positive consequences and command sequences were emphasized. For the children, treatment conditions included mand and echoics training. The results indicated that, when coaching began, all therapists made improvements in correct command sequences. The participants verbalizations, furthermore, also demonstrated increases in responding. A limitation outlined by Barkaia et al (2017) mirrored a limitation presented by Granpeesheh and colleagues (2010), stating that an onsite professional should be present supplement these coaching models to ensure quality of care.

**Desktop videoconferencing**

Another component explored is the importance of early childhood intervention. Gibson, Pennington, Stenhoff & Hopper (2010) stated that possible consequences of unaddressed early-onset conduct issues include behavioral difficulties during adolescence, juvenile delinquency,
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

higher rates of dropping out of school, and criminality in adulthood (Gibson et al, 2010). In order to provide services to target these challenging behaviors, there is a demand for consultation services to effectively train educators to implement these procedures. Gibson et al (2010), evaluated the effects of FCT on reducing instances of elopement when consultation and coaching is provided via desk videoconferencing. Staff training was done through a 45-minute video conferencing session and consisted of a consultant training staff on the implementation of FCT. This was done through a task analysis of the procedures for FCT, how to respond to instances of elopement, role-plays, practice scenarios, modeling, and corrective feedback.

In the baseline condition, the classroom teacher alerted all of the students to calendar/group time and called all of them to the carpet. The participant’s paraprofessional then verbally prompted him to sit on his letter on the carpet. If Shane eloped from the carpet, the teacher and paraprofessionals did not respond. Prior to the treatment condition, the teacher conducted a free operant preference assessment to determine what items Shane frequently engaged with to identify potential reinforcers. These items were then placed in a basket. During the treatment condition phase, the consultants implemented functional communication training. The treatment condition therefore consisted of prompting Shane to sit on his letter, once he was sitting, his teachers then prompted him to raise his hand. If he independently raised his hand he was presented with the basket of toys, if he did not respond he was provided with a physical prompt to raise his hand. If Shane left his assigned seat during calendar time, the teacher then removed the reinforcer and redirected him to his assigned seat, modeled the hand raise and then re-presented him with the basket of toys. If at any time during calendar time Shane raised his hand, he was allowed to pick a new item from the basket. The results indicated that FCT successfully reduced instances of elopement. With the success of the intervention, Gibson and colleagues, therefore, demonstrated that training staff to implement FCT using desktop videoconferencing was an effective means of achieving these results.

In Vivo vs. Distance learning
Vismara, Young, Stahmer, Griffith, & Rogers (2009) explored the effectiveness of distance learning compared to live-instruction training for training new therapists to implement the Early Start Denver Model (ESDM) (Vismara et al, 2009). The ESDM is an evidence-based model used in ABA for toddlers and infants with ASD. The ESDM embeds teaching in play-based and joint activities to increase interaction, communication and learning across a variety of developmental domains (Vismara et al, 2009).

The therapists participating in the study participated in two five-month phases of training including providing direct service utilizing the ESDM in the first phase and in the second phase the participants were required to implement a parent-coaching model to train the parents of the children to implement the ESDM (Vismara et al, 2009). The participants were divided into two groups, one receiving training via distance education and the other half received training through live-instruction training (Vismara et al, 2009). Training activities for both included self-instruction materials, didactic training of the intervention procedures and team supervision regarding specific client cases (Vismara et al, 2009). The self-instruction portion of training consisted of either print or video materials provided on a DVD, the didactic training consisted of a 10-hour seminar for direct intervention procedures and a 3-hour seminar regarding parent coaching, and supervision included a 4-hour team supervision discussion regarding specific training for individual cases.

Vismara and colleagues (2009) demonstrated that distance learning was as effective as live-instruction to train therapists to implement the ESDM and parent-coaching model. There were no differences in therapist performance across either distance-training or live-instruction training in terms of fidelity of implementing the ESDM or implementing the parent-coaching model (Vismara et al, 2009). There was, furthermore, no differences in the therapist’s rate of progress after each training activity, their final skill level and parent satisfaction (Vismara et al, 2009). Vismara and colleagues (2009) demonstrated that while the self-instruction materials were helpful and demonstrated a significant improvement in therapist skill level for implementing the
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

ESDM compared to baseline rates, however, when fidelity of implementation was defined as 80%, only 40% of therapists achieved fidelity after this training activity. Fidelity was achieved across participants during the direct intervention phase of training and, therapists’ skills further improved after the team supervision phase (Vismara et al, 2009). The implications of this training model are that although there is no difference in therapist skill level when trained via distance-education or live-instruction, regardless of modality, each training activity component was essential in improving therapist skill levels in implementing the ESDM (Vismara et al, 2009). Having clearly outlined materials and media for self-instruction were not sufficient in training staff to adequately implement the model with fidelity (Vismara et al, 2009). The combination of self-instruction, didactic workshops and team supervision, however, proved to be essential to not only increase therapists’ confidence in implementing the model but to improve therapists’ skills as well (Vismara et al, 2009).

E-Learning

Traditional approaches to training new behavior technicians on foundational knowledge of ABA include lectures, role-playing, group discussions. This form of in-person training can pose a problem for increasing the number of clinicians available to provide services in remote areas. There are a limited number, if any, of BCBA across the globe. This drastically reduces the number of BCBAs that are readily available to provide training to future clinicians. In an attempt to bridge the gap of service delivery to remote areas, Granpeesheh and colleagues tested the effects of an eLearning training format on service delivery for new clinicians. eLearning could not only efficiently train behavior technicians but could also train a large number of clinicians in various locations. This can avoid the issue of scheduling multiple people to be in the same location (Granpeesheh et al, 2010). In their study, Granpeesheh and colleagues compared the outcomes for a group of trainees who received training via an eLearning training package to a group who received traditional in-person training.
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

In the procedure outlined by Granpeesheh et al (2010), 88 participants in the eLearning program interacted with a ten-hour computer training program in addition to a two-hour follow-up with human trainers. In the study, trainees were able to launch the eLearning program on their personal computer. The eLearning package included animated slides with a vocal lecture training potential clinicians on principles and procedures of ABA including modules pertaining to introductions of Autism Spectrum Disorders (ASD), ABA, discrete trial training (DTT) procedures, antecedents, responses, consequences, intertrial intervals, prompting and fading, shaping, chaining, discrimination training, defining behavior, functions of behavior, and antecedent and consequence-based interventions (Granpeesheh et al, 2010). The slides also contained videos of the correct form of implementation for each given procedure. The in-person training took place in a classroom setting and consisted of a standard training procedure. The training consisted of a lecture accompanied with a PowerPoint presentation, group discussions and followed by smaller groups engaging in role-playing to practice the procedures that were outlined in the lecture.

A limitation of the elearning program, as outlined by the Granspeesheh et al (2010), was that, unlike traditional in-person training, instructors were not present to answer questions that may arise. The results demonstrated this limitation. Although the test scores for the eLearning group were high, the traditional training condition produced more accurate responding and higher test scores in the post-training than the eLearning condition did. A potential reason for the higher test scores achieved by the in-person training group could have been that the in-person trainers might’ve had the luxury to tailor their lectures based on the questions posed during the training. This, thus, enables them to have the opportunity to utilize multiple exemplars, which could ultimately result in greater generalization of their skills.

Elearning, moreover, has the potential to yield cost-saving benefits. With an online component to training behavior technicians, this would decrease the need for in-person contact with a BCBA. In regions that are not readily accessible by BCBA’s, these areas then bear the
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

Burden of paying significant travel expenses to bring BCBA’s into the region to train. If the academic and procedural training could be done electronically prior to bringing in an expert trainer, this could increase the number of people trained at a given time and could ultimately decrease the overall cost of training. As depicted by the outcomes of the eLearning training package, Granspeesheh et al (2010) demonstrated that an eLearning program could yield similar results to an in-person training program if it was followed by a shorter in-person, hands-on training session by a BCBA.

**Training Types: Behavioral Skills Training**

Another essential approach to the treatment of children with Autism Spectrum Disorder (ASD) within the field of ABA is Early Intensive Behavior Intervention (EIBI). EIBI is used to replace instances of challenging behaviors associated with ASD with more appropriate skills relating to socialization, language development, play skills, cognition, academics, adaptive daily living skills and motor development (Fisher, Luckzynski, Hood, Lesser, Machado & Piazza, 2014). For EIBI services, a BCBA creates and oversees treatment protocols and procedures, and a behavior technician delivers these services. As stated above, training behavior technicians in various regions is integral to meeting the high demand of service availability across the globe.

Fisher, Luckzynski, Hood, Lesser, Machado & Piazza (2014) explored using a Virtual Private Network (VPN) to deliver efficient virtual Behavioral Skills Training (BST) programs. Fisher and colleagues (2014) used a randomized-clinical trial (RCT) to evaluate how effective the virtual training program was on teaching behavior technicians on understanding and implementing the ABA principles used in EIBI services. The researchers developed a 40-hour virtual training program over a secured VPN that consisted of the implementation of behavior reduction and skill acquisition procedures in play-based and discrete trial formats (Fisher et al, 2014).

In their study, Fisher and colleagues enlisted the use of 8 participants with a background in psychology or a related field but with no prior experience in ABA. These participants were to be
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

trained to deliver services to active military families with children with ASD. The primary dependent measures used in the study to assess the new behavior technician’s implementation of the ABA principles they were trained on were ‘Behavior Implementation of Skills for Work Activities (BISWA)’ and ‘Behavior Implementation of Skills for Play Activities (BISPA)’ (Fisher, Luckzynski, Hood, Lesser, Machado & Piazza, 2014). The results of their study indicated that during the pretest, using direct-observation measures of the BISPA and BISWA, the new clinicians performed poorly in regard to the percentage of trials implemented correctly and the percentage of component skills mastered (Fisher et al, 2014). However, after completing the e-learning modules in the virtual training program, the participants in the treatment group demonstrated statistically significant increases in both the percentage of trials implemented correctly and component skills mastered when compared to the control group.

Fisher and colleagues (2014) were not only successful in demonstrating the success and efficiency of using a virtual training program to train new technicians to implement EIBI services but the role-play component in BST was completed without the use of an on-site professional (Fisher et al, 2014). The components of BST, as seen above, are instruction, modeling, role-play and in-vivo feedback. In the virtual training study done by Wacker and colleagues (insert date), there were on-site BCBA’s in a nearby hospital or clinic to provide support to the parent’s implementing the FA and FCT (Fisher et al, 2014). Fisher and colleagues (2014), however, did not include an on-site professional to aid in the role-plays in their study, and demonstrated that they were still able to show significant improvements in training new technicians to implement ABA treatment and protocols in both discrete trials and play-based formats. The implications of effectively delivering BST completely virtually without an on-site professional to provide support could ultimately decrease overall costs of ABA services and could also meet the demand for behavior technicians to provide services in various regions.

Functional Analysis
Similarly, Barretto, Wacker, Harding, Lee & Berg (2006) delved into two case examples to illustrate the effects of telemedicine to conduct brief functional analyses for two children who live in a rural setting and exhibit severe problem behavior. Each session of the FA lasted five minutes. Prior to beginning the FA, one of the participants’ school staff completed a Motivation Assessment Scale and a descriptive observation and the second participant’s foster mother was interviewed to aid in developing hypothesis and determining which the conditions to test in the functional analyses.

For the first participant, there was a clipped microphone on the table in the center of the room, which allowed for continuous audio transmission to the consultants as well provided the consultants with any insight into any occurrences of target behaviors. For the second participant, the child’s foster mother was provided with written instructions on how to conduct each condition and during the implementation of the FA, a microphone was placed near the mat next to the participant which transmitted continuous audio transmission to the consultants to provide real-time feedback to the participant’s mother regarding interventions and occurrences of target behaviors.

**Preference Assessments**

An important theme that is explored in ABA training is reinforcement. In an attempt to address this topic in regard to training via telehealth services and further bridge the gap of service availability globally, Higgins, Carroll, Fisher and Mudford (2017) enlisted the use of telehealth services to train new direct service providers to implement multiple-stimulus-without replacement (MSWO) preference assessment. As demonstrated by Higgins and colleagues (2017), identifying potent reinforcers is an integral part to several treatment packages and can greatly aid in facilitating skill acquisition (Higgins et al, 2017). Unlike previous studies, Higgins et al (2017) did not provide any in-person contact or on-site training between the experimenter and participants. In the baseline phase, participants logged onto the video-conferencing platform and there they were given 15 minutes of written instructions for conducting an MSWO prior to the
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

first assessment. Each participant was then told to conduct the MSWO as accurately as they could with the information provided. The training/treatment condition consisted of three components including a multimedia presentation, descriptive feedback from previously recorded baseline sessions and a scripted role-play with immediate feedback. All three components were delivered successively for one 90-minute remote training session. After the remote training was completed, the training-assessment sessions (role-plays) were then conducted and recorded. The 90-minute training session was repeated until a mastery criterion of 85% of the component skills was achieved. The results indicated that antecedent-based training approaches including video modeling, clearly outlined instructions, and systematic feedback were successful in increasing a novice therapist’s skills in implementing an MSWO preference assessment without the in-vivo feedback component.

Sump, Richman, Schaefer, Grub & Brewer (2018) also explored the topic of training new therapists on implementing an MSWO. Sump and colleagues (2018) looked at the efficiency component of telehealth videoconferencing on behavioral skills training for training novice therapists. The researchers evaluated the therapists on four skills including instructional context, antecedents, multiple-stimulus without replacement (MSWO) preference assessment, and consequences. As outlined in the study, the authors aimed to compare how efficient telehealth services can be in comparison to in-person training in regard to teaching the above skills, as well as the maintenance of these skills and the implementation of these skills during novel teaching tasks.

The primary dependent variable in the study is the percentage of steps performed accurately and independently and the secondary dependent variables were the number of training sessions, the duration of training sessions, the number of training trials, and the total number of prompted trials. Each of the four target skills areas, the MSWO preference assessment, instructional context, antecedents and consequences, all contained a similar number of steps, and there was no overlap in target behavior across skills. For each participant, training for two of the
target skills were done in-person while the remaining two target skills were delivered through telehealth.

The baseline condition, for both in-person and telehealth, consisted of the experimenter presenting an instruction to perform one of the target skills with a mock student with no consequences being provided to them. Each training session consisted of five steps including the experimenter providing a rationale of the target skill, demonstrated the target skill, the participant role-played the target skill with the mock student, the experimenter provided immediate corrective feedback, and the experimenter repeated the last two steps until either 30 minutes had elapsed or the participant performed the target skills independently three times. There was then a post-training session condition across modalities which were identical to the baseline condition. If a participant scored below 90% during these sessions, an additional training session was done immediately following this. If a participant scored 90% or above, another baseline session was done after at least 12 hours. Maintenance sessions were also done at one week, two weeks and a month following the last post-training session. The results indicated that behavioral skills training (BST) delivered through telehealth services and in-person yielded similar rates of acquisition across the four component skills (Sump, Richman, Schaefer, Grub & Brewer, 2018).

**Functional Communication Training and Functional Analysis**

Wacker, Lee, Padilla Dalmau, Kopelman, Lindgren, Kuhle, Pelzel & Waldron (2013) explored the use of telehealth services to train parents. Without available clinicians to provide ABA services in underserved regions, untreated problem behaviors associated with ASD tend to persist over time and can not only inhibit a child’s learning but can also contribute to high levels of parent stress (Wacker et al, 2013). Wacker and colleagues trained parents on a crucial area within the field of ABA, Functional Communication Training (FCT) and Functional Analysis (FA). To date, there are various studies within the field of ABA that have demonstrated the success of both FCT and FA procedures. FA procedures, as outlined by Iwata et al (1982/1994) have been demonstrated to be conducted by a wide range of people including parents and school
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

In their study, Wacker and colleagues (2013) aimed to evaluate the effectiveness of using telehealth services to train parents to conduct an FA and its given conditions (attention, tangible, free play and escape) without an on-site BCBA. Wacker et al (2013) enlisted 20 young children with ASD as participants. The children in their study also exhibited significant challenging behaviors at home. The parents of the participants conducted the FA’s at regional medical clinics near their homes and received live coaching on the treatment procedures and protocols by a BCBA at the University of Iowa Children’s Hospital (UICH) in Iowa City (Wacker et al, 2013).

Wacker and colleagues broke up the intervention into four phases. In the first phase, the BCBA trained the assistants that will be providing the on-site support to the parents on ABA principles, the purpose of the study, treatment procedures and their role in providing on-site support. In the second phase, the BCBA provided training to the parents of the participants on ABA principles, the treatment procedures, and the structure of the study (e.g. live remote coaching from a BCBA and on-site support from an assistant, if needed). The training phases for both the assistant and the parents were completed over the course of one to two hours. In the third phase, the BCBA interviewed parents remotely on the participants challenging behavior and had the parents complete a preference assessment as well as take baseline data over the course of a week on instances of problem behavior. In the fourth phase, in order to determine the variables maintaining the target problem behaviors, and using a multi-element design (Wacker et al., 1998), the parents then conducted an FA (Iwata et al., 1982/1994) with support from the on-site assistant and live-coaching from the BCBA.

The results of their study indicated that parents were able to successfully implement an FA and determine the variables maintain their child’s problem behavior with the aid of live-coaching telehealth services from a BCBA. The study differed from other studies in that it indicated that there were multiple functions maintaining the target problem behaviors for some participants. Across each participant, with the aid of live-coaching from the BCBA, parents were
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

also able to successfully implement FCT and the participant’s demonstrated a reduction of instances of problem behavior (Wacker et al, 2013). The implications of their study demonstrated the possibility of increasing accessibility of FA and FCT procedures to underserved regions while reducing the expenses associated with travel and on-site trained professionals (Wacker et al, 2013).

Suess, Wacker, Schwartz, Lustig & Detrick (2016) built off the study conducted by Wacker et al (2013). Suess et al (2016) aimed to continue this research of conducting an FA and FCT via telehealth in an outpatient clinic and extended the research of Wacker et al (2013) by conducting these treatments within a briefer period of time, more specifically a 2-hour frame. The researchers theorized that with a smaller timeframe, initiating treatment more quickly, and multiple brief this could efficiently provide clients with service delivery and, ultimately, avoid months of waitlist time typical in an outpatient clinic (Suess et al, 2016).

The participants were five children with an autism spectrum disorder diagnosis. Their parents had no prior experience to these procedures and conducted all sessions in a therapy room at the outpatient clinic. The Skype coaches were confederate trainers with between 5-8 years’ experience in coaching parents on these procedures. To begin, behavior consultants met with parents for 1-hour via telehealth to discuss the study and a descriptive assessment which the consultants later used to determine specific conditions for the functional analyses. Using a multielement design, an hour-long FA was conducted across conditions to test to see if the function of the problem behavior was maintained by negative (escape) or positive (attention or tangible) reinforcement (Suess et al, 2016). Prior to each FA session, the behavior consultant described and coached parents on each procedure. Following the FA, using a nonconcurrent multiple baseline design across children, the parents were then coached to implement functional communication training for three 15-minute telehealth visits which occurred weekly for three weeks. Similar to the FA coaching, consultants reviewed procedures with the parents prior to the start of each session as well as provided coaching throughout the duration of the session.
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

Furthermore, they coached parents to not respond to instances of problem behavior throughout trials as well as coached parents to implement a response-cost-plus-contingent-work procedure during reinforcement time if their child engaged in problem behavior by ending reinforcement and prompting their child back to work. Across all participants, FCT reduced instances of problem behavior by an average of 65.1% and increased independent task completion and manding by 34.3% and 87.5%.

Method

Participants

Three undergraduate students were recruited for the study from James Madison University in Virginia. Each were randomly assigned to either the in-person training condition or the tele-training condition. Students were recruited from upper-level undergraduate courses in Psychology. None of the participants had prior experience in behavior analysis and had no prior experience in the use of Picture Exchange Communication System (PECS). All participants were provided with written informed consent prior to their participation. No course credit was earned for participation.

Setting

All sessions were conducted in a small 66” x 106” room located in an academic building on the campus of James Madison University. Each room contained one table measuring 24” X 72”, two chairs, one desktop computer with a built-in monitor (Dell Optiplex 7450) with a built-in camera, a keyboard and mouse.

For the in-person condition, the experimenter, mock learner, and participant were all located in the same room at the same time.

For the tele-training conditions, the experimenter was in a separate room from the mock learner and participant, both of whom were in the same room (as described above). Of note is that the experimenter had access to the participant via the computer web camera.
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

Materials

Pages 50 to 156 of the PECS manual (2nd Edition), one 7 ¼ X 6 ¼ PECS communication book including laminated picture icons of one preferred item (phone) and one non-preferred item (coloring book), and a checklist outlining target responses. Materials for each skill were the same across baseline, training, post-training, and maintenance for both in-person and tele-training sessions.

Procedure: Baseline

Prior to the first baseline session, all participants completed a 10-item multiple-choice quiz (see Appendix D). The same 10-item quiz was given to the participants once more following the completion of the training session and prior to the post-training sessions. After completion of the quiz, participants were provided with all of the necessary materials for Phases 1-3 of PECS. Participants were then instructed to conduct one five-trial session of each phase with the mock learner with no feedback provided.

BST Training

For all participants, immediately following baseline, the training session followed and the total training package from start to finish (baseline to post-training) lasted 45 to 60 minutes. In BST training, the participants first viewed a 5-min video of a proficient graduate student and mock learner explaining PECS and modeling each of the first three phases of PECS. In the video, the trainer reviewed each item on the checklist of target responses one time for each of the first three phases of PECS.

All participants were then instructed to run one 5-trial block with the mock learner and were provided with supportive and corrective feedback. Participant performance was recorded on a checklist maintained by the researcher on a trial by trial basis (see Appendix B for checklist). The rehearsal and feedback components of BST were done in vivo and repeated until the participants performed correctly on 80% of all steps over a minimum of two consecutive sessions. For the
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

participants in the tele-training group the procedure was identical to in-person BST training, however, the rehearsal and feedback components of the training package were conducted remotely via computer’s webcam.

Quiz

Following successful completion of the BST training package all participants completed a 10-item multiple-choice quiz.

Post-training

Following completion of the quiz, all participants were instructed to conduct one five-block session of each of the three phases of PECS with no feedback given.

Experimental Design.

A comparison design was used to evaluate the effectiveness of the tele-training BST training relative to in-person BST training. The primary dependent variable was the percentage of correctly performed steps on a checklist developed by the authors and based on the PECS training manual (Frost & Bondy, 2002). A correct response was defined as the participant performing a step as it is outlined on the checklist. If the participant implemented the step with any deviations from the checklist the observers scored the step as incorrect. A trial was defined as the completion of all possible steps of the procedure within a phase.

Inter-observer Agreement

An independent observer recorded the participants' responses on their own checklist which served as IOA data on the participant’s behavior. Interobserver agreement (IOA) was examined by having a second observer score correct and incorrect responses emitted on the TA of target responses. IOA was examined on 33% of all baseline, training and post-training sessions and was calculated by adding the number of agreements between the observer and researcher of correctly performed steps divided by the number of agreements plus the number of disagreements (one observer scored correct on a step and the other observer scored incorrect), and converting the
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

given ratio to a percentage. Agreement was 84.7% for baseline, 97.1% for training and 99.1% for post-training.

Results

Through random assignment, Poppy and Ziya were in the in-person training group and Braxton was placed in the tele-training group. Each participants’ responses were tracked on a checklist outlining the target steps for phases 1-3 of PECS. Their score was recorded as the percent of correctly implemented steps in a task analysis for each phase across baseline, training and post-training conditions. The participants were also given a pre-quiz prior to baseline and a post-quiz following training. The 10-item quiz was coded as a percent of correct responses.

Figures 1-3 show the overall percentage of correct responses for each phase of PECS during baseline, training and post-training conditions for each participant. Baseline and post training sessions were conducted in five-trial blocks and training sessions were conducted until each participant reached a minimum criterion of 80% accuracy across two consecutive sessions trials. As seen in Figures 1 through 3, none of the participants met the criterion performance during baseline for any of the three training phases of PECS. All participants, however, did demonstrate criterion responding for all five trials in the post-training condition, thereby showing marked improvements in responding relative to baseline.
Poppy’s results in Figure 1 demonstrate that in the baseline condition, for phase 1, responding began at a moderate level with a slight decreasing trend and then remained at a steady state of responding at a moderate level. Phases 2 and 3 demonstrate a stable, low-to-moderate level, with no trend. Following the video modeling each step for all three phases, in the training condition, corrective feedback was given as needed and responding was stable, at a high level, and with no trend.

For Poppy, in the post-training condition, no feedback was given and responding remained at a high level, was relatively stable, and remained well above the 80% minimum criteria demonstrating that they showed improvements relative to baseline.
Figure 2: Participant Braxton’s results in the Tele-training group. Figure above demonstrates the percentage of correctly implemented steps in five-trial blocks on checklists for Phases 1 through 3 during baseline, training, and post-training sessions.

Braxton’s results in Figure 2 demonstrate that in the baseline condition, for phase 1, responding began at a moderate-to-high level with a large amount of variability for phase 3 and a slight decreasing trend for phase 2. Phase 1, however, demonstrated little variability in baseline, and remained relatively steady throughout. Following the video modeling each step for all three phases, in the training condition, corrective feedback was given as needed.

In baseline phase 3 demonstrated a high degree of variability, and in the training condition, corrective feedback addressed the issues demonstrated in baseline. This is reflected in the variability demonstrated in the first three trials for phase 3 in the training condition. For phase 3, the most common error emitted by Braxton in baseline across all five trials was switching the placement of the icon after each trial. In the training
condition, this was the step that was missed in the second trial, bringing down Braxton’s overall percentage of correctly implemented steps for that trial for phase 3. After corrective feedback was given, Braxton met mastery criteria and responding remained above criteria for two consecutive trials.

For phase 1, Braxton missed several steps, however, after corrective feedback was given, there was an increasing trend of responding, which then remained at a high level for the remaining three trials and mastery criteria was met. Phase 2 remained at a steady rate above mastery criteria throughout the training condition with little variability and no trend. In the post-training condition, no feedback was given and responding for Braxton was stable at a high level and remained above the 80% minimum criteria, which also demonstrates that Braxton showed significant improvements relative to baseline.

Figure 3: Participant Ziya’s results in the in-person training group. Figure above demonstrates the percentage of correctly implemented steps in five-trial blocks on checklists for Phases 1 through 3 during baseline, training, and post-training sessions.
Ziya’s results in Figure 3 demonstrate that in the baseline condition, for phase 1 and phase 2, responding was stable throughout the condition. Responding for phase 1 remained at a moderate level and responding for phase 2 remained at a moderate-to-high level. Responding in phase 3, however, was at a moderate level and demonstrates a large amount of variability. Following the video modeling each step for all three phases, in the training condition, corrective feedback was given as needed.

In baseline phase 3 demonstrated a high degree of variability, and in the training condition, corrective feedback addressed the issues demonstrated in baseline. For phase 3, the most common error emitted by Ziya in baseline was in regard to the error correction procedure. This is reflected in the downward trend demonstrated for phase 3 following the first trial, the second trial in the checklist an incorrect response was emitted by the mock learner, therefore in the second trial Ziya was required to conduct the error correction procedure with the mock learner. This was the step that was missed in the second trial, thereby, bringing down Ziya’s overall percentage of correctly implemented steps for that trial for phase 3. After corrective feedback was given, Ziya implemented the error correction procedure to fidelity and met mastery criteria for that phase.

Responding for phase 1 and phase 2, remained stable at a high level, with little variability. Ziya was able to meet mastery criteria for both phases within the first three trials. In the post-training condition, no feedback was given and responding for Ziya stayed at a stable and high level and remained well above the 80% minimum criteria, which. Furthermore, demonstrates that Ziya also showed marked improvements relative to baseline.
When exploring the two training conditions, for the in-person training group, in baseline, the overall mean percentage of correctly implemented steps for phase 1 was 38.7%, for phase 2 it was 45.2% and for phase 3 it was 35.7%. In comparison to the tele-training group, whose overall mean percentage of correctly implemented steps for phase 1 was 65.4%, 67.4% for phase 2, and 58.6% for phase 3. Therefore, this suggests that with just the materials and PECS handbook presented, the tele-training group was able to implement the steps of the checklist with a higher accuracy than the in-person group.

In the training condition, the overall mean increased for both training groups. The overall mean for the in-person training group in the training condition was 100% for phase 1, 99% for phase 2, and 94.7% for phase 3. For the tele-training group, the overall mean in the training condition was 83% for phase 1, 100% for phase 2, 91.7% for phase 3. The in-person training group, therefore, demonstrated a higher accuracy of responding for phase 1 in the training condition. Both the in-person and tele-training groups implemented the steps in phase 2 and 3 with similar accuracies throughout the training condition.

This was also evident in the post-training condition for both groups. The overall mean for the in-person training group in the post-training condition was 100% for phase 1, 97.6% for phase 2, and 97.6% for phase 3. For the tele-training group, the overall mean in the training condition was 95.8% for phase 1, 100% for phase 2, 97.8% for phase 3. Therefore, indicating that both the in-person and tele-training groups were able to implement the first three phases with a high level of fidelity and at similar rates of accuracy.
This was also reflected in the number of trials to criterion for both in-person and tele-training groups.

![Trials to Criterion across Phases of PECS](image.png)

Figure 4. Number of trials to criterion in the training phase across in-person and tele-training conditions.

As seen in Figure 4, in the training condition, mastery criterion was demonstrated by all participants in both the tele-training and in-person groups after 3 trials for phases 1 and 2 of PECS. For phase 3, participants in the in-person condition reached mastery criterion after an average of 3.5 trials and for the tele-training group, criterion was reached after four trials.

The quiz scores (Figure 5) demonstrate that all participants demonstrated significant improvements in score in the post-quiz relative to the pre-quiz. As seen in the graph below, participants in the tele-training group demonstrated higher scores on the post-quiz, relative to the in-person training group.
In the pre-quiz, Ziya and Braxton both scored 40% on the pre-quiz, however, since Poppy scored higher (50%) on the pre-quiz, the average of Ziya and Poppy’s two scores demonstrates a higher percent of correct responses for the in-person group relative to the tele-training condition for the pre-quiz. Similarly, while Poppy and Ziya both demonstrated improvements in scores relative to their pre-quiz rates, Ziya scored lower (70%) than Poppy (100%) in the post-quiz, thereby bringing down the weighted average for the in-person group to 85%. Since Braxton scored 100% on the post-quiz and was the only participant in the tele-training group, the overall mean for the post-quiz remained at 100% for the tele-training group.
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

Figure 6. Post-Training results for participants in the in-person and tele-training conditions.

Post-training results for participants in both training conditions (Figure 6) demonstrates that, while the participant in the tele-training condition scores slightly lower on phase 3, overall, participants in both conditions demonstrated similar rates of responding and both demonstrated above-criterion performance throughout the post-training condition.

Discussion

This study extends previous research of enlisting BST to train the first three phases of PECS with the addition of comparing the effects of training this task through an alternate modality: tele-training. The primary research question of the study aimed to explore if the training modality mattered when using BST to train the first three phases of PECS. Moreover, are we doing “no harm” with Tele-training? When looking at the post-training results for both the in-person and tele-training conditions (Figure 6), while the in-person training group demonstrated a slightly higher rate of accuracy for phases 1 and 3,
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

Overall, the tele-training and in-person training groups both implemented phases 1 and 3 with a high degree of accuracy and with very similar rates of responding. This indicates that when using BST to train the first three phases of PECS, the training modality does not appear to have a large effect on the acquisition of this skill. Furthermore, the implications of these results suggest that we are doing “no harm” with enlisting the use of tele-training as a modality to train this skill.

The secondary research question outlined in the beginning of the study aimed to explore if the task analysis would reveal any systematic effects between the training modality at the item by item level. Moreover, can we locate which items may be differentially impacted by the training modality? An error analysis conducted to evaluate each participants’ responses on the checklist across baseline, training and post-training revealed that there were no consistent patterns of errors for any particular steps in each phase - and this was true regardless of the condition (in-person vs. tele-training).

A limitation of the study, however, is that due to the circumstances surrounding the COVID-19 pandemic and sudden university closures across the nation, the researcher was unable to include more participants in the study to further compare the effects of training this task across both in-person and tele-training modalities. The data and its implications, therefore, are limited to the small sample size as well as limited opportunities to collect additional IOA data.

Due to the small number of BCBAs worldwide, there is a high demand for services across the globe. This, therefore, increases the demand for RBTs to provide those services to those areas. In order to demonstrate the effectiveness for enlisting tele-training as a training modality to meet this demand, an area for future research could be
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

to replicate the study with a larger sample size to increase confidence in exploring tele-training as a potential training modality. The larger the sample size, the more likely the participants randomly assigned to each group will be equivalent in terms of skill sets and abilities and would, therefore, demonstrate a higher degree of experimental control. In addition, a larger sample size could aid in making claims about the generalizability of the effects of tele-training to a larger population.

Aside from increasing the sample size, future research should explore maintenance of skills across the two modalities as well as test for generalization of skills to a learner with developmental disabilities. Generalization evaluates if the acquired skills translate across environments or related behaviors. Therefore, by enlisting a learner with developmental disabilities, this would be an effective way to test to see if the participant would be able to implement the skills that were trained (i.e., the first three phases of PECS) with an actual client, which would, ultimately, evaluate the success of the training modality and package. Similarly, testing for maintenance of these skills would evaluate if the acquisition of the skills derived from the training would have lasting effects at various points in time, therefore, also demonstrating the success of enlisting this modality.

While this study was effective in using tele-training to train potential clinicians at a short range, future research could explore enlisting tele-training to provide training to potential clinicians at a larger distance. In the study, tele-training was used to provide training to participants in another room within the same building. Therefore, increasing the distance between the trainer and the participant would be an important extension of the present study to explore because it would incorporate several variables and could present possible limitations. At a short range, this study was able to include a well-trained
graduate student in a Behavior Analysis program as the mock learner throughout the study. The mock learner was trained on what responses and behaviors to emit during each trial throughout each target phase of PECS. By creating a script for the mock learner, this facilitated tracking which target responses were required by the participant for each trial. When increasing the distance between the trainer and the participant, the limitation is the presence of a possibly untrained mock learner, therefore, increasing the possibility of not only missing certain responses that may be emitted but also increases the possibility of the learner exhibiting other challenging behaviors that may not be outlined in the participant’s checklist of target responses and interventions.

Another important consideration when increasing the distance between the trainer and the trainee, however, is the potential risk to the client’s individual privacy and security, therefore, future research, especially if including learners with developmental disabilities, should explore enlisting software and networks that are not only cost effective but also adhere to the BACB’s ethical code of conduct. According to the BACB’s Ethical and Compliance Code, code 8.04 regarding media presentations and services, it’s the BCBA’s duty to determine web-based modalities and communication platforms that best maintain and protect their client’s privacy and confidentiality (Romani & Shieltz, 2017).

Future research should also explore the effects of enlisting tele-training to train other behavior analytic procedures and interventions. PECS is a form of augmentative and alternative communication (AAC). Future research could look at enlisting tele-training to train other forms of assistive technology used for communication such as speech generating devices including Proloquo2Go or LAMP, for example. Previous
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

studies have included training new clinicians and parents on how to implement a variety of behavior analytic assessments through an online modality. Online trainings that have been explored in past research include training on how to conduct preference assessments, functional analyses (FA) and functional communication training (FCT). Future research could, therefore, explore using tele-training to train how to implement other behavior analytic procedures including using chaining procedures to train functional skills, such as brushing teeth, tying shoes, doing laundry, etc.

Despite the limitations of the current study’s sample size, this study was able to show that when using BST, tele-training can be a viable solution needed to overcome the challenges of providing training to clinicians across the globe. While this pattern of results would need to be replicated and extended to a larger population, including across a wide range of skills, doing so could greatly aid in the availability of quality behavior analytic services to underserved regions around the world.
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

APPENDIX A

Phase 1 Participant Responses

<table>
<thead>
<tr>
<th>Pre-Session</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>Trial 4</th>
<th>Trial 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Has training materials ready (binder, pictures of preferred items, preferred items).</td>
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<tr>
<td>2. Has data sheet and writing utensil ready.</td>
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<tr>
<td>3. Ensures preferred items are out of participant's reach.</td>
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<tr>
<td>4. Selects items for training that have been previously identified as preferred in a stimulus preference assessment.</td>
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<tr>
<td>5. Ensures items are preferred by giving free access to training item before the 1st trial with that item.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Session</th>
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</thead>
<tbody>
<tr>
<td>6. Places ONE picture that corresponds to ONE preferred item in hand on the table directly in front of the participant.</td>
<td></td>
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<tr>
<td>7. Presents item to the participant, but out of his or her reach.</td>
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<tr>
<td>8. Uses different item after every 5 trials or less.</td>
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<tr>
<td>9. Uses dime-sized pieces if edibles are used.</td>
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<tr>
<td>10. Waits 1-2 s for the participant to respond.</td>
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<tr>
<td>11. If the participant does not reach for the picture, gives gestural (i.e., point) prompt and waits 1-2 s for a response.</td>
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<tr>
<td>12. If the participant does not reach for the picture after gestural prompt, uses physical prompt (i.e., hand over hand) prompt.</td>
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<tr>
<td>13. Once the participant has the picture in hand, waits for him/her to reach out, then opens one hand out to receive picture.</td>
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<td></td>
</tr>
<tr>
<td>14. Does not take the picture from the participant.</td>
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<tr>
<td>15. Does not provide verbal prompts at any time.</td>
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<tr>
<td>16. When a correct response is emitted, provides appropriate reinforcement (i.e., praise and access to item).</td>
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<tr>
<td>17. Provides reinforcement on EVERY trial, regardless if prompting was required.</td>
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<tr>
<td>18. Gives access to preferred item for approximately 15-20 s OR until participant has consumed item in its entirety.</td>
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<tr>
<td>19. Correctly scores responses on data sheet immediately after each trial is complete.</td>
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</tr>
<tr>
<td>20. Returns picture to table (or binder) while the participant plays with or consumes item.</td>
<td></td>
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</tbody>
</table>

TOTAL SCORE
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

**APPENDIX B**

### Phase 2 Participant Responses

<table>
<thead>
<tr>
<th>Pre-Session</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>Trial 4</th>
<th>Trial 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Has training materials ready.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Has data sheet and writing utensil ready.</td>
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<tr>
<td>3. Ensures preferred items are out of participant’s reach.</td>
<td></td>
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<tr>
<td>4. Selects items identified in a stimulus preference assessment.</td>
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</tr>
<tr>
<td>5. Ensures items preferred by giving free access to training item <strong>before</strong> the 1st trial with that item.</td>
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</tbody>
</table>

#### Session

| 6. Places ONE picture that corresponds to ONE preferred item in hand on the table or binder directly in front of participant. |         |         |         |         |         |
| 7. Presents item to participant, but out of his or her reach. |         |         |         |         |         |
| 8. Uses different item after every 5 trials or less. |         |         |         |         |         |
| 9. Uses dime-sized pieces if edibles are used. |         |         |         |         |         |
| 10. Sits at least 1 ft. away from participant. |         |         |         |         |         |
| 12. Waits 1-2 s for the participant to respond. |         |         |         |         |         |
| 13. If participant does not respond, gives gestural prompt & waits 1-2 s for response. |         |         |         |         |         |
| 14. If participant does not respond to gestural prompt, uses physical prompt. |         |         |         |         |         |
| 15. Once participant has picture in hand, waits for him/her to reach out, then opens one hand out to receive picture. |         |         |         |         |         |
| 16. Does not take picture from participant. |         |         |         |         |         |
| 17. Does not provide verbal prompts at any time. |         |         |         |         |         |
| 18. When correct response is emitted, provides appropriate reinforcement (i.e., praise and access to item). |         |         |         |         |         |
| 19. Provides Sr+ on EVERY trial, regardless if prompting required. |         |         |         |         |         |
| 20. Gives access to preferred item for 15-20 s OR until participant has consumed item in its entirety. |         |         |         |         |         |
| 21. Correctly scores responses on data sheet immediately after each trial is complete. |         |         |         |         |         |
| 22. Returns picture to table (or binder) while participant plays with or consumes item. |         |         |         |         |         |
| 23. If participant has responded correctly & independently on 2 consecutive trials, moves 1 ft further away from participant. |         |         |         |         |         |
| 24. If participant has not responded correctly & independently for 2 consecutive trials, moves 1 ft closer to participant on next trial. |         |         |         |         |         |
| 25. If participant has not responded correctly & independently for 2 consecutive trials and trainer is sitting right next to participant, goes back to Phase 1 for 2 trials. |         |         |         |         |         |
| 26. AFTER participant responded correctly & independently for 5 consecutive trial blocks with trainer 8 ft. away, moves binder at least 1 ft. away from participant. |         |         |         |         |         |
| 27. If participant has responded correctly & independently on 2 consecutive trials, moves binder 1 ft further away from participant. |         |         |         |         |         |
| 28. If participant has not responded correctly & independently for 2 consecutive trials, moves binder 1 ft closer to participant. |         |         |         |         |         |

**TOTAL SCORE**
The Effects of Training Modality on Acquisition of Therapeutic Skills using Behavior Skills Training (BST): In Vivo vs. Tele-Training Modality.

**APPENDIX C**

<table>
<thead>
<tr>
<th>Phase 3 Participant Responses</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>Trial 4</th>
<th>Trial 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-Session</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1. Has training materials ready.</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2. Has data sheet and writing utensil ready.</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>3. Ensures preferred items are out of participant's reach.</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>4. Selects items identified in a stimulus preference assessment.</td>
<td></td>
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</tr>
<tr>
<td>5. Ensures items are preferred by giving free access to training item before 1st trial with that item.</td>
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</tr>
<tr>
<td><strong>Session</strong></td>
<td></td>
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</tr>
<tr>
<td>6. Places ONE picture that corresponds to ONE preferred item AND ONE distracter picture that is of a non-preferred item on binder.</td>
<td></td>
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<tr>
<td>7. Places binder directly in front of participant.</td>
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<tr>
<td>8. Presents preferred item to participant out of his/her reach.</td>
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<tr>
<td>9. Uses different preferred item after every 5 trials or less.</td>
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<tr>
<td>10. Uses dime-sized pieces if edibles are used.</td>
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<tr>
<td>11. Changes distracter picture after every 5 trials or less.</td>
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<tr>
<td>12. Waits 1-2 s for participant to respond.</td>
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<tr>
<td>13. Once participant has a picture in hand, waits for him/her to reach out, then opens one hand out to receive picture.</td>
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<tr>
<td>14. If participant exchanges preferred item picture, reinforces with praise and delivery of item.</td>
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<tr>
<td>15. If participant exchanges distracter picture, delivers distracter item and provides verbal feedback (i.e., says name of item).</td>
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<tr>
<td>16. If distracter picture is exchanged, uses 4-step error correction procedure.</td>
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<tr>
<td>17. Shows or points to correct picture.</td>
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<tr>
<td>18. Holds open hand out.</td>
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<tr>
<td>19. If learner now gives correct picture, praises but DOES NOT give item.</td>
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<tr>
<td>20. WAITS a few s before presenting binder with pictures (insert DELAY).</td>
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<tr>
<td>21. Shows item and presents binder with both pictures.</td>
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<tr>
<td>22. If learner now gives correct picture, praises and gives access to item.</td>
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<tr>
<td>23. If learner does not give correct picture, performs steps a-e above.</td>
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<tr>
<td>24. Switches placement of pictures after each trial.</td>
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<tr>
<td>25. Correctly scores responses on data sheet immediately after each trial is complete.</td>
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</tr>
<tr>
<td>26. Returns picture to table (or binder) while participant plays with or consumes preferred item after each trial.</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>27. If participant has responded independently and correctly on 5 consecutive trials, moves 1 ft. further away from participant on next trial.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>28. If participant has not responded correctly and independently for 5 consecutive trials, moves 1 ft. closer to participant on next trial.</td>
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</tbody>
</table>

**TOTAL SCORE**
### APPENDIX D

#### PECS Quiz

1. **What is the goal of Phase 1 of PECS?**
   - a. Distance and persistence
   - b. How to communicate
   - c. Discrimination
   - d. Sentence structure

2. **What is the goal of Phase 2 of PECS?**
   - a. Distance and persistence
   - b. How to communicate
   - c. Sentence structure
   - d. Discrimination

3. **What is the goal of Phase 3 of PECS?**
   - a. Distance and persistence
   - b. How to communicate
   - c. Discrimination
   - d. Commenting

4. **How many pictures are presented in Phase 1 of PECS?**
   - a. Two
   - b. One
   - c. Four
   - d. None

5. **You respond to Phase IIA errors with…**
   - a. 4-step error correction
   - b. Backstep
   - c. Two-person prompting
   - d. Least to Most prompting

6. **When do you give the learner the target item?**
   - a. After 2 trials
   - b. After 5 trials
   - c. During 4-step error correction
   - d. Immediately following a response

7. **What does FP mean?**
   - a. Full Physical
   - b. First Phase
   - c. Fixed Prompt
   - d. Fading Procedure

8. **What distance do you start at for Phase 2?**
   - a. One foot away
   - b. Two feet away
   - c. Three feet away
   - d. Four feet away

9. **How long should the learner have access to the target item?**
   - a. 3-5 seconds
   - b. 15-20 seconds
   - c. One minute
   - d. 5 minutes

10. **When do you increase your distance from the learner in Phase 2?**
    - a. After the first trial
    - b. After 1 correct response
    - c. After 2 correct responses
    - d. On the last trial
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References


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