Training Via Telehealth: Effects on the Implementation of Free-operant Preference Assessment

Dissertation

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Tangchen Li, MA

Graduate Program in Educational Studies

The Ohio State University

2022

Dissertation Committee

Sheila Alber-Morgan, Advisor

Moira Konrad

Matthew E. Brock

Abstract

This dissertation is comprised of five distinct chapters. The first chapter is an introduction to remote behavioral skills training as well as preference assessment. The next three chapters serve as standalone papers. Chapter 2 is a literature review aimed at evaluating the remote training for behavioral analytic assessments. Chapter 3 is a completed manuscript containing the study conducted for this dissertation. Chapter 4 is a practitioner paper that provides teachers with steps for implementing free-operant preference assessment. Finally, Chapter 5 addresses future career and research aspirations.

Dedication

I dedicate my dissertation work to my family. Special gratitude to my devoted parents, Hongwei and Aixiang, whose unconditional support encourages me to choose what I like. My husband, Terence, has been a constant source of support and encouragement during graduate school and life challenges. My beloved daughter Jodie, whose growth and development inspire me daily and encourage me to be fearless in all my difficulties. I am genuinely thankful for having all of you in my life.

Acknowledgments

I would like to extend my sincere thanks to Dr. Sheila Morgan for her unwavering support and belief in me. I have had her support for the past six years throughout my master's program and doctoral program. I would also like to thank Dr. Moira Konrad and Dr. Matthew Brock for their insightful comments and suggestions. To all the teachers who participated in the study, thank you for your willingness and flexibility during the experiment. To all my previous students, thank you for inspiring me.

Vita

2016…….B.A. South China Normal University

2018…….M.A. The Ohio State University

2018 to present…….Graduate Trainee, Department of Special Education, The Ohio State university

Publications

Li, T. & Alber-Morgan, S. R. (2020). The comparative effects of oral cover-copy-compare and oral interspersal-drill on math performance of students with autism. *International Forum of Special Education and Child* Development*, 1,* 45-57.

Covey, A., Li, T., & Alber-Morgan, S. R. (2021). Using behavioral skills training to teach peer models: Effects on interactive play for students with moderate to severe disabilities. *Education and Treatment of Children, 44,* 19-30.

Fields of Study

Major Field: Educational Studies

Area of Emphasis: Special Education & Applied Behavior Analysis

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Chapter 1. Introduction

Conducting assessment before designing and implementing instruction or intervention is essential in maximizing the effects. Training instructors to implement a variety of assessments is critical in improving the intervention effects. Special education teachers and service providers need professional learning opportunities not only before but also after their career journey starts. Empirically validated behavioral strategies had been widely utilized and have resulted in successful student outcomes. Using reinforcement appropriately is one effective strategy that helps students increase learning and decrease challenging behaviors. Preferred items are more likely to function as reinforcers for individuals, especially those with disabilities. Therefore, it is necessary for practitioners to learn how to identify preferred items for their students.

Behavioral Skills Training

To maximize training efficiency, a substantial number of studies have examined effective components of behavioral skills training (e.g., Gardner, 1972; Miltenberger et al., 2004; Sarokoff & Sturmey, 2004). The common features effective training include written protocols, oral instructions, in vivo coaching, Q&A sessions, brief supervised practice with performance feedback, modeling, and role-play (McCahill et al., 2014). For example, oral instruction and brief supervised practice with performance feedback were utilized by Maag and Larson (2004). Results indicated the training package could help participants learn how to implement functional assessment. Moore and Fisher (2007) compared the efficacy of lectures and two types of video modeling with three staff members. The study demonstrated that video modeling with a variety of therapist exemplars produced more significant improvements in participant performance than

lectures and partial video modeling. Instruction, modeling, role-play, and performance feedback are four training components that have been demonstrated to be effective for training numerous skills. A training model that includes the four components is called behavioral skills training (BST). As a frequently utilized training model for promoting skill acquisition and proficiency, BST has been demonstrated to be effective for a wide range of individuals, including children, parents, teachers, and service providers (DiGennaro et al., 2018; LaBrot et al., 2017). Using BST, numerous skills can be taught, including different types of assessments (e.g., Shayne & Miltenberger, 2013) and interventions (e.g., Sarokoff & Sturmey, 2004).

Variations of BST have been assessed in numerous studies. Shayne and Miltenberger (2013) utilized BST to train parents to collect ABC (Antecedent, Behavior, Consequence) data. Results indicated most parents increased their scores on taking ABC data from video scenarios during the post-training assessments. Moreover, most parents maintained the skill at a level higher than baseline during the follow-up assessments. Crockett et al. (2005) and Lafasakis and Sturmey (2007) demonstrated the efficacy of using BST to train parents to implement discrete trial training (DTT). Results suggested that the parents acquired the skills of implementing DTT and generalized the skills to teaching different programs to the child participants. Additionally, the child participants in the two studies emitted more correct responses after their parents learned the effective teaching strategies. Kunnavatana et al. (2013) trained four teachers to conduct trial-based functional analysis using a combination of didactic teaching and practice with feedback. Results indicated that all participants improved their performance on conducting the assessment following training. Hogan et al. (2015) used BST to teach four instructional staff in a special education setting to implement two students' behavior intervention plans. Results showed that all staff's implementation fidelity improved during and after the intervention phase.

Remote training has recently been utilized in increasingly more studies to maximize resources and training efficiency. Fisher et al. (2020) assessed the effects of a virtual-training program on parent implementation of play skills interventions using a randomized clinical trial. E-learning modules with multimedia presentations and scripted role-play with feedback were used in the experiment. Results of the study indicated that the treatment group showed distinct improvement in skills while the control group showed small changes. Machalicek (2010) evaluated the use of video conferencing to train teachers to implement functional analysis conditions. During training, performance feedback was utilized to improve the trainees' skills. Trainees learned to implement conditions after the training and maintained their skills for several weeks following the last feedback session. Alnemary et al. (2015) investigated the effects of remote BST on training four special education teachers in implementing functional analysis. Results indicated that the remote training helped them master the target skill. Remote training via videoconferencing had been used in other previous training and produced comparable outcomes to traditional in-person training (Gerencser et al., 2020; Tomlinson et al., 2018).

Preference assessment

Reinforcement is an evidence-based strategy widely adopted in instruction and therapy (Sam & AFIRM Team, 2015). Reinforcement is defined as a consequence following the learner's behavior that increases the future likelihood of the learner using the skill or exhibiting the behavior (Cooper et al., 2021). Students' preferred items usually function as reinforcers for them. Instructors should conduct stimulus preference assessments regularly to identify effective reinforcers for replacement behaviors and new skills (DeLeon & Iwata, 1996). There are a variety of assessments that can be chosen based on the student's skill level and needs. Commonly utilized preference assessments are single-stimulus, paired-choice (i.e., forced-choice, paired

stimulus), multiple stimuli without replacement (MSWO), multiple stimuli with replacement (MSW), free-operant, and eye-gaze assessments (Cannella-Malone et al., 2013).

In a single-stimulus preference assessment, students are presented with one item in each trial. Instructors record the students' responses and the duration of the engagement with each item. The single-stimulus method is more appropriate for individuals who have difficulty selecting items from two or more stimuli (Chazin & Ledford, 2016). In addition, the single-stimulus approach provides learners with lengthier stimulus-access time, which makes it more appropriate for assessing activity reinforcers (e.g., playing with a swing, playing video games, and playing with blocks). It is recommended to use single-stimulus preference assessment if stimuli are difficult to present in a choice format (e.g., dancing, walking the dog, going to a park). Moreover, instructors can take data on students' problem behaviors when engaging with items, which provides information about the item's capacity to compete with reinforcer-maintained problem behaviors (Hagopian et al., 2001; Ringdahl et al., 1997).

Paired-choice preference assessment was considered a more accurate predictor of reinforcement effects of the stimuli than the single-stimulus approach (Fisher et al., 1992; Piazza et al., 1996). In a paired-choice session, a student is presented with two items in each trial and asked to choose an item. The instructor provides some time for the student to consume the item. In the subsequent trial, instructors are recommended to present the item that was not chosen in a previous trial with another item and alternate the location of the unchosen item. This way, a possible side bias (e.g., students always choose the item presented on their right side) can be tested (Chazin & Ledford, 2016). In addition, the results of paired-choice preference assessments have been demonstrated to be effective based on the reinforcer tests. This procedure is time-consuming since only two items were presented each time, and it takes more time for instructors

to test and re-test the preference level. In addition, paired-stimulus preference assessments are inappropriate for students who engage in challenging behavior when a preferred item is taken away. In addition, Iwata et al. (2013) compared the reinforcement effects of single-stimulus and paired-choice preference assessments. The experiment results indicated that the paired-choice method is well suited to assess the relative effects of the stimulus. In contrast, the single-stimuli approach should be used to examine the absolute effects.

In an MSWO session, an array of five to seven stimuli will be presented in each trial. Students are asked to choose an item from the array and consume or engage with the item (i.e., eat the edible or play with the item). The chosen item is removed from the array, and the stimuli locations are alternated. Instructors continue to ask students to select an item from the remaining stimuli until one item is left or the student refuses to make any further selections. No fewer than three sessions should be conducted to gather enough information to create the most accurate preference hierarchy (Chazin & Ledford, 2016). MSWO is a more efficient approach for testing edible items for students with problem behaviors since edibles are consumed, and no item needs to be taken away. The number of stimuli presented in each MSWO array affects the students' choices. If more stimuli are presented, making reliable discriminations could be more difficult for students and decreases the preferred-stimulus selection rates (Davies et al., 2013). Therefore, the number of items in each array should be decided based on the students' scanning abilities and discrimination skills.

MSW sessions are similar to MSWO sessions since multiple stimuli are presented in a trial. Before the assessment, six to eight stimuli are chosen to be tested in the assessment. Instructors usually present the child with three to four items in each trial and ask the child to choose an item from the array. The item selected in the previous trial is presented in the

subsequent trial, and the unselected items are replaced with some items that are not included in the last array. Instructors should alternate the items' locations to minimize the side bias's effects on the assessment results. Typically, MSW sessions are more time-consuming than MSWO sessions.

Free-operant preference assessment is appropriate for students on any skill level (Chazin & Ledford, 2016). In free-operant preference assessment, students usually have access to various items. They are permitted to engage freely in the environment set up by instructors. During the assessment, instructors observe and collect data for a predetermined time without intervening in students' play behavior. For example, teachers can record the duration of engagement with each item or use the partial interval recording method to estimate the engagement time for each item. After the observation, a preference hierarchy can be created by calculating each item's total duration of engagement and ranking the order of the items. Roane et al. (1998) compared a five-minute free-operant preference assessment and a paired-stimulus preference assessment. Results demonstrated that the free-operant preference assessment produced a similar preference hierarchy as the paired-stimulus method. In addition, the free-operant approach offered advantages such as time efficiency and fewer problem behaviors. Therefore, free-operant preference assessment is helpful and recommended when time is limited, or the frequency of problem behaviors is high.

Eye-tracking technology and an augmentative and alternative communication (AAC) device need to be used to help instructor gather information on students' choices (Canella-Malone et al., 2015). For students who are not physically or vocally able to select items from a larger area, an eye-gaze preference assessment helps identify preferred items. The eye-gaze

approach has been investigated with single-stimulus and paired-choice methods. The duration of eye gaze identified students' preference hierarchies on each stimulus (Riden et al., 2022).

Each type of preference assessment has its advantages and disadvantages. Free-operant preference assessment can be utilized with a wider range of students and is less likely to evoke problem behavior. In addition, no previous study investigated the effects of remote BST on implementing the free-operant approach. Therefore, it is necessary to evaluate the training on conducting free-operant preference assessments.

Purpose

This dissertation aims to evaluate the effectiveness of remote behavioral skills training on the teacher implementation of free-operant preference assessments.

Preview of chapters. Chapter 2 is a literature review of remote training on teacher performance of behavioral assessments. Chapter 3 presents findings from an experiment training teacher to implement free-operant preference assessment with remote behavioral skills training. The percentage of correct steps was evaluated to report the effectiveness of remote behavioral skills training. In addition, a social validity survey was conducted. Findings and limitations a discussed in Chapter 3. Chapter 4 is a paper written for practitioners like teachers or interventionists. This paper provides step-by-step guidance for practitioners to implement free-operant preference assessment and utilize the assessment results to improve instruction. Finally, Chapter 5 is a discussion of my research line.

Chapter 2. Literature Review

The following chapter includes a review of literature focusing on remote training on teacher implementation of behavioral assessments.

Abstract

Behavioral analytic assessment is essential in creating function-based and effective behavior change programs for individuals with disabilities. Training teachers and staff to implement behavioral assessments have been researched by numerous scholars. There is an increasing need for remote training because of the COVID-19 pandemic and the goal of delivering training more cost-effectively. The purpose of the present review is to evaluate the effects of training individuals to implement behavior analytic assessments via telehealth and the characteristics of practical remote training. Components of effective training, the efficiency of the training, generalization effects, maintenance effects, and social validity outcomes are synthesized and summarized in the review. Implications for effective implementation of training on behavioral assessment and future research avenues are provided.

Keywords: behavioral skills training, training via telehealth, behavioral assessment, implementation fidelity

Training Staff in Behavioral Analytic Assessments: A Literature Review of Training Via Telehealth

Technology is a part of everyday life, with smartphones, tablets, laptops, and high-speed internet connections becoming more accessible and affordable (Tomlinson et al., 2018). Telehealth, which is defined as "the use of telecommunications and information technology to provide access to health [or behavioral health] assessment, diagnosis, intervention, consultation, supervision, education, and information across distance" (Nickelson, 1998, p. 527), has been used as a service delivery model for over 50 years (American Telemedicine Association, 2013). Within the past 10 to 15 years, the annual compound growth rate of its use has averaged 52% (Barnett et al., 2018). In addition, 86% of publications about telehealth have occurred (Wacker et al., 2013). Specific to behavior analysis, both synchronous interactions or live video conferencing and asynchronous training have been used for consultation and training (Gerencser et al., 2019; Schieltz & Wacker, 2020). Although telehealth is not an evidence-based practice for addressing behavior change, it is a mechanism by which professionals can provide services and teach others to implement behavioral analytic assessments and evidence-based practices (Unholz-Bowden et al., 2020).

Applied behavior analysis (ABA) is a practice based on the science of learning and behavior. As part of ABA practice, functional behavior assessment (FBA) gathers data from multiple sources to identify the antecedent and consequence events that predict and maintain problem behavior (Cooper et al., 2020). FBA is composed of indirect assessments (e.g., interviews, questionnaires, rating scales, checklists), descriptive functional assessments (e.g., direct observation, ABC data), and functional analysis (FA; Cooper et al., 2020). Information gathered in an FBA is used to create and implement individualized interventions to reduce

problem behaviors and increase positive behaviors. Disruptive behaviors, off-task behaviors, noncompliance, and inappropriate social interactions are diverse problem behaviors that can be addressed by FBA-based interventions (Gresham et al., 2001). IDEA 1997 also called for implementing FBA and positive behavior support for students with disabilities (Individuals with Disabilities Education Act, 20 U.S.C. 1400 et seq. 1975, as amended, 1997).

As the demand for well-trained teachers and clinicians to provide behavior analytic interventions is growing, behavior analysts are considering how best to support training on behavior analytic assessments with individuals working with children with disabilities as the world navigates the COVID-19 health crisis (Gerencser et al., 2019; Schieltz & Wacker, 2020). Recent literature reviews have looked at the effectiveness of staff training delivered via telehealth (Gerencser et al., 2019; Tomlinson et al., 2018), caregiver training via telehealth (Unholz-Bowden et al., 2020), fidelity outcome for interventionists coached via telehealth (Neely et al., 2017).

One common method of training practitioners to implement assessments or interventions is behavioral skills training (BST), which is typically a face-to-face approach composed of professional delivering instruction, modeling, role-play, and feedback to trainees (Kirkpatrick et al., 2019). The BST procedure has been demonstrated to be effective in training individuals to implement a variety of behavioral analytic assessments and interventions, such as stimulus preference assessments (Lavie and Sturmey, 2002), FA (Iwata et al., 2000), antecedent-behavior-consequence (ABC) data collection (Samudre, 2019), functional communication training (Wacker et al., 2013), picture exchange communication system (Homlitas et al., 2014), and discrete trial teaching (Sarooff & Sturmey, 2004).

Besides delivering BST with a face-to-face format, several studies have demonstrated that BST can be implemented remotely via telehealth (Alnemary et al., 2015; Barkaia et al., 2017; Fisher et al., 2014). Telehealth is a service-delivery mechanism, and the intervention components and training provided via telehealth are the independent variables whose effectiveness was evaluated in different studies. One or more components of BST model was utilized in previous studies on remote training. For example, Wacker et al. (2005) utilized parent manual and videoconferencing to train 25 parents to conduct FA and functional communication training in a home setting. Results indicated the effects on decreasing challenging behavior emitted by child participants. Alnemary et al. (2015) used videoconferencing to deliver instruction, modeling, role-play and feedback on FA to four special education teachers. Results demonstrated that all four trainees could master the skills across at least two of the FA conditions. Machalicek et al. (2010) evaluated the effects of providing video teleconferencing feedback to six teachers on accurate FA implementation. Results showed that teachers' levels of implementation fidelity were acceptable at first, but they declined shortly after performance feedback was discontinued. The results of previous studies suggested that the use of BST to deliver remote training sessions is a promising approach for training individuals to implement behavioral assessments.

However, there are also obstacles relating to remote training noted by previous studies. First, technical difficulties were encountered by researchers. Transferring potentially large video files and setting up equipment before sessions need to be addressed (Fischer et al., 2016). Second, as a common issue in delivering remote therapy, problems with protecting clients' confidentiality or obtaining informed consent should also be addressed in remote training since students and clients are usually involved as participants in remote training studies (Barkaia et al.,

2017; Fischer et al. 2016). Third, more direct modeling is not accessible in remote training, which is another limitation of remote training. Researchers also pointed out that it is not feasible to address all types of behavior or behavioral technology through remote training (Machalicek et al., 2010; Wacker et al., 2013).

Few literature reviews to date have evaluated the effectiveness of training practitioners to implement behavioral assessments via telehealth. Tomlinson et al. (2018) evaluated 20 articles on training individuals to implement behavioral analytic procedures, including assessments and interventions. Of the 20 studies included in the review, 11 of them was about conducting behavioral assessment such as FA and preference assessments. Videoconferencing was used to provide training in all of the included studies. Different specific methods used across the studies included direct instruction, modeling, role-playing, self-instructional online modules or videos, and written instruction. Results indicated the effectiveness of using telehealth to train individuals to implement behavioral analytic assessments. Gerencser et al. (2020) assessed 22 studies on computer-based asynchronous training on behavioral assessments and interventions published between the year of 2007 to July 2017. Five different asynchronous training formats were found in the review. Results suggested that the comparative effects of different training formats cannot be reported since no direct experimental comparisons were found in the review. In addition, training via telehealth had been found to produce comparable outcomes to traditional in-person training with significant financial savings for organizations and individuals (Gerencser et al., 2020). New studies on training individuals to implement behavioral assessments published in the past two years because of the COVID-19 health crisis and the increasing demand for training via telehealth (Bloomfield et al., 2020).

The purpose of this review is to provide an overview of training individuals working with people with disabilities to implement behavior analytic assessments via telehealth. Specifically, this review sought to answer the following research questions.

(a) What are the demographics of trainee participants?

(b) What are the components of the training on behavioral analytic assessments delivered via telehealth?

(c) What are the average durations of the training across studies?

(d) To what degree does training delivered via telehealth improve the trainee's skills of conducting behavioral assessments?

(e) Does implementation fidelity on conducting behavioral analytic assessments generalize to settings or subjects that were not directly trained?

(f) Does implementation fidelity on conducting behavioral analytic assessments maintain over time?

(g) Do the trainees consider the remote training as effective and helpful?

Method

Study Identification and Eligibility Criteria

A comprehensive systematic search was conducted using several different methods to obtain studies applying remote training on behavioral analytic assessments. First, an electronic search was completed using five databases including PsycINFO, Educational Research Information Center (ERIC), Social Services Abstracts, Education Research Complete Academic, and ProQuest Dissertations & Theses. When conducting electronic search, the following search string was input into the database (Telehealth OR Tele* OR Videoconferenc* OR remote OR distance education OR distance learn* OR distance train*OR Elearn* OR Internet) AND

(Applied behav* anal* OR Behav* anal* OR Positive behav* support OR Special education) AND (teache* OR preservice OR behave* technician OR paraprofession* OR staff training) AND (experiment* OR evalut* OR "single case design" OR "single subject design" OR "multiple baseline" OR "multiple probe" OR multielement OR multi-element OR "alternating treatment" OR reversal OR withdrawal OR "repeated acquisition" OR changing criterion OR "randomized control trial" OR "randomized controlled trial"). The electronic search yielded 670 articles.

After the initial electronic search, the second phase involved applying the eligibility criteria for inclusion in the review. Studies were chosen for final review if the following criteria are met. First, the studies had to be published in a peer-reviewed journal or a dissertation found on ProQuest. Second, the articles should be written in English or in Chinese. This criterion was applied as the author of the current review can read in English and Chinese. Third, studies with trainees working with students with disabilities (e.g., teachers, therapists, aides, service providers) and trainings were about implementing behavioral assessments were included as the focus of the current review was the effectiveness of the training on implementing behavioral analytic assessments. Behavioral assessments include preference assessments, ABC data collection, indirect assessments, functional analysis, and variations of functional analysis (e.g., trial-based functional analysis, practical functional analysis). Finally, the study had to be either a randomized controlled trial or a single-case design study with at least three opportunities to demonstrate an effect. Studies were not included if they were case studies, descriptive studies, qualitative studies, or single-subject designs that did not demonstrate experimental control (e.g., ABA, BAB designs). No year limit was applied as a similar review could not be located. After applying these limiters, a total of 33 studies were included in the further review. The next step

was to review titles, abstracts, methods, and results sections of the 33 articles and apply the two inclusion criteria.

The third phase of the search included applying inclusion criteria pertaining to the independent variables and dependent variables. As the independent variable, training on conducting behavioral assessment should be delivered through technology remotely since the purpose of this review was to evaluate the effects of training via telehealth. The experimenter, supervisor, and trainer must not have any in-person interaction at any time of the training. If a study used confederates for the role-play or rehearsal, it would be included only if the trainer or supervisor did not have any in-person communication with the trainees regarding the training. The dependent variables in selected studies should include participants' performance on implementing behavioral assessment. In other words, trainees' implementation fidelity must be measured in the study. Implementation fidelity was defined as a measure of the extent to which the trainees were able to follow the steps on a checklist to implement behavioral assessments. The implementation fidelity measure is usually reported as the percentage of correctly complete steps. After the two criteria were applied, a total of 10 studies were included for a full text review.

Based on the final full text review, a total of six articles were included. Of the six included articles, four of them were peer-reviewed articles, and two were unpublished dissertations. After the final six articles were identified, an ancestral search was conducted by reviewing the references of the six included studies. Criteria utilized in the three-phase searching process were applied in the ancestral search. For example, Machalicek et al. (2009) used videoconferencing to support teachers in conducting preference assessments. But the dependent variable was just the student outcome. Therefore, it was not included in the present review. No

additional articles were included based on the ancestral search. Refer to Figure 1 for a visual depiction of search results.

Coding Procedures

The included articles were coded across several variables after the search was completed. The variables included for coding were (a) trainees' demographics including age and experience on behavior analysis and behavioral assessments; (b) methods including setting, independent variable, dependent variable, duration of the training, technology used, procedural integrity, generalization, maintenance, and social validity measures; and (c) treatment outcome. Refer to Table 1 for the coding results.

Data Analysis for Single-Subject Research Designs

Visual analysis was applied to evaluate the effects of the single-subject designs. The effect size was determined by calculating the percent of non-overlapping data points (PND) for studies demonstrating strong or moderate evidence of functional relation. PND is an index of the effects of interventions calculated with a non-regression approach (Scruggs & Mastropieri, 2001). To calculate PND, the number of data points in the intervention phase that do not overlap with data points in the baseline phase is divided by the total number of intervention data points (Scruggs & Mastropieri, 2001). Generally, a higher percentage indicates a more effective intervention. Scruggs and Mastropieri (2001) suggested that PND scores more than 90 represents very effective treatment, scores from 70 to 90 represents effective treatment, scores from 50 to 70 represent questionable treatment, scores less than 50 represents ineffective treatment. The above criteria were applied to determine the effect size of the studies.

Coder Training and Interobserver Agreement

One doctoral student coded 30% of the studies across the inclusion criteria, demographic information, methods, and treatment outcomes. A coding manual was provided to the doctoral student. The doctoral student received a verbal description of coding procedures and practiced with randomly selected articles. After the doctoral student coded 30% randomly selected articles, the author compared the responses using point-by-point agreement for each of the coded variables and then multiple by 100. The results indicated that IOA for inclusion criteria were 99%, demographic information was 93% (range 82-100%), methods were 90% (range 80-100%), and treatment outcomes were 100%.

Results

Participant Demographics and Settings

Participants' demographics were coded for both trainees and child participants in the six included articles. Age, previous experience with behavioral analytic assessments, positions, degree levels were analyzed for adult participants. For the child participants, age and diagnosis were analyzed. Several studies did not include all pertinent information reported above. For example, the previous experience of the six staff members in one study (i.e., Machalicek et al., 2010) was not included in the article. Another example is that one study (i.e., Pizzella, 2020) only used confederate for adult participants to practice assessments, so no information about the students/clients was reported.

Based on the information provided in the articles, a total of 30 adult participants engaged in the six studies. Of studies that reported age, all of the adult participants were between the age of 18 and 32. Of studies that provided information on the participants' experience status and positions, seven (38%) of the participants were newly hired clinicians working at a EIBI clinic,

seven (38%) of them were special education teachers working either at a public or private school, four (24%) of them were paraprofessionals working with special education teachers in a school setting. Of studies that reported degree levels, 19 (73%) of the participants held a Bachelor's degree, six (23%) were working on obtaining a bachelor's degree at the time of the study, one (4%) held a Master's degree. Additionally, in a study (i.e., Rios et al., 2020), seven of the ten participants were either Board Certified Behavior Analysts® (BCBAs®) or receiving training to obtain their certification.

As for the child participants' demographics, a total of 13 students or clients engaged in the seven studies. All 13 child participants were between the age of four and ten. 13 (100%) of the child participants had been diagnosed with autism spectrum disorders.

Setting was coded only for trainees since the child participants were students or clients of the trainees. For studies that included child participants, the instruction and rehearsal with performance feedback sessions took place either in the classrooms or office at the school or clinic (e.g., Machalicek et al., 2010). For studies that did not include child participants and had the trainees role-play with confederates, the trainings were delivered at trainees' homes or an office at a university.

Technologies

In remote training sessions, additional hardware and software were required for the trainer to deliver information and for the trainee to receive instruction and feedback. Common hardware utilized in the seven studies included laptop, HD webcam, tablet with a built-in camera, telephone, headset with an attached microphone, and Bluetooth© earphone devices. Software that had been used included VSee©, iChat©, VidyoDestop©, Google Chrome© browser, Apple Keynote, Piktochart©, digital timer, and Capto©.

Training Focus

Of the six studies, three (50%) studies (i.e., Machalicek et al., 2010; Rios et al., 2020; Rubatto, 2020) provided training on functional analysis and its variation. The variation was interview-informed, synthesized contingency analysis (IISCA). The other three (50%) studies (i.e., Ausenhus & Higgins, 2019; Higgins et al., 2017; Pizzella, 2020) focused on multiple stimulus without replacement preference assessment.

Characteristics of Training

The characteristics of the training components were analyzed in the review. Five of the six studies utilized the behavioral skills training (BST) model for training the participants to implement behavioral analytic assessments. Each of the studies has its own characteristics in the BST training components. For example, scripted role-play was conducted in Higgins et al. (2017). Pizzella (2020) asked the participants to self-score their own implementation of the assessment.

Regarding the approach of instruction delivery, one (16%) of the included studies (i.e., Ausenhus &Higgins, 2019) used synchronous instruction sessions. Two (33%) of the included studies (i.e., Pizzella, 2020; Rubatto, 2020) adopted asynchronous instruction sessions. Three (50%) of the included studies (i.e., Higgins et al., 2017; Machalicek et al., 2010; Rios et al., 2020) utilized written materials for instruction purposes.

As for the modeling component in the training package, one (16%) of the studies (i.e., Ausenhus and Higgins, 2019) did not include modeling at any time of the training. One (16%) of the studies (i.e., Machalicek et al., 2010) did not include modeling before the trainee had a chance to practice the assessment. Four (66%) of the studies (i.e., Higgins et al., 2017; Pizzella, 2020; Rios et al., 2020; Rubatto, 2020) included video modeling in the treatment package.

When it comes to the rehearsal section, one (16%) of the studies (i.e., Rubatto, 2020) implemented verbal role-play. Two (33%) of them (i.e., Ausenhus & Higgins, 2019; Machalicek et al., 2010) asked the trainee to practice the assessment with child participants. Three (50%) of them (i.e., Higgins et al., 2017; Pizzella, 2020; Rios et al., 2020) asked the trainee to rehearse the assessment with confederates.

With respect to the feedback component in the training package, one (16%) of the studies (i.e., Pizzella, 2020) used delayed feedback after the researcher reviewing the pre-recorded videos. Five (84%) of the studies (i.e., Ausenhus and Higgins, 2019; Higgins et al., 2017; Machalicek et al., 2010; Rios et al., 2020; Rubatto, 2020) used immediate feedback.

Duration of Training

Of the six included studies, four (i.e., Ausenhus & Higgins, 2019; Machalicek et al., 2010; Pizzella, 2020; Rios et al., 2020) reported the duration of training. Each trainee spent a different amount of time on the whole training because role-play and performance feedback were utilized in all four studies. The mean total training duration was 65.7 min (range between 31 to 186 min).

Experimental Design

Single-subject experimental designs were utilized in all of studies included in the current review. The criteria summarized by Kratochwill et al. (2010) were applied to determine the experimental design in each of the seven studies. Of these included studies, five (84%) studies (i.e., Ausenhus & Higgins, 2019; Higgins et al., 2017; Pizzella, 2020; Rios et al., 220; Rubatto, 2020) used a multiple baseline across participants design. One (16%) study (i.e., Machalicek et al., 2010) used a combined design which was a multiple baseline across participants designs with embedded multi-element design.

Generalization and Maintenance Measures

Each study was reviewed to determine if measures of generalization and maintenance were included. The outcome of generalization measures demonstrates if effects of the training transfer to untrain variables. The majority of the studies did not include measures of generalization. One (16%) study (i.e., Ausenhus & Higgins, 2019) examined the effects of the training with an actual child and with different preference assessment stimuli. The outcome of maintenance measures suggests if the effects of the training sustain over time. Maintenance measures pertaining to procedural integrity by the participants were implemented in all of the six included articles. Ausenhus and Higgins (2019) conducted a maintenance probe two weeks after the real-time feedback phase. Higgins et al. (2017) conducted a maintenance assessment one month or two months following training. Machalicek et al. (2010) and Rubatto (2020) collected maintenance data one to three weeks following each trainee's demonstration of criterion performance. Pizzella (2020) and Rios et al. (2020) conducted maintenance sessions one week after the training.

Reliability and Procedural Integrity

As CEC and WWC indicated, the measure of reliability is a significant component of a strong research methodology (CEC, 2014; Kratochwill et al., 2010; WWC, 2017). For a study with single-subject research design, two independent observers record data during the same observation period. The data are determined to be accurate if the two observers obtain similar data. According to Kratochwill et al. (2010), at least 20% of sessions include a second observer with at least 80% agreement should be attained to determine if the data are accurate. All six included studies provided information regarding reliability. Interobserver agreement (IOA) was the common reliability measure that all six studies utilized. The percent of sessions in which IOA

were conducted ranged between 33% and 100% of sessions. IOA ranged from 66.6 to 100% across the participants and conditions in the included studies. Therefore, the data obtained are reliable and accurate.

As another important measure indicated by the CEC standards, procedural integrity in the current review means the degree to which the training procedures were implemented as designed. Of the six studies included in the review, only three (50%) of them conducted procedural integrity measures. Of the studies that reported measures of procedural integrity, the range of the sessions in which procedural integrity data were collected was between 30 and 67% of sessions. The training procedures were followed with an accuracy rate between 86 and 100% when the procedural integrity data were collected. Since the majority of the included studies did not report procedural integrity data, the conclusion on whether the intervention was implemented with integrity across all of the studies cannot be made.

Social Validity

As Schwartz and Baer (1991) specified, social validity is a measure of the acceptability of the intervention. Social validity was measured for trainee participants in all of the six studies with either a Likert-scale or questionnaire. Items on the social validity measures are varied in different studies. Trainee participants in four (66%) of the studies agreed that the remote trainings on behavior analytic assessments were useful (i.e., Ausenhus and Higgins, 2019; Machalicek et al., 2010; Rios et al., 2020; Rubatto, 2020). As for the satisfaction level with the remote set-up of the training, four (66%) of the studies reported positive ratings (i.e., Higgins et al., 2017; Machalicek et al., 2010; Pizzella, 2020; Rubatto, 2020).

Treatment Outcomes

Treatment outcomes for participants' procedural integrity on implementing assessment were analyzed across all included studies. The percent of non-overlapping data points (PND) was the effect size measure utilized in this review since all of the studies were single-subject design studies. Based on the visual analysis, all six studies demonstrated strong evidence of a causal relationship. The PND statistic was then applied to analyze the effect size of the six studies. Of the studies that demonstrated strong evidence of a causal relationship, four (i.e., Ausenhus & Higgins, 2019; Higgins et al., 2017; Pizzella, 2020; Rubatto, 2020) demonstrated very effective treatment, one (i.e., Machalicek et al., 2010) demonstrated effective treatment, one (i.e., Rios et al., 2020) demonstrated questionable treatment. Refer to Table 2 for the summary of PND result.

Discussion

Behavioral analytic assessment is critical in identifying the student preferences, the function(s) of the behaviors, and providing important information for practitioners to develop function-based interventions for the target behaviors. Several previous reviews have analyzed the efficacy of remote training on implementing behavioral analytic assessments (Alnemary et al., 2015; Barkaia et al., 2017; Fisher et al., 2014). The present review aimed to expand and update the finding of previous reviews and answer several research questions. The research questions pertained to (a) demographics of trainee participants, (b) components included in the effective training package, (c) time required for training, (d) effectiveness of the training on trainee implementation fidelity, (e) generalization and maintenance, (f) social validity for trainees.

Demographics of Trainee Participants

The present review demonstrated that remote trainings on behavioral analytic assessments could be applied with a variety of participants, including special education teachers,

clinicians, and paraprofessionals. In addition, both individuals with and without experience with behavioral analytic assessments would benefit from the remote trainings and acquire the skills to implement behavioral assessments.

Components Included in the Effective Training Packages

As an effective training package, behavioral skills training (BST) consists of instructions, modeling, role-play, and feedback. One or more components of the BST procedure were utilized in the reviewed studies.

Instructions were delivered differently across studies. Some studies used synchronous instructional sessions (Ausenhus & Higgins, 2019), some studies implemented asynchronous sessions (Higgins et al., 2017; Pizzella, 2020). Blackman et al. (2020) compared the efficacy of self-directed online training modules and in-person training for parents. Results suggested that both approaches promote positive parent-child interactions. Although the dependent variables in Blackman et al. (2020) were different from the one focused in the present review. But, Blackman et al. (2020) suggested that asynchronous online training can be a cost-effective alternative for the delivery of training. More research on comparing the synchronous and asynchronous training methods should be conducted to provide evidence for practice. Other variations of the instruction component were the format of instruction. Written instructions were used in Higgins et al. (2017), Machalicek et al. (2010), and Rios et al. (2020). There were other components in the training package in the three studies. Therefore the effects of written instruction only cannot be assessed. However, Higgins et al. (2017) provided written instructions to trainees during the baseline phase, and the results indicated that written instruction only was not effective in helping trainees acquire behavioral assessment skills.

Since the present review evaluated remote training and real-time modeling might not be feasible in some remote training settings, four of the six studies utilized video modeling to demonstrate how to implement the targeted assessments. The other two studies did not provide modeling before the performance feedback. Modeling was provided at a different time of the training process. For example, Machalicek et al. (2010) provided real-time modeling through videoconferencing as needed following incorrect responses. Four studies utilized video modeling provided the video before trainees had a chance to practice the assessment. Comparative effectiveness of real-time modeling through videoconferencing and video modeling cannot be evaluated since there is no existed research to provide evidence. However, video modeling with a variety of exemplars has been demonstrated to be a more effective approach than lecture and video modeling with less exemplars on training staff to implement functional analysis (Moore & Fisher, 2007).

Role-play sessions were delivered differently across studies. Since the whole training was conducted remotely and the trainer was not able to meet the trainees in person. Confederates were used for role-play sessions. For example, Higgins et al. (2017) provided confederates with verbal prompts through a headset and had them role-play with the trainees. The confederates' performance in a role-play session can impact the trainees' performance. Therefore, training confederates needs to be considered if a confederate is involved. Providing scripts, prompting, and providing performance feedback were utilized in supporting confederates across included studies (Pizzella, 2020; Rios et al., 2020). Another variation of role-play via telehealth was the verbal role-play utilized in Rubatto (2020). In this case, the assessment scenarios were described or presented through video. Trainees were asked to describe the actions need to be taken orally.

The comparative efficacy of verbal role-play and physical role-play should be investigated in future research.

There were also variations of performance feedback. Providing real-time feedback while the trainee was implementing the assessment was used in several studies. In order to provide real-time feedback, HD cameras and headset or earphones were required. The quality of the internet also needs to be considered when using real-time feedback (Ausenhus & Higgins, 2019; Machalicek et al., 2010). Asking trainees to record their rehearsal sessions and provide feedback after watching the video was used in Pizzella (2020). The advantage of watching videos is that the trainer can replay the video and provide more detailed feedback. In addition, self-scoring was adopted in Pizzella (2019), in which the trainees were asked to observe their own performance through video and follow the checklist to evaluate their implementation fidelity. Jahr (1998) proposed to use self-management in staff training. Other than self-scoring, setting daily goals, other self-monitoring strategies, graphing data, and administering self-praise can be incorporated into the training package (Jahr, 1998). It is suggested to conduct more studies evaluating the comparative effects of real-time feedback and delayed feedback. In addition, the efficacy of self-scoring can also be assessed in future research.

A combination of skills training discussed by scholars was antecedent-based training, which means instruction or modeling, or both were implemented, and no feedback (i.e., consequence-based component) was provided throughout the training. For example, a self-instruction package without performance feedback has been demonstrated to effectively train individuals without previous experience in conducting preference assessments (Graff & Karsten, 2012). It is a cost-effective approach since no consequence-based performance feedback is required, and it is feasible to implement remotely. Graff & Karsten (2012) only used written self-

instruction materials, which did not require trainers to present. Weldy et al. (2014) utilized instruction and modeling in the antecedent-based training package. Results suggested the trainers can acquire the skills to conducted preference assessments within one or two training sessions. More investigations on antecedent-based training packages are recommended to be conducted.

There were a variety of combinations in the six reviewed studies. More research, especially component analysis, is required to provide evidence for effective and practical training components.

Time Required for Training

Due to high staff turnover and lack of trained service providers, training efficiency can also be evaluated by the amount of time required for training (Ausenhus & Higgins, 2019). The average total training duration was 65.7 min across four studies reported this information. Pizzella (2020) compared traditional in-person training and remote training for providing training on behavioral analytic assessment. The average total time spent engaged in in-person training was 30.3 min, which was 63 min less than in remote training. However, it is reported that one participant in the remote training group spent two hours viewing the video model. The researcher cannot determine if the trainee was watching or not while the video was playing. Therefore, the comparative time required for in-person and remote training cannot be assessed. Roscoe and Fisher (2008) investigated training efficiency, and results showed that almost all the trainees achieved mastery-level performance in a single training session across two different preference assessment procedures. 15 to 20 minutes long brief training procedure incorporated written instruction, role-play, and feedback was utilized in the study. Future research should continue to evaluate the efficiency of training when delivering training on behavioral assessments via telehealth.

Effectiveness of Training Via Telehealth

The data reported in the present literature review suggested that five out of six included studies demonstrated effective or very effective training on behavioral assessment. The comparative effects of different training components cannot be suggested as no direct experimental comparisons were found in the included articles. However, Pizzella (2020) compared traditional in-person training and remote training for providing training on behavioral analytic assessment. Results of the study indicated that both methods were equally effective and the maintenance data also suggested similar outcomes. Based on the results of the current review, training individuals to implement behavioral analytic assessment via telehealth is viable.

Generalization and Maintenance

Only one out of six studies conducted generalization measure (Ausenhus & Higgins, 2019). The trainees were asked to conduct the assessment with an actual child during the generalization probe. The reason for not including generalization measure was not mentioned in the other five articles. The remote set-up might become an obstacle to the observation and data collection of the probes when an actual child is involved. It could be difficult for the trainer to observe all trainee behaviors and student responses through videoconferencing since more advanced equipment and high-speed stable internet connection might require. Demonstrating that training using confederates transfers to situation engaging real clients can strengthen the outcome of remote training (Roscoe & Fisher, 2008). It is worthwhile to explore if pre-recorded session videos can be used to evaluate generalization effects. Maintenance measures pertaining to implementation fidelity by the trainees were conducted in all of the reviewed studies, which showed that trainees were able to maintain the implementation fidelity at a different level. Future

research should explore approaches for measuring generalization in training via telehealth. Maintenance probes should also be conducted in future research.

Social Validity for Trainees

As Schwartz and Baer (1991) specified, social validity is a measure of the acceptability of the intervention. Social validity measures across trainees indicated behavioral assessment is feasible in a variety of settings, and the training on behavioral assessment via telehealth is helpful. In addition, four of the reviewed studies reported positive ratings on the remote set-up of the training. The other two articles did not provide information on how to improve the set-up to help with enhancing the training experience and efficacy. Future research or practice can consider the remote set-up when designing the training.

Implications for Practice

Several implications for practice can be noticed after conducting the literature review. First, different instructional methods such as written instruction and self-instruction package can be used in training via telehealth. However, the reading comprehension skills of the trainees need to be considered when creating the written materials (Delliperi et al., 2015). Second, video modeling is an alternative approach to in-vivo modeling as remote training often has technological obstacles. Video modeling with a variety of exemplars is ideal (Moore & Fisher, 2007). Third, self-management strategies can be implemented along with training via telehealth to maximize training outcomes (Pizzella, 2019).

Limitations and Future research

Some gaps in the research need to be addressed to provide more evidence on enhancing the efficacy of training. First, more component analysis and comparative analysis should be conducted to provide evidence on effective training components. For example, the comparative

efficacy of verbal role-play and physical role-play should be investigated in future research on remote training since it might not be feasible to implement physical role-play in remote cases. Second, more studies should be conducted to evaluate if antecedent-based training is viable. For example, the efficacy of using a self-instruction package should be assessed. Third, to deliver remote training time and cost effectively, the use of self-management strategies such as self-scoring in remote training can also be assessed in future research.

Conclusion

Based on the results of the current review, providing training via telehealth is a viable method of delivering training on behavioral assessments. The comparative effects of the components included in the reviewed studies cannot be evaluated because there was no direct investigation included in the study. Results of the present review indicate more comparative studies should be conducted. Feasible training components like self-scoring and antecedent-based training packages are suggested to be evaluated in future research since the efficiency of the remote training was valuable in practice.

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Table 1. Summary of studies for behavioral assessment training via telehealth

Study	Participants	Settings	Technologies	Training focus	Training components	Duration	Outcomes
Ausenhus and Higgins (2019)	Trainees: 4 staff *Age range: 19 – 23 years* *Ex: newly hired, no experience about PA* Clients: 1 child aged 4 years with ASD	Private office in an EIBI clinic	VidyoDestop (2018) Laptop, webcam, and tablet with a built-in camera	Multiple stimulus without replacement (MSWO) preference assessments	Instruction based on a brief scenario via a shared computer screen Real-time feedback on the delivery or absence of MSWO component skills	Average total training duration: 40.5 min (range 31 to 46 min)	Real-time feedback phase: an increase in trainees' implementation of the brief MSWO was achieved across participants Post-training probes: high procedural integrity 2-week follow-up: high procedural integrity Social validity: acceptance and satisfaction were expressed by all participants
Higgins et al. (2017)	Trainees: 3 staff *Age range: 21 – 24 years* *Ex: recently hired, no experience about PA* Clients: 3 children (age 4 and 5) with ASD	Conference room	Telephone, HD webcams, compact document scanner, a headset with an attached microphone	Multiple stimulus without replacement (MSWO) preference assessments	BST Written instruction for conducting MSWO during baseline Self-paced multimedia presentation with video modeling	Not provided	Assessment immediately following each training session: performance increased for all participants Post-training assessment: all participants achieved 100%

Study	Participants	Settings	Technologies	Training focus	Training components	Duration	Outcomes
					Descriptive feedback from recorded baseline sessions Scripted role-play with confederate with immediate feedback		accuracy with the confederate; 2 of the participants achieved 100% with the child Maintenance: all participants performed above the criterion with both confederate and the child Social validity: satisfaction were expressed by all participants
Machalicek et al. (2010)	Trainees: 6 staff Students: 6 children (age between 5 and 9) with ASD or at-risk	Classroom in a private school serving children with DD and ASD	iChat© MacBook laptop computer, iSight camera, and iMac	Functional analysis (FA)	Read a journal article to learn the procedure of functional analysis Performance feedback while the participant is implementing the assessment	Average total training duration: 75 min (range 60 to 95 min)	Intervention phase: participants' performance varied across different FA conditions Maintenance: participants' implementation of functional analysis conditions varied Social validity: participants ranked the remote training high

Study	Participants	Settings	Technologies	Training focus	Training components	Duration	Outcomes
Pizzella (2020)	Trainees: 3 adults *Age: at least 18* *Ex: had no experience with ABA*	On campus or at the participants' home	Not provided	Multiple stimulus without replacement (MSWO) preference assessments	BST Pre-recorded instruction and video modeling Rehearsal with confederate Self-scoring by participants Feedback provided by researcher after watching the video	Average total training duration: 97.3 min (range 43 to 186 min)	Training: performance increased for all participants Maintenance: participants achieved a higher average score than in the training phase Social validity: strong social validity was indicated
Rios et al. (2020)	Trainees: 10 clinicians *Ex: limited experience conducting FAs* Clients: 3 children (age 4 and 5) with ASD	A private room at a university	VSee© Laptop, Bluetooth© earphone devices, webcams	Functional analysis (FA)	BST Written instructions of the procedure and answer questions Video modeling of each of the four FA conditions Rehearsal with the confederate Feedback immediately after rehearsal of each condition	Average total training duration: 50 min (range 36 to 75 min)	Remote BST phase: all participants met the mastery criteria with an average of 3 sessions Post-training probe: 8 of participants maintained their performance at or above the mastery criterion In-situ probes with actual clients: 9 of participants scored at least 90% across conditions Social validity: 1 out of 3 were

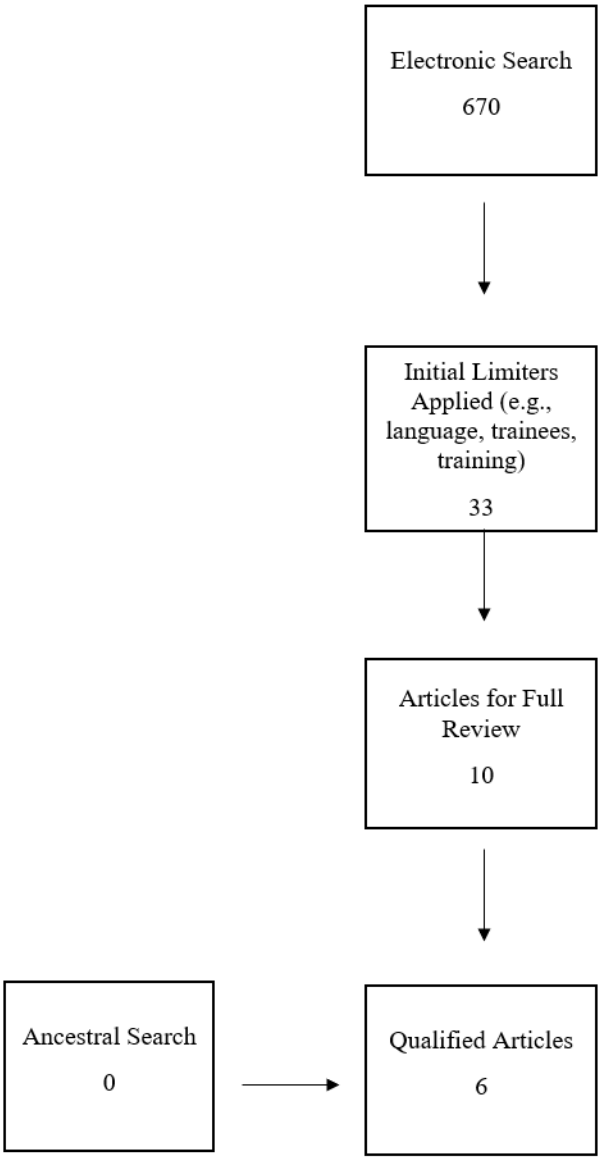
							immensely satisfied with the training
Study	Participants	Settings	Technologies	Training focus	Training components	Duration	Outcomes
Rubatto (2020)	Trainees: 3 staff *Age range: 22 – 25 years* *Ex: recently hired, no experience about IISCA*	Trainees' home	GoToMeeting©, Dropbox Laptop, webcam, and microphone	IISCA	BST Instruction: self-paced pre-recorded narrated presentation Video modeling Rehearsal: verbal role-play Feedback: descriptive feedback immediately follow performance	Not provided	Significant improvement from their baseline rates across all participants on implementing IISCA Participants maintained high scores during 2-week and 3-week follow-up Social validity: the training experience was rated highly by all participants

Table 2. Summary of PND results

Authors (Year)	Dependent Variable	PND
Ausenhus and Higgins (2019)	Percentage of steps completed correctly	1.00****
Higgins et al. (2017)	Percentage of steps completed correctly	1.00****
Machalicek et al. (2010)	Percentage of steps completed correctly	0.80***
Pizzella (2020)	Percentage of steps completed correctly	1.00****
Rios et al. (2020)	Percentage of steps completed correctly	.30*
Rubatto (2020)	Percentage of steps completed correctly	1.00****

Note. ****=very effective treatment; ***=effective treatment; **=questionable treatment; *=ineffective; n/a=not applicable

Figure 1. Results tree



Chapter 3. Experimental Study

The following chapter presents an experimental study evaluating the effects of remote behavioral skills training on implementing free-operant preference assessment by teachers working with children with developmental delays.

Abstract

Motivating students to engage in learning activities is a common challenge for special education teachers. Using positive reinforcement is an evidence-based strategy that helps increase on-task behaviors and decrease off-task behaviors. A student's preferred stimuli such as specific toys or activities are likely to function as reinforcers. To determine the reinforcers most likely to be effective for improving student outcomes, teachers can conduct free-operant preference assessments before designing and implementing interventions. Because teachers report a lack of training for conducting free-operant preference assessments, it is necessary to evaluate effective training strategies. Behavioral skills training (BST) is an evidence-based practice for training staff a wide range of skills. The purpose of this study was to examine the effects of remote BST on teachers' implementation of free-operant preference assessments. A multiple baseline across participants design demonstrated a functional relation between the remote BST intervention and the percentage of steps completed correctly. Additionally, two of the four participants demonstrated generalization. Limitations and future research directions are discussed.

Key words: behavioral skills training, remote training, free-operant preference assessment

Training Staff to Implement Free-Operant Preference Assessment: Effects of Remote Behavioral Skills Training

Applied behavior analysis is based on the science of learning and behavior. One assessment based on the science of applied behavior analysis is preference assessment (Cooper et al., 2020). As an efficient procedure for identifying potential reinforcers from several stimuli, preference assessment is recommended for practitioners (Leaf et al., 2018). However, more than half of 406 survey respondents reported that the limited time and lack of training were barriers to utilizing preference assessments in practice (Graff & Karsten, 2012). Preference assessments can use a restricted-operant format or a free-operant format. In a typical restricted-operant format, the teacher presents the student with single, paired, or multiple stimuli over a series of trials and prompts the student to choose the item he or she most prefers (Ortiz & Carr, 2000). For example, in a paired-stimuli assessment, two items are presented in a trial and the student chooses one item he wants to engage with. The interventionist takes the item back from the child after predetermined amount of time (e.g., 15 to 30 seconds) before presenting the next trial. In a free-operant preference assessment, the student is provided free access to a range of stimuli while the teacher records the items the student selects and the duration of time the student engages with each item (Roane et al., 1998). Compared to restricted-operant assessment, free-operant assessment provides a quick, easy evaluation of student preferences. With free-operant assessment, preferences can be determined without removing or withholding preferred items or making students feel as if demands are being placed on them when asking them to make discrete choices (Sautter et al., 2008). For these reasons, behavior problems are less likely to occur during a free-operant preference assessment (Roane et al., 1998).

Numerous training methods have been demonstrated to be effective for helping practitioners learn new instructional skills (e.g., performance feedback, self-monitoring, and goal setting). Behavioral skills training (BST) is a training procedure that promotes consistent improvement of implementation integrity (Brock et al., 2017). A typical BST package includes four components: instructions, modeling, role-play, and feedback. During instructions, trainers describe the skills and explain the reasons for using the skills. Modeling is usually provided to the trainee in the form of in-vivo or video modeling. The trainer performs a demonstration of the skill for the trainee to observe. During role-play, the trainees are provided with opportunities to practice using the skills. For example, the trainer can take on the role of a student or client, and the trainee uses the skill to implement an intervention or conduct an assessment. In some studies, this is called rehearsal instead of role-play since multiple practice opportunities are provided. Feedback can be provided during or after role-play. Trainers usually reinforce correct responses and provide corrective feedback for incorrect responses. Trainers can also deliver feedback in a different format, such as in-person oral feedback, remote oral feedback, or an email or voice message (Kirkpatrick et al., 2019).

BST can be used for training teachers, clinical staff, and parents to use various skills, including discrete trail training, prompting hierarchies, functional communication training, preference assessment, and visual analysis (Fetherston & Sturmey, 2014; Kirkpatrick et al., 2019). Several studies demonstrated that BST is effective for training staff to implement preference assessments. Higgins et al. (2017) examined the effectiveness of a remote BST package on the direct-care staff's implementation of a multiple stimulus without replacement (MSWO) preference assessment. In MSWO, a student is presented with five to seven stimuli in the first trial. After the student chooses an item an engages with it, the instructor removes that

item from the set and asks the student to select another item from the remaining stimuli. The procedure is repeated until one stimulus left. The order in which the items are selected are considered the student's order of preference. In Higgens et al., an immediate improvement in implementation fidelity of the MSWO procedures was observed after the BST training. The effects were maintained during follow-up observations. In addition, participants were satisfied with the remote BST experience. In a similar study, Smith (2018) evaluated the effects of BST and didactic training on staff implementing MSWO preference assessment. The results of both studies demonstrated a functional relation between the training and participants' treatment integrity scores and positive effects on generalization and maintenance. However, no previous study evaluated the effects of BST on staff implementation of free-operant preference assessment.

Due to the COVID-19 pandemic and the goal of delivering training more cost-effectively, there is an increasing need for remote training. Previous studies evaluated the effects of remote training on the implementation of multiple stimuli without replacement preference assessment. The results suggested that the remote training effectively improved participants' implementation integrity (Ausenhus & Higgins, 2019; Higgins et al., 2017; Pizzella, 2020). Ausenhus and Higgins (2019) evaluated the effects of remote real-time feedback on clinical staff's procedural fidelity when implementing a brief multiple stimuli without replacement (MSWO) preference assessment. Results demonstrated that all four participants showed increased procedural integrity for implementing the preference assessment. Short training time (range 31–46 min) and minimal sessions (range 2–3 sessions) were effective in helping the clinical staff acquire and maintain the skill of conducting MSWO preference assessment. Moreover, the social validity questionnaire results showed that the participants were satisfied with the remote training and would

recommend the training procedure to others. Pizzella (2020) also conducted a remote BST experiment which compared the effects of in-person and remote BST on participants' implementation of MSWO. Results indicated that the two trainings were equally effective for increasing the percentage of correct steps. The group that received remote training spent more time (63 more minutes on average) on the training since they watched the training video multiple times.

Previous research has demonstrated BST is an effective training model and it can be utilized remotely to train practitioners to implement interventions and assessments. However, no study has assessed the effectiveness of remote BST training on implementing free-operant preference assessment. Moreover, Sun et al. (2019) found that about one in 100 children in mainland China had been diagnosed with autism spectrum disorders. But there is a lack of trained professionals and paraprofessionals to design and implement quality instructions and interventions for individuals with autism. Therefore, this study aimed to evaluate the effectiveness of remote BST on implementing free-operant preference assessment with a group of teachers in China. Specifically, the experimenter sought to answer the following research questions:

1. What are the effects of remote BST on the correct implementation and scoring of free-operant preference assessments for Chinese special education teachers?
2. What are the effects of remote BST on teachers' generalization of free-operant preference assessments to a different scenario or another person?
3. What are the effects of remote BST on teachers' maintenance of free-operant assessment implementation?
4. What are the participants opinions of the remote BST training procedures?

Method

Participants

The participants were special education teachers for children with developmental delays. The experimenter posted recruiting letters on a discussion group for individuals working with children with disabilities. The interested teachers were invited to join an online group meeting hosted by the experimenter. The experimenter introduced the project to the potential participants and answered all the attendants' questions. The experimenter also provided consent forms to any teachers interested in participating in the study. Teachers interested in participating in the study were encouraged to schedule one-on-one meetings with the experimenter to discuss the research. Teachers who returned signed consent forms to the experimenter were recruited as participants in the study. Finally, four participants completed the study. Participant A was a special education teacher working at a center for children with developmental delays in Guangdong, China. She conducted one-on-one and group instruction with children aged between three and seven. Participant B was a paraprofessional at a center in Beijing, China, who was also hard of hearing. Most of her experience was providing prompts and implementing behavioral management tools to children during group instructions. Participant C was a BCaBA and worked with children with autism spectrum disorders in Guangdong, China. She worked with children with moderate-to-severe disabilities and delivered one-on-one instruction to her students. Participant D was a BCaBA and worked at a school for children with developmental delays in Beijing, China. She provided both one-on-one and group instruction to her students. All four participants had no experience in implementing free-operant preference assessment. Both participant C and D

attended a lecture about preference assessment and had not implemented free-operant preference assessment before.

Setting

Trainings were conducted remotely in a videoconferencing call in a one-on-one setting. The experimenter and the participant attended the training session. The experimenter was in the United States in her home, and the participants participated in the training in China at their home remotely. Participants A, B, and D conducted the preference assessment session at the center or school they worked for. Participant C conducted all preference assessment sessions at her home. The feedback during the intervention phase was delivered remotely in a videoconferencing call in a one-on-one setting.

Materials

Videoconferencing provided live audio and visual connection between the participants and experimenter using Zoom (2021). Remote sessions were achieved using laptop, webcam, and microphone at the participant site. All sessions were videotaped and scored at a later time. Additional materials included desks, chairs, slides for presentations, videos for video-modeling, task analysis of the preference assessment procedure, preference assessment data sheet, scenarios (short paragraphs discussing potential preferred and nonpreferred stimuli for the consumer), preference assessment stimuli, interval timers, a calculator, writing utensils.

Dependent Variable

The dependent variable measured in this research was the correct implementation of each step. Skills included the proper presentation of materials and prompts. Data were summarized as the percentage of preference assessment steps implemented correctly by the participant. A checklist with the procedural steps of the assessment was created and utilized to record the target

behavior (see Figure 1 for implementation fidelity checklist). Taking 10-second partial interval data during the assessment is the seventh step on the checklist. Given that taking correct data is the most critical skill in a behavioral assessment, this step was divided into ten portions, each counted as one step when calculating the percentage of correct steps. Participants observed the play behavior for five minutes, which consisted of 30 intervals in a 10-second partial interval recording system. The 30 intervals were divided into ten groups, which consisted of the ten steps in the checklist. Therefore, 10 out of 18 steps were partial interval data collection accuracy during the observation. An interval data sheet was created to record the play behavior during the assessment (see Figure 2 for the data sheet).

Experimental Design

A delayed multiple-baseline-across-participants design was used to assess the effects of the remote training package on participants' acquisition and maintenance of free-operant preference assessment skills. Participants were not able to start the baseline at the same week, which precluded a full scale multiple-baseline-across-participants design. Participants began the remote behavioral skills training package depending on when their performance showed steady-state responding in baseline (Cooper et al., 2020).

Procedures

Baseline. The task analysis and the partial interval data collection sheet were sent to the participants on the first day of the week. Participants were encouraged to ask any questions they had before conducting the free-operant preference assessment. Questions about the requirements for the video recording and the equipment to use were answered within eight hours of receiving the message. However, questions about the details of implementing preference assessment were not answered during baseline to minimize interfering effects since instruction and Q&A was

included in the intervention package. After receiving a session request from the experimenter, the participants conducted a session with a confederate that they can find at their convenience and submitted their videos and data sheets to the experimenter. The experimenter watched the video, took procedural fidelity data, and compared the partial interval recording data. No feedback about the preference assessment procedure was provided to the participants during baseline. But questions about the quality of the video or what equipment to use were discussed by the experimenter and the participants.

Behavior skills training. A training-assessment session consisted of two components: the first component was a multimedia presentation lasting 20 to 30 minutes with instruction, modeling, and data collection practice, and the second component was role-playing with delayed feedback. The experimenter delivered the multimedia presentation through videoconferencing and scheduled a session for participants to role-play with a confederate within one week. The experimenter repeated the training sessions until the participants displayed mastery performance for 88% of the component skills during role-play.

Multimedia presentation. The multimedia presentation consisted of a Microsoft PowerPoint presentation with information on the rationale for and use of positive reinforcement and the task analysis of the preference assessment. The experimenter delivered presentation when she was videoconferencing with the participants. The presentation included a brief textual display of definitions of each component skill and narration, followed by a brief video model. The experimenter also provided the participants with a chance to practice collecting 10-s partial interval data using the video modeling. The experimenter shared her screen and asked the participant to watch the video and take data simultaneously. They compared the data after watching the video and discussed the questions they may have.

Role-play with delayed video feedback. The role-play was conducted following completion of multimedia presentation. The participant recorded each role-play trial with a confederate and sent the video to the experimenter within one day of the session. The experimenter watched the video and scored the performance via the fidelity checklist. Within one day of receiving the role-play video, the experimenter had a meeting with the participant and provided feedback to the participants on their performance during their last role-play session. During each trial of the video replay, the experimenter paused the video to provide descriptive feedback, which involved (a) showing a video clip of the trial, (b) stating the correct and incorrect responses regarding the implementation of the skills, and (c) obtaining confirmation that the participants observed the correct or incorrect response. The training was discontinued after trainees reached mastery criteria (i.e., three consecutive sessions at or above 88% accuracy).

***Maintenance and generalization*.** During the generalization sessions, the participants were asked to implement a free-operant preference assessment with a child instead of a confederate. Whether or not a participant had generalization sessions depends on the feasibility of implementing and video recording a session with a child. The experimenter asked all participants to conduct a generalization session, but only two could implement and video record a preference assessment session with a child (participant C had one during baseline and one during intervention phase, participant D had one during intervention phase). There were two maintenance sessions for each participant. The first one was conducted two weeks after the last intervention session, and the second one was conducted four weeks after the last intervention session. The materials provided during generalization and maintenance sessions were the same as the materials provided at the baseline sessions. Participants were asked to videotape the

sessions for data collection purposes. Feedback was provided for generalization during intervention phase. Feedback was not provided during maintenance sessions.

Interobserver agreement

Following recommendations by Council for Exceptional Children Quality Research Indicators, two observers watch the video recording of 30% of sessions across baseline and intervention for each participant. A graduate student and a graduated Ph.D. were trained on the interobserver agreement (IOA) by reviewing the task analysis of the preference assessment, watching the video modeling, and participating in several practice opportunities that ended with the observer and the experimenter above 90% (range: 94%–100%) IOA. Total count IOA was used to evaluate the agreement between observers using the following formula: a smaller count of the correct steps or correct data points divided by a larger count multiplied by 100. During baseline, IOA was 91.6% (range: 86%–100%). During training phase, IOA was 92.5% (86%–100%). Maintenance IOA was collected for Participant A, B, and C, and results were 90% (range: 86%–94%).

Procedural Fidelity

Another teacher observed the researcher for 30% of the baseline and training sessions to ensure that the experiment was being implemented as written. This was done during the baseline phase and the intervention phase. A procedural fidelity checklist was created and utilized. The observer marked on the checklist whether the experimenter followed the experiment procedure. Overall procedural fidelity across all participants was 100% for the behavioral skills training.

Social Validity

Each participant completed a social validity survey following the final role-play session (see Appendix A). This survey was entirely anonymous. The experimenter sent a link to the

survey to the participants via email. No personal information was collected in the survey to make it anonymous. The survey was consisted of six five-point scale questions regarding if the participants were satisfied with learning through videoconferencing, if they are satisfied with the process of arranging cameras and recording the assessment procedure, if they are planning to use the free-operant preference assessment in the future.

Results

Figure 3 shows the results of the percentage of correct steps implemented for all participants. Participant A had an average of 28.5% of correct steps during baseline (range 27–33%). The percentage increased to 88 after the first training session, and she maintained her performance for three consecutive sessions. Participant A met the mastery criteria after the third session during the intervention phase. Participant B had an average of 51.25% of correct steps in baseline (range 50–55 %). Her performance increased during the intervention and reached an average of 94% (range 88–100 %) accuracy. Participant B also met the mastery criteria after three intervention sessions. Participant C had an average of 61% of correct steps during baseline, one of which was a generalization session since she conducted the preference assessment with a child instead of an adult confederate. She reached the criteria within three intervention sessions with an average of 92% (range 88–94 %) of correct steps. Participant D had an average of 30% (range 27–33 %) accuracy during baseline sessions. She reached the 88% goal line in her second intervention session and met the master criteria within four sessions with an average of 89.75% (range 83–100 %) accuracy.

The time spent in training was also analyzed. Participant A participated in one BST session (60 minutes) and three delayed feedback sessions (10 to 15 minutes per session) and spent 98 minutes in training. Participant B attended one BST session (50 minutes) and three

delayed feedback sessions (9 to 13 minutes per session) and spent 83 minutes in training. Participant C had a BST session (53 minutes) and three delayed feedback sessions (8 to 15 minutes per session) and spent 86 minutes in training. Participant D received a BST session (55 minutes) and four delayed feedback sessions (10 to 13 minutes per session) and spent 90 minutes in training. All four participants spent an average of 89.25 minutes in training. The experimenter is collecting data for the maintenance phase and will able to present the data in future publication.

Social Validity

Overall, participants reported positive feedback to the study. The social validity survey results show that all teachers were satisfied with using videoconferencing to attend training (100%). Two of the participants (50%) expressed that they "agree" but not "strongly agree" with the process of arranging cameras and recording the free-operant assessment. In addition, all participants (100%) were satisfied with the delayed feedback. All participants (100%) would like to learn other skills from remote training like the current experiment. Participants (100%) also expressed that they will recommend remote training to other individuals who cannot receive on-site training. All of them (100%) expressed that they will use the free-operant preference assessment in their practice.

Discussion

The current study trained four participants to implement free-operant preference assessment utilizing remote behavioral skills training. There was a functional relation between BST training with delayed feedback and increased implementation fidelity. The current experiment contributes to the literature in at least two ways. First, the BST was implemented remotely via videoconferencing and was efficient and effective. Three teachers achieved mastery

criteria within three delayed feedback sessions following the BST session. The other trainee had one more delayed feedback session to meet the requirements. Previous studies show that remote BST is effective for helping teachers acquire multiple stimuli without replacement preference assessment (Pizzella, 2020). Free-operant preference assessment has different steps and data collection approaches. No previous study evaluated the effects on trainee's implementation on free-operant preference assessment. The current study provides evidence of the training effectiveness. Second, trainees were asked to video record the practice sessions and send the video to the experimenter for data collection purposes. Social validity data show that this was acceptable to teachers.Moreover, video recording the sessions makes it convenient for the trainer to provide feedback. The trainer can replay the video and provide detailed feedback to the trainee. Non-recorded role-play sessions are usually implemented in a in-person training session. During a non-recorded session, trainer can observe and take behavioral data of the trainee and provides feedback. However, there is no video materials that can be used to show the trainee that which behavior meets the criteria and which behavior should be adjusted. Therefore, it is recommended that future training or studies on training can use video for feedback purposes.

There are several limitations of the current study. First, three generalization data points were collected across two participants. The present study failed to provide more evidence regarding the effects of the training on the trainees' generalization of the skill. Due to the changing pandemic situation and lack of parental permission, only two trainees had opportunities to implement generalization sessions with a child other than with confederates. Future research can implement more generalization sessions to assess the socially effectiveness of the training further. Second, based on some anecdotal data, the entire 5-minute free-operant session could be challenging for a practitioner to implement given that young students' attention spans could be

shorter. Shorter free-operant sessions are recommended for future research or practice since the highly preferred items can be identified with fewer problem behaviors by students during the assessment (Clay et al., 2020). Third, the experiemter was not able to start the baseline for each participant at the same time. Delayed multiple beasline across participants design was implemented and varied length of baseline was not presented. Future research should ensure sufficient and varied length baselines to strengthen the experimental control. Fourth, reinforcer assessments were not able to implement to further evaluate the accuracy of the free-operant assessment conducted by the participants since the experimenter was not able to recruit students and clients to pair with the participants. Future research should collect data on both trainees and students and evaluate the accracy of the preference hierarchy created based on the free-operant preference assessment result.

Overall, this research supports previous research that demonstrates BST is an effective and practical approach for training practitioners to implement assessments and interventions. Additionally, remote BST is a practical and effective way to build skills for practicing teachers. The current investigation demonstrated that remote BST effectively trained four teachers to implement free-operant preference assessments. Conducting free-operant assessments is an important skill that helps teachers identify reinforcers that will work best for their students' behaviors. Future research should examine remote BST training across a range of practitioners, settings, and student populations.

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Figure 2. Implementation Fidelity Checklist

Observer:		**Date:**	
Steps		**+/-**	**Notes**
1	Select up to 10 stimuli to evaluate, write their name on the yellow row (see page 2)		
2	Set up a timer to count out 10 second intervals over the 5-minute assessment		
3	Arrange the stimuli in a semi-circle on a table, spread out equally from each other, and from the student		
4	Sample the stimuli: Bring student into assessment area and prompt the student to interact with each item for 10 to 30 seconds. No recording is needed.		
5	After student has sampled each item, lead the student a short distance from the table (approximately 0.6m)		
6	Assessment: Instruct the student that he/she may interact with some, all, or none of the available stimuli. (Record if the participant following all three rules in each interval in the interval recording form) a. Student should be allowed free access to all items b. No prompts or consequences should be delivered for interaction during the assessment c. Avoid social interaction with the student		The participants should have at least 80% of intervals following all three rules to get a "+" in this step, otherwise mark "-"
7	Place a check on the item that the student interacted with in the 10 seconds interval. (Record if the participant takes correct data in the interval recording form)		1. 30 intervals are divided into 10 groups and compare each group of data 2. write down the number of correct groups in the box
8	Sum the interval with item interaction in the grey row. Calculate the percentage of intervals interacting with the item during the 5-minute assessment and record it.		
9	Identify the level of preference and fill out the preference hierarchy form		
Total # of steps: **Percentage of correct steps: / 18 = %**			

This procedure is adapted from Roane, Vollmer, Ringdahl, and Marcus (1998) used in their experiment.

Figure 3. Interval Recording Form

	Stimuli selected										Procedural fidelity	
	1	2	3	4	5	6	7	8	9	10		
Interval											6 Rules	7 Data
0:00-0:10												
0:10-0:20												
0:20-0:30												
0:30-0:40												
0:40-0:50												
0:50-1:00												
1:00-1:10												
1:10-1:20												
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3:40-3:50												
3:50-4:00												
4:00-4:10												
4:10-4:20												
4:20-4:30												
4:30-4:40												
4:40-4:50												
4:50-5:00												
Total Intervals												
% Total												

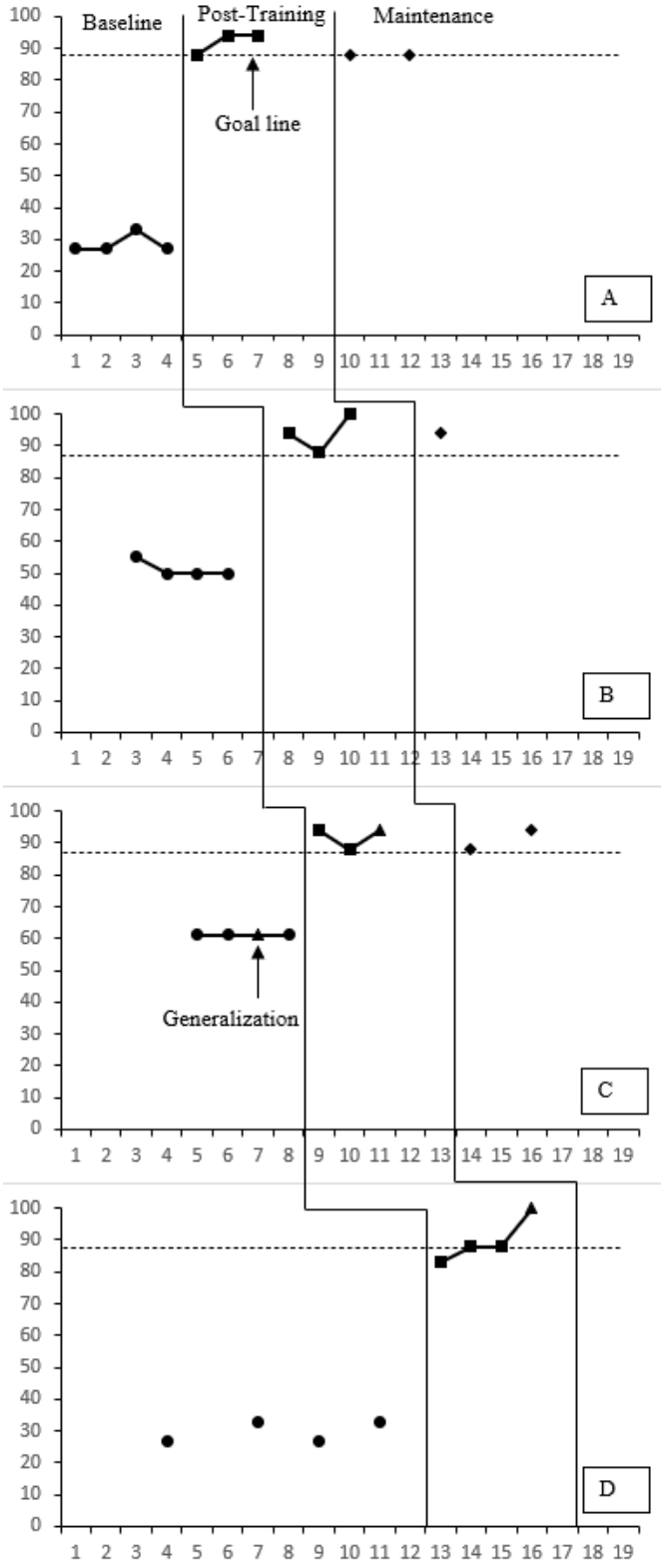
Preference Hierarchy

Highly preferred items (approached frequently, engaged with for highest percentage of intervals):

Moderately preferred items (approached, engaged with for lowest percentage of intervals):

Low preferred items (did not approach):

Figure 4. Percentage of correct steps implemented



Chapter 4. Practitioner Paper

The following chapter includes a practitioner paper for teachers and clinicians. The paper includes steps for implementing free-operant preference assessments and its variations.

Abstract

Conducting preference assessment can help instructors find powerful reinforcers to engage students in learning activities. Free-operant preference assessment is a procedure for identifying student preferences that are likely to function as reinforcers. During free-operant preference assessment, students can choose any stimuli to engage with for any duration. The items for which the students engage with for the longest durations are identified as most preferred. Teachers do not take preferred items away during the free-operant preference assessment, which helps decrease the challenging behavior. Free-operant preference assessments are more efficient than the other types of preference assessment including single stimulus preference assessment, paired stimulus preference assessment, and multiple stimulus without replacement assessment. This article provides step-by-step guidance for teachers in preparing, implementing, and applying the results of free-operant preference assessments. Practitioners can follow the steps to find out the learner's preference hierarchy of reinforcers and use that information to motivate the learners on their learning journey.

Key words: free-operant preference assessment, preference hierarchy

Simple and Useful! Steps for Implementing Free-Operant Preference Assessment

Ms. Bruner is a novice special education teacher who works in a resource classroom. She is teaching Roger, her 5-year-old student, how to label different items. "Roger," she says, "What's this?" She points to a ball. Roger giggles and runs away. "Roger," she says, "Please come back." He ignores her and runs to the other side of the classroom and starts digging through the toy box. Despite her best efforts, Ms. Bruner is unable to get Roger to follow her instructions most of the time. She consults with her mentor teacher who asks, "What kind of reinforcers do you use?" Ms. Bruner says, "I've tried using Mr. Potato Head, but he's not interested." The mentor teacher asks Ms. Bruner why she thought Mr. Potato Head, would work for Roger, and she said, "Most kids like Mr. Potato Head."

It would benefit teachers like Ms. Bruner to understand and use preference assessments to identify reinforcers that are likely to be effective. When identifying preferred items as reinforcers for use during instruction, teachers can consult with parents and other teachers to get their opinions; however, their opinions may not accurately reflect a student's highly preferred reinforcers. To identify the reinforcers most likely to be effective for increasing and maintaining target behaviors, direct and systematic observation is the best approach for determining highly preferred items (Roane et al., 1998). Observing and recording student responses using a preference assessment will help teachers identify highly preferred items are as well as moderately and low preferred items. This preference hierarchy can be used to create a systematic reinforcement strategy.

Preference assessment is a procedure that is used to measure and predict the reinforcing effects of different stimuli. Teachers should conduct preference assessments before implementing an intervention since the highly preferred items identified in the preference

assessment are more likely to function as a reinforcer for correct responding. There are various types of preference assessments including multiple stimulus without replacement (MSWO), multiple stimulus with replacement (MSW), paired stimulus, and single stimulus. See Chazin and Ledford (2016) for information about how to conduct these types of preference assessments.

This article focuses on free-operant preference assessments. In a typical free-operant preference assessment, students have free access to a variety of items for no longer than five minutes. Teachers record students' choices and the duration of playing with each item, which are used to analyze relative preference of the students. One of the advantages of using a free-operant preference assessment is that is requires minimal time to conduct and is less likely than other methods to cause problem behavior (Roane et al., 1998). The next section presents a 5-step process for implementing a free-operant assessment procedure to determine highly preferred items likely to be effective reinforcers.

Five Steps for Implementing a Free-Operant Preference Assessment

Step 1: Identify Stimulus for Preference Assessment

Since parents and caregivers are usually most familiar with their child's preferences, it is a good idea to start by interviewing them or asking them to fill out a short questionnaire to gather information. The *Reinforcer Assessment for Individuals with Severe Disabilities (RAISD)* by Fisher et al. (1996) is a structured interview protocol for teachers to gather information on students' preferred stimuli. Questions about visual, auditory, olfactory, edible, tactile, and social domains are included in this tool. For example, one of the 10 questions is, "Some children really enjoy certain food or snacks such as ice cream, pizza, juice, graham crackers, McDonald's hamburgers, etc. What are the things you think ____ most likes to eat?" Space is provided for the interviewer to write down the parent's response. Other items in the instrument are similarly

worded and include questions about visual stimuli (e.g., TV), auditory stimuli (e.g., music), olfactory stimuli (e.g., flowers), physical play (e.g., running), tactile stimuli (e.g., splashing water), and types of toys (e.g., toy cars) and activities the child likes.

After asking all questions, teachers can rank order the preferred stimuli from most to least preferred to create a stimuli list to use during the free-operant preference assessment. Teachers can either set-up a one-on-one interview with the parents or send a questionnaire home and ask the parents to complete it. In addition to the questions listed on the structured interview, teachers should ask follow-up questions are necessary. See Figure 5 for examples of follow up questions.

Figure 5. Sample follow-up questions

1. Have you ever seen the child play with the item?
2. How often does the child play with the item?
3. Does the child ask for the item when it's not in sight?
4. Under what circumstances do you think the item works for stopping the child's challenging behavior?
5. Does the child throw tantrums when the item is taken away?

After Ms. Bruner explained the purpose of the assessment to Roger's mom, she asked questions about Roger's interests, "Some children really enjoy certain toys or objects such as puzzles, toy cars, balloons, comic books, flashlights, bubbles, etc. What are Roger's favorite toys or objects?" "Dinosaurs!" Roger's mom answered without hesitation, "Every time we go to a toy store, he stays at the dinosaur shelf for a very long time and refuses to leave." Ms. Bruner replies, "Seems like he really wants dinosaur toys," and asks follow up questions such as, "Does he have any toy dinosaurs at home? When and how often does he play with them?" Roger's

mother shared a lot of information about the dinosaur toys Roger has at home while Ms. Bruner took notes on the structured interview form.

After asking all the questions from the structured interview, the teacher should be able to select all the stimuli that the student may prefer and write each one on an index card (e.g., "a small red T-rex toy with sounds"). Then have the interviewee select the top 10 to 16 stimuli and rank order them using the cards. In addition to input from teachers, parents, and caregivers, students themselves can be the interviewees who help with identifying the stimuli. If the learner has the verbal skills to understand and answer questions, teachers can gather information from the student about his or her preferred items. Figure 6 shows different types of questions teachers can ask their students when identifying preferred stimuli.

Figure 6. Sample questions to ask the learner

Type of questions	Example(s)
Yes or no	"Do you want to play with puzzles?" "Do you like to play outside?"
Open-ended	"What are your favorite toys?" "What is your favorite music?"
Choice	"Would you like to play with puzzles or Legos?" "Which do you prefer, marble run or piano?" (suggested for learners with advanced language skills)
Rank-ordering	Teacher provides the learner with a list of items and instructs the learner to rank-order the items from most to least preferred.

Since Roger was able to understand simple questions and answer questions, Ms. Bruner decided to ask him some questions about his preference on different items. "Do you want dinosaur or cars?" asked Ms. Bruner. "Di-no" Roger replied. "Good job! Would you like to play with puzzle or dinosaur?" Ms. Bruner tried to confirm by switching the order of the item name. Roger said "di-no" again, and Ms. Bruner wrote down this information on her notes.

Step 2: Implement Free-Operant Preference Assessment

A regular free-operant preference assessment provides learners with a 5-min access to all stimuli. Shorter sessions are more efficient because the highest preference stimuli can be identified with fewer problem behaviors during the assessment (Clay et al., 2020). If time is limited and the student is engaging in high-frequency and high-intensity interruptive behavior, teachers can implement a brief free-operant assessment (i.e., less than 5 minutes). Another strategy to avoid challenging behaviors during the assessment is to conduct the preference assessment when the student is in a good mood and wants to cooperate. Teachers should avoid using edibles during free-operant preference assessments since there might be health concerns if students keep consuming food with high calories or sugar. Figure 7 shows an example of the procedure of the free-operant preference assessment.

Figure 7. Example of a Brief Free-Operant Preference Assessment Checklist

Step		**+/-**	**Notes**
1	Select up to 10 stimuli to evaluate, write their name on the table	+	
2	Set up a timer to count out 10 second intervals over the 2-minute assessment	+	
3	Arrange the stimuli in a semi-circle on a table, spread out equally from each other, and from the student	+	

4	Sample the stimuli: Bring student into assessment area and prompt the student to interact with each item for 10 to 30 seconds. No recording is needed.	+	
5	After student has sampled each item, lead the student a short distance from the table	+	
6	Assessment: Instruct the student that he/she may interact with some, all, or none of the available stimuli. (Record if the participant following all three rules in each interval in the interval recording form) a. Student should be allowed free access to all items b. No prompts or consequences should be delivered for interaction during the assessment c. Avoid social interaction with the student	+	
7	Place a check on the item that the student interacted with in the 10 seconds interval. (Record if the participant takes correct data in the interval recording form)		
8	Sum the interval with item interaction in the grey row. Calculate the percentage of intervals interacting with the item during the 2-minute assessment and record it.		
9	Identify the level of preference and fill out the preference hierarchy form		

After meeting with the parents, Ms. Bruner was able to identify five possible preferred items can be used in the preference assessment. She selected 10 stimuli to be evaluated during the assessment. After setting up the timer and arranging the stimuli in a semi-circle on a table, she asked Roger to come to the table, "Roger, please come over to the table and play for a while." She instructed Roger to play with every item in front of him, especially with those were not mentioned by the parent. Ms. Bruner wanted to make sure Roger knows how to play with each item that is presented. After that, Roger was told to leave the table for a while so that Ms. Bruner had some time to organize the items. Then she guided Roger back to the table and started

the session by saying, "Roger, you can play with all, some, or none of the items in front of you, enjoy!" She then started the timer and observed Roger.

Step 3: Take Data on Student's Choice

Taking data on the learner's choice is beneficial for us to analyze the preference hierarchy and decide items that the instructors can provide in the intervention. Students might switch items frequently during the observation, therefore, taking data on how long a child plays with an item (i.e., taking duration data) could be hard for teachers. A 10-s partial interval recording system is recommended when collecting data during free-operant preference assessment (Roane et al., 1998). To take accurate duration data, teachers need to focus on the onset and end point of interacting with an item by the student. Compared to taking duration data, teachers just need to take data on if one or multiple items are selected during an interval. However, using a partial interval recording method with larger intervals (i.e., more than 10-s per interval) is more likely to overestimate the preference level of a toy. Therefore, shorter intervals are recommended. In a 10-s partial interval recording session, a teacher needs a timer so that the begin or an end of an interval can be easily noticed. A target behavior should be recorded in the observation is defined as the student touches any part of the item within the 10 second interval. During each 10-s interval, the teacher marks down whether an item is chosen any time during the interval by placing an "+" for occurrence and no marks for no occurrence. Figure 8 is an example of a data collection sheet for a free-operant preference assessment session.

Figure 8. Example of a Data Collection Sheet

Free Operant Preference Assessment Interval Recording Form

		Stimuli selected									
Interval		1	2	3	4	5	6	7	8	9	10
1	0:00-0:10										
2	0:10-0:20										
3	0:20-0:30										
4	0:30-0:40										
5	0:40-0:50										
6	0:50-1:00										
7	1:00-1:10										
8	1:10-1:20										
9	1:20-1:30										
10	1:30-1:40										
11	1:40-1:50										
12	1:50-2:00										
	Total Intervals										
	% Total										
Preference Hierarchy											
Highly preferred items (approached frequently, engaged with for highest percentage of intervals):											
Moderately preferred items (approached, engaged with for lowest percentage of intervals):											
Low preferred items (did not approach):											

Ms. Bruner used a data sheet to take data during the observation so she could record the stimuli selected in each 10-s interval. She used the timer in her cellphone, and she missed taking data in some of the intervals because Roger switches his toys frequently. Ms. Bruner complained

that it is hard to observe the learner and take data at the same time. She asked her mentor if there is any tool to help her with the situation.

There are challenges when taking partial interval recording data since the learner might exhibit problem behaviors and it is hard for the instructor to observe and record data at the same time. Switching items frequently is another challenge that teachers might face during partial interval recording sessions. Figure 9 displays some tips and the pros and cons of those tips.

Figure 9. Tip for Free-operant preference assessment

Tip		Pros and Cons
Video recording the session and watch the video later to take data	Pros	instructors can pay full attention to the learner and redirect when its necessary
	Cons	learners might react to the presence of the camera and affect the assessment
Use an interval timer which have alarms when an interval end	Pros	instructors will be able to know when the interval ends
	Cons	some interval timers only have a beeping sound as the alert which draws learner's attention and might interfere with the assessment
Minimize the effects of other interfering stimuli in the environment by removing extract items from the environment	Pros	no extract stimuli in the environment can decrease the possibility that the learner is distracted from the assessment
	Cons	might be a lot of work for the teacher to remove every extract stimulus from the environment

Interval Timer – HIIT Workouts© is a digital application that is helpful for interval data collection. Teachers can create a schedule based on preference and needs. For example, if a teacher needs to conduct a 5-min observation, the duration can be set as five minutes. The number of intervals can be set at 30, and each interval is 10 seconds. Teacher can choose sound alone, vibrate alone, or both sound and vibrate as the signal. In addition, visual cues are also included in the tool, the background color of the screen switched between green and red as the interval changes.

Step 4: Analyze the Results of the Preference Assessment

After the two-minute preference assessment session, Ms. Bruner recorded the following data on her data sheet. She then counted the total number of intervals that Roger engaged with each item and calculated the percentage of total intervals. With all of this information, she was able to fill out the preference hierarchy form.

		Stimuli selected									
Interval		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
		Dinosaurs	*iPad*	*Mice toys*	*bags with zippers*	*Lizard hunts*	*chip clips*	*puzzles*	*cars*	*blocks*	*squizz*
1	0:00-0:10	+									
2	0:10-0:20	+									
3	0:20-0:30	+						+			
4	0:30-0:40							+			
5	0:40-0:50			+				+			
6	0:50-1:00			+							
7	1:00-1:10	+		+							
8	1:10-1:20	+						+			
9	1:20-1:30				+			+			
10	1:30-1:40				+			+			
11	1:40-1:50				+						
12	1:50-2:00	+									
	Total Intervals	*6*	*0*	*3*	*3*	*0*	*0*	*6*	*0*	*0*	*0*
	% Total	*50%*	*0%*	*25%*	*25%*	*0%*	*0%*	*50%*	*0%*	*0%*	*0%*

Highly preferred items are the items that the learner engaged with for highest percentage of intervals during the whole observation session. In this example, Roger engaged with both dinosaurs and puzzles for 50% of the intervals, which are the longest durations compared to the other stimuli. Therefore, both fidgets and puzzles were identified as the highly preferred items.

Moderately preferred items are the items that the learner engaged with for the lowest percentage of intervals. In this example, mice toys and bags with zippers were identified as the moderately preferred items.

Low preferred items are the items that the learner does not approach during the observation. In this case, lizard hunts, chip clips, iPad, cars, blocks, and squigz© are the items that were not approached by the learner, so they were identified as the low preferred items.

Preference Hierarchy
Highly preferred items (approached frequently, engaged with for highest percentage of intervals):
Dinosaurs, puzzles
Moderately preferred items (approached, engaged with for lowest percentage of intervals):
Mice toys, bags with zippers
Low preferred items (did not approach):
Lizard hunts, chip clips, iPad, cars, blocks, squigz

Step 5: Apply the Results in Practice

Once the preferred items are identified, the next step is to use the results to guide teachers' selection of consequence during instruction. A preference hierarchy can be used with the token economy. For example, the teacher can set goals with the learner, earn 10 tokens to exchange for highly preferred items, five to nine tokens to earn moderately preferred items, zero to four tokens to exchange for low preferred items. The goals can be adjusted based on the learner's performance every few weeks. In this way, learners can be motivated to engage in the learning activities, and engage in more on-task behavior.

Stimuli that we identify in a preference assessment are preferred items and may not always function as reinforcers (Higbee et al., 2000). To assess if the preferred stimuli are working as reinforcer and how strong the effects are, practitioners should analyze the learner's reaction to delivery of the items. For example, a smiling face by the learner might mean that the item is working as a reinforcer, whereas frowning means it does not qualify reinforcer. Whether the presence of the preferred stimuli helps the learner acquire skills is an important outcome

teachers should examine to evaluate the effects of the preferred stimuli. Data on learning behavior (i.e., the number of correct responses, the rate of responses, and the frequency or duration of disruptive behaviors) should be collected and analyze to see if student is making progress.

The results from a preference assessment cannot be used all the time since most of the students' preferences can change frequently. Teachers should conduct preference assessments or reevaluate the effects of the preferred stimuli regularly. If the speed of acquiring skills is not ideal, or the learner is no longer engaging with the preferred items originally identified, reevaluation should be considered.

Ms. Bruner followed the steps to conduct a complete free-operant preference assessment with Roger. She identified his most preferred items as the dinosaurs in the classroom. She used the preference hierarchy to create a list of backup reinforcer for toke economy. Roger followed her instructions and stayed on task for longer time than before. Ms. Bruner is very happy with the change, and she planned to conduct preference assessments with other learners in her class.

Free-operant preference assessment is a practical approach for identifying students' preference hierarchy on various stimuli in order to identify effective reinforcers. When conducting free-operant preference assessments, teachers can be flexible with the duration of the observation and the number of stimuli included in a session to best fit their instructional setting. Teachers should conduct free-operant preference assessment regularly to maximize their students' instructional outcomes.

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Chapter 5. Discussion

My goal is to continue exploring efficient approaches to train practitioners to maximize instructional outcomes for students. I was working as a teacher before joining the master's program at The Ohio State University. I utilized a variety of strategies to engage students in their learning journeys. The knowledge and skills I acquired in the graduate program helped me positively impact student outcomes. During my six years of graduate school at OSU, I had opportunities to train pre-service and in-service teachers and therapists to implement evidence-based strategies. Their challenges motivate me to find effective and efficient training for them to learn new skills. Assessing before designing and implementing instruction is critical for improving students' performance. Some teachers lack the skill to implement assessments before instruction. Therefore, exploring the effective and socially acceptable training approaches to improving teachers' assessment skills is necessary.

In Chapter 1, I proposed that training teachers to implement free-operant preference assessment remotely using behavioral skills training (BST) may be effective and efficient. Next, in Chapter 2, I reviewed remote training procedures and the effectiveness of the training on teacher implementation of behavioral assessments. The literature review in Chapter 2 indicated that remote training is effective for helping practitioners acquire assessment skills. Various training components (e.g., performance feedback, modeling, video modeling) and combinations of the components have been investigated in previous remote training studies. The BST model was demonstrated to be a promising approach for practitioner training. The findings from Chapter 2 inspired me to conduct the experiment in Chapter 3, in which I delivered BST training to four practitioners working in schools and clinics in China. The targeted skill was implementing free-operant preference assessment since it has been demonstrated to be helpful

for identifying effective reinforcers. However, no previous study has evaluated the effects of BST on implementing the free-operant assessment. In this study, delayed feedback was utilized since the participants and I were in different time zone. It was more convenient to have the participants record rehearsal sessions, and I provided feedback later. Results of the experiment demonstrated that remote BST effectively improves the percentage of correct steps implemented by practitioners. The social validity measure results show that the training and the free-operant assessment procedure were acceptable to the participants. Therefore, I wrote a practitioner paper in Chapter 4 to provide step-by-step guidance for implementing free-operant preference assessment. Finally, this last chapter presents my career goals and outlines my future research plan.

I got my bachelor's degree in education and gained experience as a general education teacher in China. Teachers work hard to engage students in learning activities, but it is not easy to ensure every student pays attention to teachers, and I faced some challenges in classroom management. I had students at risk of learning disabilities or diagnosed with attention-deficit/hyperactivity disorder. But the general education teachers like me did not have enough knowledge and skills to support students with special needs. I started my master's program in 2016. I learned not only about students with disabilities but also the evidence-based strategies for improving student engagement and learning outcomes. I had opportunities to work with students on the autism spectrum. Some of my students with autism had difficulties engaging in instruction. I gained experience not only with academic and behavioral interventions but also with conducting research. Through those experiences, I realized that effective training was critical for instructors. Because the training I attended helped me acquire assessment and

intervention skills quickly, I can also see the improvement in my students and clients when I use the skills that I learned in training.

I began my journey into doctoral studies in 2018 as a board certified behavior analyst (BCBA). As a BCBA and a teaching assistant, I had opportunities to provide instruction and supervision to undergraduate and graduate students. My co-workers back in China and my supervisees and students during my graduate program were passionate about their careers but needed more training in evidence-based strategies for behavioral management. I found out that various training components have been demonstrated to be effective in teaching different skills. Therefore, I incorporated practical training components in my lecture and supervision sessions. I got positive feedback from my students and supervisees. Positive changes can be observed in teachers and their students.

Since the training I provided to teachers was successful, I wanted to conduct my dissertation experiment on training teachers to implement interventions or assessments. More and more scholars have investigated remote training because technology has been widely used, which provides the tools for delivering remote training. In addition, the spread of the Covid-19 virus made keeping social distance necessary. Therefore, I decided to research training teachers to implement assessments remotely. There are several options for preference assessment (e.g., single-stimulus, paired stimulus, multiple stimuli, free-operant). Free-operant is appropriate for a larger group of students and has been demonstrated to be the one that takes a shorter time to implement with less possibility to trigger problem behaviors. I conducted a literature review on remote training, and I found that no study has evaluated the effects of remote behavioral skills training on teacher implementation of free-operant preference assessment. Hence, I decided to focus on this topic for my dissertation.

Since I have a background in general education, I also value the inclusion of students with disabilities. I was able to provide service or supervision in an inclusive setting and was inspired by the interactions between typically developing children and students with disabilities. Inclusion benefits students with disabilities and boosts the development of typically developing students. Students with disabilities can learn age-appropriate behavior and skills from their peers. Students with typical development can acquire the skill of offering help and other skills. They are provided with chances to learn more about diversity and better understand the diverse world. So, I had the idea to explore ways to promote inclusion and positive interaction between students in inclusive settings. As an effective training model, BST can be used to train different age groups and skills. I had a chance to conduct a peer-mediated intervention with three dyads of students (i.e., three students with typical development and three with disabilities). I utilized behavioral skills training to train the peer models to engage students with disabilities in play activities. The targeted skills were prompting the partner to do the next step and reinforcing when the partner completed a step. I got positive feedback from peer models (i.e., expressed that they want to play with their partners and join our sessions) and the classroom teachers (i.e., mentioned that more positive interaction was observed after the training). I could not continue this research line because of the covid-19 pandemic. But after I graduate, I would like to continue with studies on training peer models to have interactive play with students with disabilities and training teachers to implement peer-mediated interventions. Since I have done research on BST, an empirically validated training model, I would like to continue to utilize BST to provide training to practitioners and participants in my studies.

Conclusion

Training practitioners to implement assessments is essential for maximizing students' learning outcomes. Throughout my career, I will continue providing training to teachers and clinicians and research to investigate efficient training methods. I would also like to evaluate effective strategies for promoting inclusion for students with disabilities. I will apply evidence-based strategies for inclusion in my practice and training. Every child deserves a better inclusive education. I want to help with that by providing quality training to practitioners working in an inclusive environment.

Appendix A. Social Validity Questionnaire Sample

Questions	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
1. I am satisfied with the remote training, which involved meeting at a video-conferencing room.					
2. I am satisfied with the process of arranging cameras and recording the free-operant assessment.					
3. I am satisfied with the process in which feedback was provided delayed and during a one-on-one meeting.					
4. The process of remote training is acceptable for learning other instructional skills.					
5. I recommend this process of remote training to other individuals who are unable to receive on-site training.					
6. I will use the free-operant preference assessment in the future.					