AN EVALUATION OF INTERACTIVE COMPUTER TRAINING TO TEACH DISCRETE
TRIAL AND NATURALISTIC INSTRUCTION TO NOVICE THERAPISTS

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Effective and efficient training strategies are needed to provide training to novel therapists whom provide early intensive behavioral intervention (EIBI) services to young children with autism. We evaluated the effects of interactive computer-based training (ICT) on novice therapists’ implementation of two, common EIBI instructional techniques: discrete-trial instruction (DTI) and naturalistic instruction. Results demonstrated that ICT improved trainees’ instructional fidelity during role-plays with a confederate for DTI instruction and also with a child with autism for both DTI and naturalistic instruction. As a result, the requirement for supervisor feedback on performance was minimized. In addition, results suggest that child language improved as a result of improved therapist performance.
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By

Olivia Nielsen
ACKNOWLEDGEMENTS

This thesis is dedicated to my mother and father, Suzanne and Daren Nielsen, whom have loved and supported me throughout all of my endeavors, and have instilled within me a passion for success and achievement. I also wish to dedicate this thesis to my two loving sisters, Leigha Cochran and Erica Nielsen, who have encouraged and guided me towards higher goals and greater challenges. Additionally, I am so grateful to my partner, Harry Hughes, for all of his love and unyielding commitment to my educational and personal success.

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CHAPTER 1

INTRODUCTION

Early intensive behavioral intervention (EIBI), a comprehensive intervention based on operant learning principles, is considered the most effective intervention for young children with autism and one of the most widely used (Reichow; Barton, Body & Hume; 2014; Rogers & Vismara, 2008). EIBI has been shown to produce substantial improvements in IQ, social-communicative behaviors and school placement (Lovaas, 1987; Eikeseth, 2009) as well as produce decreases in maladaptive behaviors (Sallows & Graupner, 2005). Thus, as the prevalence of individuals diagnosed with autism continues to rise, there is an increasing demand for EIBI services (Developmental, D. M. N. S. Y., & 2010 Principal Investigators, 2014; Leaf et al., 2016).

A common service-delivery model of EIBI involves a tiered system in which an individual with advanced training in behavior analysis creates and supervises an individualized treatment program that is mainly implemented by behavioral therapists or technicians (Behavior Analyst Certification Board, 2014). Behavioral therapists must be well-trained and well-supervised to ensure high-quality EIBI services are being delivered (Hayward, Gale & Eikeseth, 2009). However, ensuring this can be difficult. First, behavioral therapists often enter the profession with minimal training and education in behavior analysis which places a high training demand (Eikeseth, Klintwall, Jahr, & Karlsson, 2012). Second, supervisors may find it difficult to initiate and maintain high-quality training because there is a high turn-over rate associated with behavior therapists (Johnson & Hastings, 2002) and supervisors are faced with limited time constraints to provide extensive training and supervision (Bibby et al., 2002; Eikeseth et
al., 2009). In summary, it is critical that there are effective and efficient training models available to increase the skill set of behavioral therapists.

Effective training programs typically include a combination of instructions, modeling, rehearsal, and feedback that is referred to as "behavioral skills training" or BST (Sarakoff & Sturmey, 2004; Parson, Rollyson, & Reid, 2012). Although these procedures are widely effective, BST requires a considerable amount of supervisor resources to implement each component effectively (Karsten, Axe, Mann, 2015). As a result, researchers have capitalized on recent technological advances to create mechanisms, such as interactive computer training or ICT, which reduces trainer time while retaining the effective components of BST.

ICT includes providing instructional content within self-paced computerized training modules and has been used to train consumers to implement behavior analytic teaching techniques. Discrete trial instruction (DTI) is one widely-used instructional method that is effective in teaching a variety of critical skills to individuals with autism (Smith, 2001); as a result, researchers have developed training methods to teach staff to implement DTI. For example, Pollard et al. (2014) trained novice staff to implement discrete-trial instruction at mastery criterion after approximately 2 hours of ICT both with a confederate and with a child. Higbee et al. (2016) replicated and extended the results of Pollard by demonstrating the effectiveness of ICT on teaching DTI skills with both students and special educators in Brazil. Although ICT has demonstrated promise in teaching DTI skills to novice therapists, DTI is only one type of instructional procedure common employed within quality EIBI programs (Howlin, Magiati, Charmen, 2009). To
ensure appropriate generalization of skills and enhance learning outcomes, naturalistic instruction is also necessary.

Naturalistic Instruction is a child-led instructional method in which teaching occurs directly in the child’s natural environment and natural consequences are provided contingent upon child responding. Hart and Risley (1968) demonstrated that incidental teaching, one of the first models of naturalistic instruction, increased language in preschoolers. Since this seminal article, incidental teaching procedures have been extended to individuals with autism resulting in improvements in large gains in language (McGee et al, 1985) and social behavior (McGee, Almeida, Sulzer-Azaroff, & Feldman, 1992).

McCulloch and Noonan (2013) investigated the use of online training modules to train school paraprofessionals to implement mand-training techniques, a variant of naturalistic instructional procedures, with students in the classroom. Although the online modules improved teacher performance, the performance did not consistently reach mastery criterion. Given the importance of naturalistic instruction techniques of individuals with autism, more research is needed to train therapists to implement these techniques in conjunction with DTI.

Thus, the purpose of the current evaluation was to extend the previous literature on interactive computer training to training novice therapists to implement both DTI and naturalistic instructional techniques with children with autism. First, we provided ICT for DTI instruction and assessed performance during role-plays with a confederate and we also assessed performance with a child with autism. Next, we provided ICT for
naturalistic instruction and assessed performance with a child with autism. Finally, we assessed the effects of therapist fidelity during naturalistic instruction on child language.
CHAPTER 2
METHODS
Participants, Setting, and Materials

Two therapists and two children diagnosed with Autism Spectrum Disorder (ASD) participated. Participants were recruited via a recruitment flyer and informed consent was obtained prior to participation. The therapists were two female undergraduate students that were recently hired to provide EIBI services at a university autism center. Crystal was 20 years old and majoring in psychology, and Martha was 19 years old majoring in speech pathology. Therapists had no prior experience with implementing behavior-analytic teaching techniques. Child participants were currently receiving early intensive behavioral intervention (EIBI) services from the university autism center. Eric was a 3-year-old male and spoke in one-word phrases. Trey was a 2.5 year-old-male and generally communicated with one-word approximations.

For all naturalistic instruction training sessions, we formed therapist-child dyads, and assessed therapist performance with one child. We paired Crystal with Eric and Martha with Trey. For discrete trial instruction (DTI) sessions, we assessed therapist performance during child probes across varying children that had a current, instructional program equivalent to the type of program the therapists were receiving training on (e.g. intraverbals).

All training sessions were conducted at the autism center. We conducted DTI sessions with confederates in a room that contained a table, chairs, relevant session materials (e.g. data sheets) and a video camera. We conducted DTI sessions with clients and naturalistic instruction sessions in a different room that contained a table,
chairs, relevant session materials (e.g. data sheets), video camera, and various age-
appropriate toys such as puzzles, books, Play-Doh, markers, vehicles, and balls. All
sessions were video recorded for subsequent data collection, and there were either one
or two experimenters in the room.
CHAPTER 3
RESPONSE MEASUREMENT AND INTEROBSERVER AGREEMENT

General

We recorded the duration for completion of each ICT module as well as the duration of feedback. For both DTI and naturalistic instruction, training duration per module was calculated by subtracting the recorded start time from the recorded stop time per module. Next, we summed the module training times to determine the total training duration. We calculated feedback duration in the same manner except for feedback rather than training times.

DTI

The primary dependent variable for DTI sessions was the percentage of correctly implemented steps. The steps to be implemented included the therapist’s ability to accurately prepare a datasheet for the session, assess the child or confederate’s preference to a reinforcer, establish attending from the child or confederate, present the instruction and target stimuli, prompt incorrect responses, ignore challenging behavior, and begin a new trial upon completion of a previous trial. We collected data using a pen and a program-specific datasheet. Each step was scored as a correct, incorrect, or not applicable. The overall percentage was calculated by summing the total correct steps, dividing the sum by the total number of correct and incorrect steps, and multiplying by 100.

A mastery criterion was set at 90% correct steps implemented across two consecutive sessions with no consistent errors for confederate sessions. A consistent error was defined as 50% or more of the trials for a performance variable incorrectly
implemented. For example, a trainee could achieve 90% correct performance yet consistently fail to respond appropriately to problem behavior. For client probes, a mastery criterion was set at 90% across one session with no consistent errors. Full operational definitions are provided in Appendix A. The datasheet and additional rules for data collection that were created to address special considerations not included in the behavioral definitions, and are presented in Appendix D.

Naturalistic Instruction

We evaluated the following therapist behaviors during naturalistic instruction: (a) responsivity, (b) modeling and expanding, (c) prompting, and (d) reinforcement. To calculate the percentage of correct responsivity, the frequency of responsive models that the therapist provided was divided by the total number of target comments the child engaged in and then multiplied by 100. The percentage of correct modeling and expanding was calculated by dividing the total number of modeling and expanding the therapist engaged in immediately following non-target comments by the total number of non-target comments and multiplying by 100. The percentage of correctly implemented prompting procedures was found by dividing total correct prompts by total non-target mands and multiplying by 100. Finally, the percentage of correct reinforcement was found by dividing the total frequency of reinforcers provided by the sum of target mands and prompted target mands. A mastery criterion for the first module was defined as 90% correct responsivity and reinforcement across two sessions. A mastery criterion for the second module was 90% correct responsivity, reinforcement, and modeling and expanding across two sessions. A mastery criterion for the third module was 90%
correct responsivity, reinforcement, model and expanding, and prompting across two sessions.

Secondary measures were collected on the frequency of correct communicative temptations, incorrect communications, inappropriate redirections from an activity selected by the child, and questions the trainee asked in order to test the child’s knowledge of an activity or item. The mastery criterion for redirections and questions was below two occurrences per session. No quantitative criterion was set for communicative temptations and labeling because the opportunity for occurrence of each was dependent on child behavior. The mastery criterion for communicative temptations and labeling was judged by visual inspection of the graphs by the experimenter. Operational definitions of the primary and secondary dependent variables are provided in Appendix A.

We also collected data on child behavior including: (a) target mands, (b) non-target mands non (c) prompted target mands, (d) prompted non-target mands, (e) target comments and (f) non-target comments. Target language per child was individualized and identified by the board certified behavior analyst on the child’s team as the language level that is one level above the child’s current language level. Non-target language was defined as non-stereotypical language that was at or below the level of language the child most frequently used.

All naturalistic instruction measures were collected and analyzed using a laptop with data collection software, BDataPro. The percentages of each dependent variable were calculated using an Excel spreadsheet.

Interobserver Agreement
A second independent observer was trained to collect data on the trainees’ DTI and naturalistic training performances. For DTI, the observer was provided a sheet of the behavioral definitions and data collection rules, and trained to collect data using pilot DTI training videos. The observer received training to accurately score responses on the trainee step implementation datasheet until scoring was reliable (two sessions above 80% across all measures). Once reliability was reached, interobserver agreement (IOA) was then collected from video or in vivo scoring, and was at or above 90% across 30% of sessions in each experimental condition. IOA was calculated on a trial-by-trial basis by dividing the number of agreements (A) by the total number of agreements and disagreement (A+D) and then multiplying by 100; the resulting formula was written as \( \frac{A}{A+D} \times 100 \). Mean agreement was 93.3% for Crystal (range, 91.1 to 97.8%), and 95.6% for Martha (range, 91.2 to 99.4%).

For naturalistic training, the independent observer was provided a sheet of the behavioral definitions for naturalistic training and trained to collect data using Behavioral Data Program (BDataPro) on pilot naturalistic training videos. An independent observer was able to score videos after reaching proportionate interval agreement (PIA) at 80% or higher across all variables for two sessions. IOA was calculated through BDataPro by dividing the entire session into 10-second intervals and scoring for agreement across variables. Proportional agreement per interval was scored as the smaller number of occurrences divided by the larger number of occurrences and multiplied by 100; intervals in which nonoccurrence were scored for both recorders were scored as 100% agreement. The proportional agreement per interval was then summed across each interval and divided by the number of intervals per 10-min session (60 intervals) and
multiplied by 100% to generate the percentage of proportional agreement per session. Mean agreement for 30% of videos across conditions was 97.2% for Crystal (range, 80.0 to 100%) and 95.5% for Martha (range, 81.7 to 100%).

Treatment Integrity

Treatment integrity measures were collected for adherence to confederate scripts for 30% of sessions across each condition to ensure that experimental procedures were implemented consistently and correctly. A treatment integrity checklist of researcher behavior was used to assess fidelity of confederate sessions and is provided in Appendix E. A secondary observer collected data on treatment integrity from the videos following sessions. Treatment integrity was calculated by dividing the number of correctly implemented items (C) by the total number of items (C+I) and then multiplying by 100 to generate a percentage. The resulting formula was \( \frac{C}{C+I} \times 100 \). Treatment integrity for confederate sessions was at or above 90% across both trainees. The mean accuracy of implementation of the confederate checklist was 94.8% (range 90 to 100%) for Crystal; 93.2% (range, 90 to 100%) for Martha.
CHAPTER 4
PROCEDURES

Experimental Design – Discrete Trial Instruction

We used a multiple-probe design across four instructional programs to evaluate the effects of ICT on trainees’ implementation of DTI.

DTI Baseline

The researcher presented the trainee with a binder that contained a brief protocol per instructional program which stated the program-specific: (a) discriminative stimulus (SD) or instruction to be delivered, (b) child target responses, (c) reinforcement contingencies, (d) set-up requirements (e.g. three object array), and (e) controlling prompt; a glossary of any terms stated on the brief protocol (e.g. “controlling prompt”); and a datasheet to record responses of the confederate or child. The binder materials are provided in Appendix C. The experimenter also provided therapists with a pencil, required program stimuli (e.g. common objects), and an assortment of five preferred items.

After presenting the session materials, the experimenter read a script that instructed the therapists to conduct instructional sessions to the best of their ability given the provided materials. The experimenter then provided up to 5 min for therapists to prepare for each session as they chose, and therapists could end the preparation period earlier if they chose. Once the therapist indicated that they had completed 12 trials, the researcher would stop the video recording and reset the room and materials. No performance feedback was delivered.
**Confederate sessions.** During each 12-trial confederate session, the experimenter pseudorandomly engaged in four correct responses, two incorrect responses (provided a non-target response), two non-responses (did not provide any response), two scrolling responses (provided both non-target and target responses) and two self-correction responses (provided a non-target response immediately followed by the target response). In addition, the experimenter also pseudorandomly engaged in each of the following “problem behaviors” once during the session: elopement from the instructional area, swiping instructional materials, protesting, crying, failing to attend after one request from the therapist, prolonged failing to attend after multiple requests from the therapist, incorrect responding to the controlling prompt, failing to respond to the controlling prompt, and demonstration of disinterest in the preferred item provided. Refer to Appendix B for a full description of the confederate script and checklist.

**Client probes.** The experimenter entered the room with the child and told the therapist the child’s name. The experimenter also provided the materials to conduct the program with each child as these targets were part of each child’s ongoing instructional programs and were therefore different than the targets/materials provided during confederate sessions. No other instructions were provided.

**Interactive Computer Training for DTI (ICT-DTI)**

We developed ICT modules for four DTI programs: receptive identification of objects, expressive identification of objects, gross motor imitation, and intraverbals. Therapists completed one module at a time and first completed the receptive identification module. We modified the content based upon a self-instructional manual developed by Severtson and Carr (2012). Each module was a separate Powerpoint-
based interactive manual with an advance key on each slide that appeared after a 5 s delay. Trainees had to click on the advance key in order to progress to the next slide. Each module contained video models of both examples and non-examples of key skill components. In addition, each module contained multiple choice, true or false, and short answer questions. All multiple choice and true or false questions had to be answered correctly in order to advance to the next slide. Incorrect answers resulted in the trainee returning to the slide in which the answer was provided so that they could review the material and answer the question again. All short answer responses were recorded on the companion study guide. The answer to each short answer question was provided on the slide immediately following the question and trainees were instructed to self-correct their answers if necessary. Trainees were shown a video model of a 12-trial instructional session at the end of each manual and were prompted to practice recording data on the companion datasheet. Trainees were to check their responses to an answer key after watching the video model of an entire instructional session. Once the trainee completed a module, the experimenter ensured that the study guide was completed and asked the trainee if she had any questions. If the trainee asked a question, the researcher would direct the trainee to the answer in the training manual.

Post-ICT. We assessed performance under conditions identical to baseline conditions following completion of each module. We first conducted two sessions. If performance was below mastery criterion (i.e. 90% for two consecutive sessions) or characterized by a consistent error, we provided trainees with a brief role play opportunity and performance feedback. More specifically, the experimenter provided praise for steps performed correctly, explained any errors that were made, and role-
played until the therapist provided an example of correct performance. The experimenter also answered any questions the therapist had that were relevant to the program.

Following mastery performance on a trained program, we assessed response generalization across all other instructional programs. For any instructional program in which therapist performance was below mastery criterion, we provided the module-specific ICT.

*Generalization probes with child.* Once therapist performance met mastery criterion with a confederate, we assessed for generalization with a child with autism for each program. Sessions were identical to probe sessions during baseline.

**Experimental Design – Naturalistic Instruction**

We used a multiple-baseline design across four instructional areas to evaluate the effects of ICT on therapists’ implementation of naturalistic instruction and child language.

**Naturalistic Baseline**

Sessions were 10 min in duration. The experimenter read a script that provided information on each child’s preferred items, which were present in the room, and each child’s current and target level of language. The therapist was instructed to try and increase child language while having fun with the child. A sample confederate script is provided in Appendix B. The experimenter provided 5 minutes for the therapist to prepare for each session. When the trainee indicated they were ready to begin, or the 5 minutes had elapsed, the researcher would bring in the child. No other instructions or feedback were provided.
Post-DTI Baseline. Sessions were identical to baseline sessions except that trainees had completed training for DTI instruction. These sessions were conducted to evaluate the effects, if any, of DTI instruction on performance during naturalistic instruction.

Interactive Computer Training for Naturalistic (ICT-Naturalistic)

Naturalistic training was similar to the DTI manual in that we provided therapists with an interactive PowerPoint that contained content descriptions, quiz questions, and video models as well as a companion study guide. We divided the naturalistic manual into three modules. The first module provided instruction on understanding language targets and goals and techniques on how to engage with the child such as following the child’s lead, reciprocal imitation of child behavior, identifying and labeling child nonvocal behavior (“labeling”), and responding to target language (“responsivity”) (Hancock, Ledbetter-Cho, Howell & Lang, 2016). The first module also provided training to recognize and avoid questions to test the child’s knowledge of an activity or item, and to avoid redirecting the child while they are engaged in functional play. The second module focused on training the therapist to provide communicative temptations to increase the likelihood of requests. In addition, the manual described how to provide an expanded language model after the child engages in non-target comments or target-level requests (“model and expand”) and how to provide natural reinforcers. The third module instructed correct prompting techniques contingent upon non-target requests and how to manage challenge behaviors. The fourth module served strictly as a textual review of all the previously trained material, and was provided prior to post training maintenance probes which occur at one week, two weeks, and one month intervals.
following training. Similar to the training sequence in DTI, therapists completed one module at a time.

Post-ICT. We assessed performance following completion of each module by conducting two sessions that were identical to baseline sessions. We provided feedback if performance was below mastery criterion (i.e. 90% for two consecutive sessions) or characterized by a consistent error. Following mastery performance on a module, we assessed response generalization across the skills presented in the other instructional programs. For any instructional program in which therapist performance was below mastery criterion, we provided the module-specific ICT.
CHAPTER 5

RESULTS

Discrete Trial Instruction

Figure 1 and Figure 2 display the percentage of DTI components implemented correctly with a confederate and during probes with a child by Crystal and Martha, respectively. During baseline sessions prior to ICT for receptive identification, both trainees’ performance was low and stable ($M = 18.9\%$ for Crystal; $M = 16.8\%$ for Martha). Following training on receptive identification, Crystal’s performance improved but remained below mastery criterion. We provided one feedback session (5.33 min) and Crystal’s performance exceeded mastery criterion for receptive identification tasks. Although she demonstrated generalized improvements across the other instructional programs with an average performance of 87.5\%, her performance did not meet mastery criterion; thus, we provided training for expressive identification. Her performance met mastery criterion following training on expressive without any feedback requirements and her performance improved to 97.2\% on the intraverbal program. We subsequently provided training on gross motor imitation and Crystal’s performance was at or above mastery criteria with no corrective feedback required. Performance probes across the other programs revealed stable performance at mastery criteria. In addition, Crystal’s performance was at or above mastery criteria for all client probes.
Figure 1. The percentage of correctly implemented DTI steps across instructional programs for Crystal. Note: Solid lines denote the implementation of ICT whereas the dashed vertical lines denote the implementation of performance feedback. Horizontal vertical lines represent mastery criterion, 90%.
Figure 2. The percentage of correctly implemented DTI steps across instructional programs for Martha. Note: Solid lines denote the implementation of ICT whereas the dashed vertical lines denote the implementation of performance feedback. Horizontal vertical lines represent mastery criterion, 90%.

Martha’s performance was similar to Crystal’s performance. Her fidelity improved following training on receptive identification tasks, but remained below mastery criteria for two consecutive sessions. Following one feedback session (11 min), her
performance met mastery criteria for receptive identification and also demonstrated
generalized improvement across the other instructional programs although performance
was still below mastery with an average performance of 80.4%. Following expressive
identification training, Martha’s performance met mastery criteria for both the expressive
identification and intraverbal programs with no additional feedback required. Training for
gross motor imitation was implemented since that program was below mastery.
Feedback following gross motor imitation was required for Martha due to a consistent
error pattern, even though the second post-training assessment met percentage
mastery criteria. Martha’s performance met mastery following feedback, and post
feedback probes revealed that performance across all programs remained at or above
mastery criteria. During client probes post DTI training, Martha required brief feedback
(1.5 min) for receptive identification due to a consistent error pattern (i.e. state the exact
SD provided on the update sheet and repeat that SD when prompting). Following
feedback, Martha’s performance met mastery criteria. A summary of the feedback
provided during each feedback session provided for both trainees is presented in below:

Table 1

<table>
<thead>
<tr>
<th></th>
<th>DTI Training (in minutes)</th>
<th>DTI Feedback (in minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal</td>
<td>314.20</td>
<td>5.33</td>
</tr>
<tr>
<td>Martha</td>
<td>195</td>
<td>12.50</td>
</tr>
</tbody>
</table>

Crystal completed DTI training in 314.2 minutes and required 5.33 minutes of
feedback following the Receptive ID manual. Crystal only needed to complete three of
the four DTI training manuals in order to meet mastery criteria across confederate and client probes, and required no further feedback following any of the other manuals. Martha also only completed three of the four DTI manuals, and required 195 minutes of total DTI training. Martha received 12.5 minutes total of feedback in order to meet mastery criteria across confederate and client probes. Feedback for Martha occurred following the Receptive ID manual, and again following the Gross Motor Imitation Manual and a Receptive ID client probe to correct consistent error patterns. Table 1 provides the total training and feedback times in minutes for each trainee.

Naturalistic Training

Both trainees had stable baselines with low performance rates across the primary and secondary independent variables. Crystal had an average performance of 0% responsivity, 0% model and expand, 16.3% reinforcement, and 8.3% prompting. Naturalistic performance was assessed following DTI training and performance remained at baseline levels across both primary and secondary independent variables. The first naturalistic module was introduced and responsivity increased significantly, but was below mastery criteria with an average performance of 50%. Brief feedback (4.75 min) was provided regarding responsivity (i.e respond to child’s target comments with an exact copy of what they said and increase frequency of labels), and performance increased to mastery criteria. Average performance for the other primary variables increased to 34.3% for model and expand, 0.0% for reinforcement, and 0.0% for prompting. The second module was introduced and performance for responsivity was unable to be assessed because Eric did not engage in any target comments. Model and expand performance increased to 80% the first session following training, and then
there was no non-target comments that occurred in the second session. Performance for reinforcement increased marginally to 16.7%, and feedback was provided (i.e always provide a model of what the child said following a target mand and increase frequency of labels). Following feedback, performance for responsivity was still unable to be assessed due to a lack of opportunity. However, model and expand performance, as well as reinforcement performance, averaged at 100%, and prompting increased to 66.7%. The third module was implemented and responsivity and model and expand performances were unable to be assessed the first post training session due to a lack of target and non-target commenting. Reinforcement and prompting performances were below 90% for the first session, and then increased to 100% for every session after. A total of three post training sessions were conducted because there was a lack of consistency in opportunities for responsivity and model and expanding to occur. The third post training session revealed that model and expand performance had dropped to 10%. Thus, feedback was provided (10.2 min) and performance met mastery criteria across all variables across two post feedback sessions. Figure 3 indicates Crystal’s performance across each training intervention and feedback session.
Figure 3. The percentage of correctly implemented naturalistic procedures for Crystal.

Note: Solid lines denote the implementation of ICT whereas the dashed vertical lines denote the implementation of performance feedback. Horizontal vertical lines represent mastery criterion, 90%.

Martha had an average performance of 40.8% for responsivity, 25.8% for model and expand, 50.3% for reinforcement, and 0.0% for prompting. Following the DTI training, responsivity performance dropped to 14.3%, model and expand dropped to
0.0%, reinforcement decreased to 0.0%, and prompting remained at 0.0%. The first naturalistic training module was introduced and performance increased to an average of 94.4% across the post training assessments. However, feedback was provided (1.5 min) because several target comments were missed in both training sessions by Martha and we wanted to assure that she knew to always respond to target comments with a model of what the child said. Following feedback, responsivity performance remained above mastery criteria, and the average performances for the other variables were 100% for model and expand, 100% for reinforcement, and 58.2% for prompting. The second module was still introduced even though performance for met mastery criteria for that module, because the trainee was unaware of why or how she was performing correctly with model and expanding and arranging for communicative temptations. Additionally, the trainee had not received any direct training on how to address nontarget comments, and was simply responding with one-word phrases which happened to meet the target level of language requirements for that client; therefore, the trainee’s performance may have differed for a client with a two-word target level. Following the second module, responsivity, model and expand, and reinforcement performances met mastery criteria, and prompting performance also averaged at 100%. However, the third module was introduced to provide the trainee with information regarding correct prompting and dealing properly with challenging behavior. The post training assessments revealed that average performance for responsivity was 94.4%, 100% for model and expand, 95.5% for reinforcement, and 95% for prompting. Naturalistic training was concluded with no additional feedback provided, and Martha’s performance is displayed in Figure 4.
Figure 4. The percentage of correctly implemented naturalistic procedures for Martha. Note: Solid lines denote the implementation of ICT whereas the dashed vertical lines denote the implementation of performance feedback. Horizontal vertical lines represent mastery criterion, 90%.

Both participants required similar time for naturalistic training (an average of 187 min) and for feedback (an average of 11 min). Crystal completed all four modules for naturalistic training in 190 minutes with 10.2 minutes of feedback, and Martha
required 183 minutes and 11.9 minutes of feedback. The two participants differed in the frequency of feedback in that Crystal required consistent brief feedback following each module, whereas Martha required brief feedback following only the first and second module. A summary of training and feedback times for each participant is presented in the table below:

Table 2

<table>
<thead>
<tr>
<th></th>
<th>Naturalistic Training (in minutes)</th>
<th>Naturalistic Feedback (in minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal</td>
<td>190</td>
<td>10.20</td>
</tr>
<tr>
<td>Martha</td>
<td>183</td>
<td>11.90</td>
</tr>
</tbody>
</table>

Secondary independent measures were taken for both trainees on their use of communicative temptations, labels, test questions and redirects. Crystal’s use of labeling increased from baseline levels following feedback after the first module. Crystal needed consistent feedback on increasing label usage for each additional feedback session to address performance decreases. Correct communicative temptation use increased following Module 2 training, and remained at stable levels for the remainder of training. Incorrect communicative temptations remained at low levels throughout baseline and training. Crystal’s use of redirects and test questions remained below threshold criteria of 2 per session throughout baseline and training. Figure 5 provides a summary of Crystal’s data:
Figure 5. Frequency of communicative temptations, labeling, test questions, and redirections for Crystal. Note: Communicative temptations are abbreviated as C.T. and a dashed line represents mastery threshold of 2 test questions and redirects.
Martha’s performance with secondary independent variables is presented in Figure 6. Baseline levels for labeling began relatively high and variable, before tapering off to stable low levels. Martha’s use of correct and incorrect communicative temptations remained low and stable during baseline measures. Following Module 1, Martha’s use of labels increased from baseline levels. Labeling briefly decreased following Module 1 feedback, and remained at stable levels above baseline performance until Module 2 feedback. Following the feedback provided after Module 2, Martha’s labeling returned to previously high levels. Correct communicative temptations increased following training in Module 2 and incorrect communicative temptations remained at near-zero levels for the remainder of training. Correct communicative temptations briefly declined to low levels following Module 2 feedback, but returned to previous stable levels following Module 3 training.

Martha’s use of test questions in baseline was high and variable. Martha rarely engaged in redirects throughout baseline. Following Module 1, Martha’s use of test questions and redirects remained at stable levels below the criteria threshold of 2 per session.
Figure 6. Frequency of communicative temptations, labeling, test questions, and redirections for Martha. Note: Communicative temptations are abbreviated as C.T. and a dashed line represents the mastery threshold of 2 test questions and redirects.
Figures 7 and 8 depict child language data that was taken for each therapist-child dyad. Crystal was paired with Eric who had a two-word target level of language. Total language and total target language measures for Eric were at low, stable levels during baseline. Following Module 1 training, Eric's total language increased and target language decreased. Following Module 1 feedback, Eric's total language increased more but target language remained at low stable levels. Following Module 2 training and feedback, Eric's total language remained slightly above-baseline levels, and target language increased to baseline levels. Following Module 3 training and feedback, Eric's total language increased to previously high levels, but target level of language remained at baseline levels.

Martha was paired with Trey who had a one-word target level of language. Trey's baseline level of language showed a decreasing trend in number of occurrences. Following Module 1 training, Trey's total target language and total language increased significantly to high levels, but total language was relatively variable. Following Module 1 feedback, Trey's total language decreased to stable levels above baseline performance, and total target language remained at stable above-baseline levels. Post additional training and feedback sessions, Trey's total language steadily increased in frequency and remained at high, somewhat variable levels throughout the training. Total target language remained at relatively stable, above-baseline levels for the remainder of training.
Figure 7. Total language and total target language for Eric.

Figure 8. Total language and total target language for Trey.
CHAPTER 6
DISCUSSION

The purpose of the study was to extend the previous literature on interactive computer training to train novice therapists to implement both DTI and naturalistic instructional techniques with children with autism. There is little research that has evaluated the effectiveness of ICT on training paraprofessionals in naturalistic instruction. Unlike in discrete trial instruction, naturalistic instruction does not follow a procedure and allows for a less restricted environment; this may prove to be a more difficult technique for novice therapists since they must learn to respond appropriately to child behavior under a variety of environmental conditions. However, therapists who are able to correctly implement naturalistic instruction can facilitate more appropriate communication and possibly increase the child’s use of target language.

The increases in total child language following each naturalistic training module supports the findings of Hart and Risley (1968) that incidental teaching can be beneficial in improving overall communication in preschoolers. The training modules also utilized behavioral skills training components of instructions, modeling, rehearsal, and feedback in order to provide the most effective training (Sarakoff & Sturmey, 2004; Parson, Rollyson, & Reid, 2012). However, unlike typical BST procedures, the computer-based program we developed did not require substantial supervisor resources, and instead allowed the participant to self-monitor her performance and self-pace through the training.

Both trainees showed significant improvement in performance following each training manual, and each required less than 30 minutes of performance feedback from
a supervisor for both instructional techniques to correct error patterns and meet mastery criteria of training. Additionally, secondary measures revealed increases in labeling and communicative temptations for both trainees, and reductions in test questions and redirections following the first naturalistic training module. Total child language also increased from baseline levels across both child participants. The results of the study suggest that using a computer-based, self-paced training program may be an effective method to teach novice therapists how to correctly implement discrete trial instruction and naturalistic teaching with clients diagnosed with Autism Spectrum Disorders.

A computer-based, self-paced training program provides several inherent advantages of time and cost savings. A major potential benefit to a computer-based training is the decreased need for supervisor face-to-face meetings and training implementation (Granpeesheh et al., 2010). Since there is often a low ratio of supervisors to employees, reducing the need for managers to provide in-person training allows for their time to be allocated to other organizational tasks and job duties. Therefore, in order to be an effective training program, a computer-based manual should relay all the information required for the trainees to meet competency, and require less face-to-face hours versus other traditional training methods (Granpeesheh). Additionally, computer-based manuals allow for multiple employees to receive training simultaneously, which is suitable for various healthcare industries that have larger organizations or high turnover rates.

Another advantage to self-paced training methods is that they allow for the users to exercise autonomy and progress at their own rates of learning. Therefore, an employee who may require additional training time is permitted to review the material at
their own pace and possibly reduce the need for corrective feedback from supervisors compared to traditional training methods that are time restrictive. Conversely, an employee who is able to progress through the training more quickly and meet performance criteria is able to begin adding value to the organization sooner. In this study, Crystal required 119.2 min more in DTI training than Martha, but needed only one brief session (5.33 min) of feedback to meet mastery criteria. Although training time was significantly longer for Crystal, she required 7.2 min less than Martha for supervisor time giving feedback. In order to be effective, however, a self-based training program should incorporate self-check answers to ensure that the users are receiving feedback regarding their performance throughout the training. Future research should investigate the most effective frequencies and delivery methods of providing feedback within computer-based, self-paced manuals.

A significant limitation of this study is regarding how efficiency is determined. In this evaluation, the time required to create the interactive computer modules was not assessed. Although the manuals were efficient in that they reduced the amount of face-to-face time that is required for a supervisor, there was a significant amount of time and expertise required to develop the manual. Research suggests that for ICT manuals (and similar methods) to provide a true cost-benefit savings to a service provider, the training would have to be provided for approximately 60 trainees (Leblanc, 2016). At a large university-based center, this is feasible; however, for providers that employ fewer therapists, the time investment to create these type of manuals may not outweigh the savings of supervisor time.
A second limitation of the study is that we have only assessed the effects with two trainee participants. Future replication of these effects are necessary. In addition, it would be beneficial to assess the effects of training with individuals that are non-university students. For example, many Registered Behavioral Technicians® who implement EIBI procedures may not have formal education beyond a high school education. It is critical to assess how a training package such as ICT effects performance across several demographics.

An additional limitation of this study is that two sessions for Martha could not be assessed due to the video files being lost. The first session was the Receptive ID probe following Expressive ID training, and the second session was Gross Motor Imitation client probe. Therefore, Martha’s performance of those two programs with a confederate and a client were not assessed, and cannot be assumed to meet mastery criteria.

In conclusion, more research is needed to determine optimal designs and features of computer-based, self-paced manuals. However, using an autonomous electronic training method allows for reduced training time requirements and performance feedback from supervisors, which are key advantages to healthcare providers in clinical settings. Additionally, computer-based, self-paced manuals allow for flexibility to alter and change the training to suit particular job duties, provide trainees with independence to proceed at their own comfort and learning rate, and offer a variety of self-monitoring techniques so that trainees can evaluate their performance as they progress. Therefore, inorder to address the increasing demand for EIBI services and efficient training methods for novice therapists, using computer-based, self-paced
training programs may provide highly effective training solutions to EIBI providers and clinical settings.
APPENDIX A

OPERATIONAL DEFINITIONS OF DTI AND NATURALISTIC VARIABLES
<table>
<thead>
<tr>
<th>Dependent Measures</th>
<th>Operational Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Staff’s Behavior</strong></td>
<td></td>
</tr>
<tr>
<td>Correct prompting</td>
<td>If child engages in a mand that is below target level to request a desired object or activity, the therapist will engage in correct prompting sequence – wait, model, model (reinforce only when target occurs).</td>
</tr>
<tr>
<td>Reinforcement</td>
<td>Deliver item/activity after the child engages in target mand within 5 s + model language at the target level.</td>
</tr>
<tr>
<td>Model and Expand</td>
<td>In response to a child’s spontaneous non-target comment, the therapist will include child’s utterance into a more complete form by modeling the target level of communication that is relevant to the ongoing activity. The therapist will not provide a model more than 4 words greater than the target level.</td>
</tr>
<tr>
<td>Responsive Model</td>
<td>In response to a child’s spontaneous target comment, the therapist will model a similar phrase at the target level of communication that is relevant to the ongoing activity. The therapist will not provide a model more than 4 words greater than the target level.</td>
</tr>
<tr>
<td>Labeling</td>
<td>In response to a child’s interactions with an item, the therapist will label the activity (mapping) using target language. Examples could be labeling the child’s activity; the item child is vocalizing, pointing at, or holding up. Does not include praise, instructions, and questions from staff, prompt, labeling staff’s actions or commenting on participant’s clothing or on how the</td>
</tr>
</tbody>
</table>
participant looks (anything that was not initiated by child participant themselves).

Redirects
Therapist redirects child away from an activity/item initiated by the child. Anything within the theme of child’s initiation is not a redirect.

Questions
Therapists ask the child to label, describe, or answer a question about the properties of an item (e.g. questions about the child are permitted, such as, “Do you like these cups?” “Is this your favorite color” “Do you like to eat chips?”

Correct Communicative Temptation
Therapist sets up an environmental arrangement to get the child to engage in a request

Incorrect Communicative Temptation
Therapist restrains a child or takes an object away from the child to try to get them to request for access to the object they were engaged with

**Child’s Behavior**

**Target mand**
Child requests using responses in pre-determined response class. Includes answering question to “What do you want?”

**Non-target mand**
Child requests using a response that is below pre-determined response including gestures such as reaching, pointing, and pulling therapists hands towards an item. Does not include eye contact (unless otherwise specified by BCBA)

**Target comment**
Includes targets comments and intraverbals. Either labeling a nonverbal stimulus or engaging in a verbal exchange (not requesting information) with the therapist.
There must be at least 3 seconds between the therapists’ last utterance or child changes topics/activities. If child repeats a phrase repeatedly, only score the first until child varies the phrase.

**Non-target comment**

Includes targets comments and intraverbals child labels sing non-target level of language. Either labeling a nonverbal stimulus or engaging in a verbal exchange (not requesting information) with the therapist. There must be at least 3 seconds between the therapists’ last utterance or child changes topics/activities. If child repeats a phrase repeatedly, only score the first until child varies the phrase.

**Prompted target mand**

Verbal imitation of therapists’ model that is a direct replication.

**Prompted non-target mand**

Verbal imitation of therapists’ model that is not a direct replication of therapist’s target language OR verbal replication of therapist’s nontarget model that is a direct replication.
<table>
<thead>
<tr>
<th>Target Behavior</th>
<th>Operational Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before Session:</strong></td>
<td></td>
</tr>
<tr>
<td>1. Writes targets correctly</td>
<td>Writes correct targets an equal number of times, without writing the same target more than 2 consecutive times, and without repeating patterns (e.g., ball, cow, fork, ball, cow, fork,)</td>
</tr>
<tr>
<td>2. Fills out data sheet correctly</td>
<td>Writes date, initials, circles shift (AM/PM), and writes the correct condition that corresponds with the update sheet</td>
</tr>
<tr>
<td>3. Selects effective reinforcers</td>
<td>Gives a choice of several items, allowing the child to choose an item and engage briefly with the item before beginning OR selects a reinforcer that the child has indicated a STRONG preference for or is indicated as a program specific reinforcer on the update sheet</td>
</tr>
<tr>
<td><strong>SD:</strong></td>
<td></td>
</tr>
<tr>
<td>4. Begins trial within 5 seconds after Sr+ is removed</td>
<td>After the leisure item is removed, social interaction is also removed and Al starts the trial within 5 seconds. Al must make visible attempts to establish ready behavior to be considered the start of a new trial. This will not include writing notes or continuing to take data.</td>
</tr>
<tr>
<td>5. Establish “Ready Behavior”</td>
<td>Al uses at least one of the attention securing techniques and waits to present the stimuli &amp; instruction until the child is oriented toward the therapist or stimuli and is not engaging in disruptive movements of the limbs</td>
</tr>
<tr>
<td>6. Present the stimuli correctly</td>
<td>All targets are presented, evenly spaced and in line with one another, and are presented in a different order than the previous trial with the target in a different position</td>
</tr>
<tr>
<td>7. Clearly &amp; Accurately states SD</td>
<td>Al presents SD, exactly as indicated on protocol/changes sheet with the exception of an article (e.g., “touch cow” vs. “touch the cow”)</td>
</tr>
<tr>
<td>8. Waits correct delay for response</td>
<td>After presenting the SD, Al waits to restate SD, provide the prompt, remove stimuli, or deliver another instruction before 3 seconds elapses. If the confederate engages in an error response before 3 seconds elapses, and Al waits until the error response ends, score as correct</td>
</tr>
<tr>
<td><strong>Contr. Prompt</strong></td>
<td></td>
</tr>
<tr>
<td>10. Clearly &amp; Accurately states SD</td>
<td>See 7 (must occur in correct order)</td>
</tr>
<tr>
<td>11. Uses correct Contr. Prompt</td>
<td>Provides only the controlling prompt indicated on the update sheet</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>12. Contr. Prompt during or immediately following SD</td>
<td>Provides the controlling prompt while stating the SD or immediately following. Score as incorrect if more than 2 seconds elapse between the SD and the controlling prompt.</td>
</tr>
<tr>
<td>13. Waits correct delay for response</td>
<td>See 8</td>
</tr>
<tr>
<td><strong>E/NR to Contr. Prompt</strong></td>
<td></td>
</tr>
<tr>
<td>14. Re-states SD</td>
<td>See 9</td>
</tr>
<tr>
<td>15. Clearly &amp; Accurately states SD</td>
<td>See 7</td>
</tr>
<tr>
<td>16. Physically guides response during or immediately following SD</td>
<td>Physically guides the correct response if no response or an error, is made to the controlling prompt</td>
</tr>
<tr>
<td><strong>Reinforcement/End of Trial</strong></td>
<td></td>
</tr>
<tr>
<td>17. Immediately delivers Sr+ &amp; praise (after correct/prompt)</td>
<td>Verbal praise and the reinforcer are delivered immediately following correct and prompted responses (within 3 s). Score as incorrect if Sr+ is provided following challenging behavior</td>
</tr>
<tr>
<td>18. Removes stimuli</td>
<td>Stimuli are removed following the completion of a trial (within 3s)</td>
</tr>
<tr>
<td>19. Immediately &amp; Accurately records data (after Sr+ given)</td>
<td>AI circles the correct codes on the data sheet before presenting the next trial</td>
</tr>
<tr>
<td><strong>Challenging Behavior (CB)</strong></td>
<td></td>
</tr>
<tr>
<td>20. Gives minimal attention to disruptive behavior</td>
<td>AI keeps a neutral facial expression and does not make any comments about the disruptive behavior.</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
</tr>
<tr>
<td>21. Re-assesses preference *if needed</td>
<td>If child appears to be disinterested in the Sr+, AI offers new choices and allows the child to select a new item. If the child requests or indicates a preference for a specific toy, the AI gives access to the toy and starts to use it as the Sr+ for trials following</td>
</tr>
<tr>
<td>Moves to next trial without Sr+ (GMI, EXP, IV)</td>
<td>Score as + if the instructor moves on without re-presenting the SD and/or a prompt for the same response and does NOT give the Sr+ following a NR/E to the 1st presentation of the controlling prompt</td>
</tr>
<tr>
<td></td>
<td>Score as – if the instructor re-presents the SD and/or prompt for the same response following after 3+ seconds following the controlling prompt sequence (this could include a re-stating of the SD without the prompt due to AI error on previous steps)</td>
</tr>
<tr>
<td>If AI re-states the SD or prompts more than 1 time after the original SD, score as -</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B

DTI CONFEDERATE SCRIPTS AND CHECKLIST
Receptive Identification of Objects

For this task, we will role play a discrete trial teaching session; you will play the role of the AI, attempting to teach a child with autism. I will play the role of the child. Use discrete trial teaching at a 3-second constant time delay to teach the program, Receptive Identification of objects [researcher points to title of update sheet in trainee binder]. Across 12 trials, try to teach me to point to each object when it is named: stimulus 1 name, stimulus 2 name, stimulus 3 name [researcher points to each object’s name on the update sheet]. Here is a sheet with the explanation of terms you will see on the update sheet for your reference [researcher points to reference sheet], some toys you may use if you would like [researcher points to the bucket of toys], the stimuli you will need [researcher points to the set of three stimuli], the update sheet [the researcher points to the update sheet], a datasheet [the researcher points to the trainee’s datasheet], and a pencil. Take 5 minutes to prepare for your session and let me know when you are ready to begin.

Expressive Identification of Objects

For this task, we will role play a discrete trial teaching session; you will play the role of the AI, attempting to teach a child with autism. I will play the role of the child. Use discrete trial teaching at a 3-second constant time delay to teach the program, Expressive Identification of objects [researcher points to title of update sheet in trainee binder]. Across 12 trials, try to teach me to name each object when it is shown: stimulus 1 name, stimulus 2 name, stimulus 3 name [researcher points to each object’s name on the update sheet]. Here is a sheet with the explanation of terms you will see on the update sheet for your reference [researcher points to reference sheet], some toys you may use if you would like [researcher points to the bucket of toys], the stimuli you will need [researcher points to the set of three stimuli], the update sheet [the researcher points to the update sheet], a datasheet [the researcher points to the trainee’s datasheet], and a pencil. Take 5 minutes to prepare for your session and let me know when you are ready to begin.

Gross Motor Imitation

For this task, we will role play a discrete trial teaching session; you will play the role of the AI, attempting to teach a child with autism. I will play the role of the child. Use discrete trial teaching at a 3-second constant time delay to teach the program, Gross Motor Imitation [researcher points to title of update sheet in trainee binder]. Across 12 trials, try to teach me to do each action: action 1 name, action 2 name, action 3 name [researcher demonstrates each action listed on update sheet]. Here is a sheet
For this task, we will role play a discrete trial teaching session; you will play the role of the AI, attempting to teach a child with autism. I will play the role of the child. Use discrete trial teaching at a 3-second constant time delay to teach the program, Intraverbals [researcher points to title of update sheet in trainee binder]. Across 12 trials, try to teach me to answer each question when it is asked: question 1 and target response, question 2 and target response, question 3 and target response [researcher points to each answer on the update sheet]. Here is a sheet with the explanation of terms you will see on the update sheet for your reference [researcher points to reference sheet], some toys you may use if you would like [researcher points to the bucket of toys], the update sheet [the researcher points to the update sheet], a datasheet [the researcher points to the trainee’s datasheet], and a pencil. Take 5 minutes to prepare for your session and let me know when you are ready to begin.

Intraverbals

For this task, we will practice a discrete trial teaching session with one of our actual clients here at KFAC named [client’s name]. You will attempt to teach him/her the best you can. Use discrete trial teaching at a 3-second constant time delay to teach [client’s name] the program [program name]. Across 12 trials, try to teach him/her to [target response] when [discriminative stimulus]. Here is a sheet with the explanation of terms you will see on the update sheet for your reference [researcher points to reference sheet], some toys you may use if you would like [researcher points to the bucket of toys], the stimuli you will need [researcher points to the set of three stimuli], the update sheet [the researcher points to the update sheet], a datasheet [the researcher points to the trainee’s datasheet], and a pencil. Additionally, feel free to use any toys in the room or toys the client brings with them. Take 5 minutes to prepare for your session and then I will bring in [client’s name], and you may begin.

Client Probes
Confederate Checklist: Response Type Distribution

*Discrete Trial Instruction*

**Session #:**

__________

**Program:**

________________

**Data Collector:**

__________

Confederate:

_____

- □ Primary
- □ Secondary

<table>
<thead>
<tr>
<th>Response Types across Session</th>
<th>Before SD</th>
<th>After SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct (4X)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrong (2X)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrong w/CB:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Response (2X)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Response w/CB:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scroll (2X)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Touch 2 (2X) <em>Self-Correct for GMI, EXP, IV</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swiping stimuli (1X)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elope from table w/flop (1X)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protest (1X)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crying/Whining (1X)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Attending before trial (1X): Require only 1 method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Attending before trial (1X): Require 2-3 methods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Response to Contr. Prompt (1X) <em>Only if prompt is given</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error to Contr. Prompt (1X) <em>Only if prompt is given</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disinterest in reinforcer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX C

UPDATE SHEET, DEFINITIONS SHEET, AND TRAINEE’S DATASHEET
Program: **Gross Motor Imitation**
- **SD:** "Do this" while engaging in target action
- **Setup:** Run at a table
- **Other:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Initial</th>
<th>Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/16</td>
<td>JEH</td>
<td>Targets: clap hands, kneel behind, tag&lt;br&gt;Reinforcement: 5 responses&lt;br&gt;Condition: B C T D&lt;br&gt;Contr. Prompt: full physical guidance&lt;br&gt;Other: (unprompted)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Targets:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reinforcement:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Condition:</td>
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<tr>
<td></td>
<td></td>
<td>Contr. Prompt:</td>
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<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Targets:</td>
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<tr>
<td></td>
<td></td>
<td>Reinforcement:</td>
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<tr>
<td></td>
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<td>Other:</td>
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<tr>
<td></td>
<td></td>
<td>Condition:</td>
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<tr>
<td></td>
<td></td>
<td>Contr. Prompt:</td>
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<td></td>
<td>Targets:</td>
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<td>Reinforcement:</td>
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<td>Other:</td>
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<td>Condition:</td>
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<td>Contr. Prompt:</td>
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<td>Targets:</td>
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<td>Reinforcement:</td>
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<td>Other:</td>
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<tr>
<td></td>
<td></td>
<td>Condition:</td>
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<td></td>
<td></td>
<td>Contr. Prompt:</td>
</tr>
</tbody>
</table>

012 J.DOE
Discrete Trial Teaching: Definitions

3-second Constant Time Delay (3s CTD):
- The amount of time that should pass before a prompt is given

SD:
- The instruction or event that precedes the task

Targets:
- The responses being taught

Controlling Prompt (Contr. Prompt):
- Assistance provided to increase the likelihood that a correct response will occur

Model Prompt:
- Assistance provided by the instructor, in which the instructor makes the motion that is an example of what the correct response should be, such as pointing to the correct stimulus

Vocal Prompt:
- Assistance provided by the instructor, in which the instructor makes the vocalization that is an example of what the correct response should be, such as saying the correct response

Full Physical Guidance:
- Assistance provided by the instructor, in which the instructor physically guides the child’s body entirely through the correct motion

Reinforcement:
- An item or activity following a response that makes the response more likely to occur in the future
APPENDIX D

DTI DATASHEETS
Trainee Step Implementation Data Sheet  
Extreme Trial Instruction: *Receptive Identification*

<table>
<thead>
<tr>
<th>Session #:</th>
<th>Program:</th>
<th>Data Collector:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

- **Confederate:**___________  
- **Client:**________________

- **Condition:**___________  
- **Ctr.Prompt:**___________

- **Primary**  
- **Secondary**

<table>
<thead>
<tr>
<th>Trials</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>Total (+)</th>
</tr>
</thead>
</table>

**Before Session:**

1. Writes targets correctly
2. Fills out data sheet correctly
3. Assesses preference to select Sr+

**SD:**

4. Begins trial within 5 seconds after Sr+ is removed
5. Establish “Ready Behavior”
6. Present the stimuli correctly
7. Clearly & Accurately states SD
8. Waits correct delay for response

**Controlling Prompt:**

10. Clearly & Accurately states SD
11. Uses correct Controlling Prompt
12. Contr. Prompt during or immediately following SD
13. Waits correct delay for response

**E/NR to Contr. Prompt**

14. Re-states SD
15. Clearly & Accurately states SD
16. Physically guides response during or immediately following SD
<table>
<thead>
<tr>
<th>Trials</th>
<th></th>
<th></th>
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<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinforcement/End of Trial</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td>(+)</td>
</tr>
<tr>
<td>17. Immediately delivers Sr+ &amp; praise contingent upon correct response</td>
<td></td>
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<tr>
<td>18. Removes stimuli</td>
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</tr>
<tr>
<td>19. Immediately &amp; Accurately records data (after Sr+ given)</td>
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<tr>
<td>Challenging Behavior</td>
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<tr>
<td>20. Gives minimal attention to disruptive behavior</td>
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<tr>
<td>Other</td>
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</tr>
<tr>
<td>21. Re-assesses preference *if needed</td>
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<td>Notes:</td>
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<tr>
<td>Areas of strength:</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Areas targeted for growth:</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Trainee Step Implementation Data Sheet
Discrete Trial Instruction: Expressive Identification

Session #: ____________________  Program: ________  Data Collector: ________
□ Confederate: _______________  Condition: ________  □ Primary
□ Client: _________________  Ctr. Prompt: __________  □ Secondary

<table>
<thead>
<tr>
<th>Tr</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>Total (+)</th>
</tr>
</thead>
</table>

Before Session:
1. Writes targets correctly
2. Fills out data sheet correctly
3. Assesses preference to select Sr+

SD:
4. Begins trial within 5 seconds after Sr+ is removed
5. Establish “Ready Behavior”
6. Present the stimuli correctly (present and indicate toward 1 obj.)
7. Clearly & Accurately states SD (“What is it?” or “What’s this?”)
8. Waits correct delay for response

Controlling Prompt:
10. Clearly & Accurately states SD
11. Uses correct Controlling Prompt (“[target]” or “say [target]”)
12. Contr. Prompt during or immediately following SD
13. Waits correct delay for response

E/NR to Contr. Prompt
14. Moves to next trial without Sr+ period

Reinforcement/End of Trial
15. Immediately delivers Sr+ & praise contingent upon correct response
16. Removes stimuli
17. Immediately & Accurately records data (after Sr+ given)

**Challenging Behavior**
18. Gives minimal attention to disruptive behavior

**Other**
19. Re-assesses preference *if needed

**Notes:**

<table>
<thead>
<tr>
<th>Areas of strength:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Areas targeted for growth:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
Trainee Step Implementation Data Sheet  
*Discrete Trial Instruction: Intraverbals*

**Session #:** __________________  
**Program:** ____________  
**Data Collector:** ________

- ☐ Confederate:__________  
- ☐ Client:______________  
- ☐ Primary  
- ☐ Secondary

<table>
<thead>
<tr>
<th>Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7 8 9 10 11 12</td>
</tr>
</tbody>
</table>

**Before Session:**
1. Writes targets correctly
2. Fills out data sheet correctly
3. Assesses preference to select Sr+

**S^D:**
4. Begins trial within 5 seconds after Sr+ is removed
5. Establish “Ready Behavior”
6. Clearly & Accurately states S^D ("[target question]")
7. Waits correct delay for response

**Controlling Prompt:**
9. Clearly & Accurately states S^D
10. Uses correct Controlling Prompt ("[target]" or "say [target]")
11. Contr. Prompt during or immediately following S^D
12. Waits correct delay for response

**E/NR to Contr. Prompt**
13. Moves to next trial without Sr+ period

<table>
<thead>
<tr>
<th>Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7 8 9 10 11 12</td>
</tr>
</tbody>
</table>

**Reinforcement/End of Trial**
14. Immediately delivers Sr+ & praise contingent upon correct
response

15. Immediately & Accurately records data (after Sr+ given)

<table>
<thead>
<tr>
<th>Challenging Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Gives minimal attention to disruptive behavior</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Re-assesses preference *if needed</td>
</tr>
</tbody>
</table>

**Notes:**

<table>
<thead>
<tr>
<th>Areas of strength:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Areas targeted for growth:</th>
</tr>
</thead>
</table>
# Trainee Step Implementation Data Sheet

**Discrete Trial Instruction: Motor Imitation**

<table>
<thead>
<tr>
<th>Session #:</th>
<th>Program:</th>
<th>Data Collector:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tbody>
</table>

- **Confederate:**
- **Client:**

- **Condition:**
- **Ctr. Prompt:**

- **Primary**
- **Secondary**

<table>
<thead>
<tr>
<th>Trials</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>Total (+)</th>
</tr>
</thead>
</table>

### Before Session:

1. Writes targets correctly
2. Fills out data sheet correctly
3. Assesses preference to select Sr+

### SD:

4. Begins trial within 5 seconds after Sr+ is removed
5. Establish “Ready Behavior”
6. Clearly & Accurately states SD (says, “Do this” + models action)
7. Waits correct delay for response

### Controlling Prompt:

9. Clearly & Accurately states SD (says, “Do this” + models action)
10. Uses correct Controlling Prompt
11. Contr. Prompt during or immediately following SD
12. Waits correct delay for response

### E/NR to Contr. Prompt

13. Moves to next trial without Sr+ period

### Reinforcement/End of Trial

14. Immediately delivers Sr+ & praise contingent upon correct response
15. Immediately & Accurately records data (after Sr+ given)  

**Challenging Behavior**

16. Gives minimal attention to disruptive behavior  

**Other**

17. Re-assesses preference *if needed  

**Notes:**

**Areas of strength:**

**Areas targeted for growth:**
APPENDIX E

TREATMENT INTEGRITY CHECKLISTS
Confederate Checklist: Response Type Distribution

<table>
<thead>
<tr>
<th>Session #:</th>
<th>Program:</th>
<th>Data Collector:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Confederate: ______

<table>
<thead>
<tr>
<th>Response Types across Session</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

☐ Primary

☐ Secondary
<table>
<thead>
<tr>
<th>Behavior</th>
<th>Before SD</th>
<th>After SD</th>
<th>Y</th>
<th>N</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct (4X)</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Wrong (2X)</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Wrong w/CB:__________________</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>No Response (2X)</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>No Response w/CB:</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Scroll (2X)</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Touch 2 (2X) *Self-Correct for GMI, EXP, IV</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Swiping stimuli (1X)</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
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<tr>
<td>Elope from table w/flop (1X)</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Protest (1X)</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Crying/Whining (1X)</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Not Attending before trial:</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Require only 1 method</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Not Attending before trial:</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Require 2-3 methods</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>No Response to Contr. Prompt</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>*Only if prompt is given</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>Error to Contr. Prompt</td>
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<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
</tr>
<tr>
<td>*Only if prompt is given</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
<td>NA</td>
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<tr>
<td>Disinterest in reinforcer</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
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### Naturalistic Corrective Feedback Summaries

<table>
<thead>
<tr>
<th>Trainee</th>
<th>Module 1</th>
<th>Module 2</th>
<th>Module 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Martha</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Always respond with a repeat of the child’s target comment</td>
<td>When providing a reinforcer for a target mand, always repeat what client said.</td>
<td>No feedback required.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If client interacts with an object and is making</td>
<td></td>
</tr>
<tr>
<td>Crystal</td>
<td>Increase labeling amount and always label at the target level of language. When labeling, talk about the item rather than saying, “My turn”</td>
<td>When providing a reinforcer for a target mand, always repeat what client said. Increase frequency of labels</td>
<td>Model and expand following every non-target comment. Always respond at the target level of language. Increase frequency of labels</td>
</tr>
</tbody>
</table>
REFERENCES


Leaf, J. B., Leaf, R., McEachin, J., Taubman, M., Ala’i-Rosales, S., Ross, R. K., … & Weiss, M. J. (2016). Applied behavior analysis is a science and, therefore,


