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Extending Brief Error-Correction Assessments to Adults with Intellectual or Developmental Disabilities

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Extending Brief Error-Correction Assessments to Adults with Intellectual or Developmental Disabilities

by

J Turner B. Braren

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Applied Behavior Analysis Department of Child and Family Studies College of Behavioral and Community Sciences University of South Florida

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Keywords: adults, assessment, discrete-trial instruction, error correction, intellectual and developmental disabilities

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DEDICATION

This thesis is dedicated to my family. Thank you for your unwavering support and patience throughout the completion of this research. To Frank, thank you for always providing a listening ear.
ACKNOWLEDGMENTS

I would like to express my sincere gratitude to my advisor, Dr. Andrew Samaha, for his guidance and patience throughout the thesis process. It was an honor to be one of your students and I wish you all the best in your future endeavors. I would also like to thank Dr. Sarah Bloom and Dr. Catia Cividini-Motta for your knowledge and encouragement. I am confident that all of your mentorship has provided me with the tools necessary to pursue research in the future.

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ABSTRACT

We extended the results of Carroll, Owsiany, and Cheatham (2018) by evaluating the predictive validity of a brief error-correction assessment (brief assessment) in adults with intellectual or developmental disabilities. A brief assessment and validation assessment were conducted for each participant, where the efficiency and intrusiveness of six error-correction procedures (ECP) were compared when teaching participants to assemble arbitrary Lego structures. During Phase 1, we evaluated whether we obtained orderly acquisition data during the brief and validation assessments and evaluated overall correspondence between the brief and validation assessments. During Phase 2, we developed an empirical decision-making model to identify the most relevant and predictive dependent measures related to acquisition and intrusiveness. During Phase 3, the model discussed in Phase 2 was applied to identify a target ECP for efficiency and target ECP for intrusiveness for each learner. In general, there was low correspondence between target ECPs identified during the brief assessment and the ECP identified during the validation assessment using the same decision-making model. However, results show overall correspondence between data collected on 11 dependent measures during brief and validation assessments across people, error-correction procedures, and dependent variables.
CHAPTER ONE:
INTRODUCTION

Discrete-trial instruction (DTI) is a multi-component treatment package used to teach individuals with intellectual and developmental disabilities (IDD) a variety of skills including communication, social interaction, and self-care (Smith, 2001). During a typical DTI procedure, the instructor presents a discriminative stimulus, the learner responds, and the instructor delivers reinforcement (e.g., praise, edibles) contingent on correct responding. If the learner engages in an error, the instructor implements an error-correction procedure (ECP; Smith, 2001). Research on DTI shows that the inclusion of ECPs contingent on incorrect responding increases the rate of acquisition for individuals with IDD (e.g., Barbetta, Heward, & Bradley, 1993; Carroll, Joachim, St. Peter, & Robinson, 2015; Rodgers & Iwata, 1991; Worsdell et al., 2005). However, the level of intrusiveness across ECPs varies.

Error-correction procedures that require the learner to engage in a correct response one or more times following an error are considered more intrusive than ECPs that do not require the learner to engage in a correct response (McGhan & Lerman, 2013). Also, ECPs often include prompt hierarchies that affect the intrusiveness of the procedure (e.g., Seaver & Bourret, 2014; West & Billingsley, 2005). Prompting levels within these prompt hierarchies require different therapist responses, ranging from minimally intrusive (e.g., repeating instruction) to most intrusive (e.g., hand over hand guidance; West & Billingsley, 2005). In addition, research
comparing ECPs of varying levels of intrusiveness have shown that multiple ECPs are similarly effective and efficient in reducing or preventing errors in individual learners (e.g., Rodgers & Iwata, 1991; Wordsell et al., 2005). Therefore, researchers have developed assessments that allow practitioners to consider effectiveness, efficiency, or intrusiveness when choosing an ECP for a particular client, and in some cases maximize each (Carroll et al., 2015; Carroll Owsiany, & Cheatham, 2018; Kodak et al., 2016; McGhan & Lerman, 2013).

The predicative validity of the error-correction assessment is evaluated by determining the correlation between the results of the error-correction assessment and the results of validation assessments. Previous studies have shown a high correspondence between error-correction assessments and validation assessments (Carroll et al., 2018; McGhan & Lerman, 2013). However, error-correction assessments can be lengthy to conduct (Carroll et al., 2018).

To that end, Carroll et al. (2018) developed a brief error-correction assessment (brief assessment) to reduce the duration of the error-correction assessment. In previous studies, researchers conducted training sessions during the error-correction assessment until participants reached a pre-specified mastery criterion for target responses in one or more ECPs (Carroll et al., 2015, Kodak et al., 2016; McGhan & Lerman, 2013). This approach can require a substantial number of training trials for some participants, and cumulative durations of error-correction assessments ranged from 2 to 22 hr (Carroll et al., 2015; Kodak et al., 2016; McGhan & Lerman, 2013). Carroll et al. (2018) reduced the duration of the assessment by conducting five training trials or fewer if the participant met a criterion for correct responding. Results from Carroll et al. (2018) showed high correspondence between the brief assessment and one or more validation assessments for two of the four participants, and partial correspondence for the remaining two
participants. In addition, brief assessments took an average of 2.6 hr (range, 1.7 hr -3.6 hr) to complete. Thus, the brief assessment developed by Carroll et al. (2018) provides a practical and time-sensitive tool to identify the most effective and efficient ECP for individual learners.

Carroll et al. (2018) evaluated three dependent variables including frequency of correct responses, frequency of errors, and frequency of error-correction trials when identifying the target ECP for each learner. However, Carroll et al. (2018) provided little rationale for why these particular variables were evaluated, and if these variables were equally important in determining the effectiveness and efficiency of an ECP. In addition, Carroll et al. (2018) assigned arbitrary scores from 1 – 5 (1 being low and 5 being high) to each ECP, which may have inadvertently masked the true differences in responding during each condition. Finally, because Carroll et al. (2018) terminated the brief assessment following the first condition to meet mastery criterion, other conditions that met termination criterion on a later session were less likely to be identified as the target ECP. Therefore, further research is needed to refine procedures used to identify a target ECP for each learner.

The generality of Carroll et al. (2018) and other studies that have evaluated the predicative validity of error-correction assessments (e.g., Carroll et al., 2015, Kodak et al., 2016; McGhan & Lerman, 2013) may also be limited due to skills targeted and the young ages of the participants (ages 3- to 10-years-old). Behavior targeted for skill acquisition included vocal-verbal responses (i.e., reading sight words) and matching-to-sample targets that required participants to engage in low-effort motor responses (e.g., pointing to target). Other functional skills commonly taught using DTI (e.g., leisure skills, daily-living skills), require the participant to engage in a motor response or a chain of motor responses.
Research comparing the effectiveness of response prompts (e.g., ECPs) when teaching skills that require a motor response often include least-to-most prompt hierarchies (LTM) and most-to-least prompt hierarchies (MTL) with and without a delay (e.g., McKay, Weiss, Dickson, & Ahern, 2014; Seaver & Bourret, 2014). Although LTM and MTL prompt hierarchies can increase the rate of acquisition of skills for individuals with IDD (e.g., Libby, Weiss, Bancroft, & Ahearn, 2008), the delivery of intrusive prompts (e.g., physical guidance) when implementing these procedures may increase problem behavior (Heckaman, Alber, Hooper, & Heward, 1998; McKay et al., 2014). The occurrence of problem behavior during work may be of particular concern when working with adults with IDD, because the severity of their problem behavior may discourage caregivers from teaching them appropriate replacement skills due to fear of injury (Hastings & Brown, 2000).

Adults with IDD often display deficits in leisure and daily-living skills that limit their independence and participation within the community (Belva & Matson, 2013; Wilson, Arnold, Rowland & Burnham, 1997). However, these individuals often require systematic interventions to acquire and maintain these skills (Wilson et al., 1997). For example, Symon (2001) state that individuals with IDD may engage in abnormal behaviors during leisure times if not explicitly taught leisure skills. Nonetheless, staff in residential and day program settings may find it challenging to teach these skills to adults with IDD due to the cognitive impairments and behavioral problems that are common to this population (Van Bourgondien & Elgar, 1990). Furthermore, Cannella-Malone et al. (2006) noted that caregivers in inpatient facilities and group homes tend to assist individuals with in completing these tasks without attempting to prompt the individual to complete it on their own. These results highlight the need to teach functional skills to adults with IDD, because failing to do so may limit the independence of the individual.
The purpose of this study was to extend the research of Carroll et al. (2018) by evaluating the predicative validity of a brief assessment for identifying the most efficient or least intrusive ECP for adults with IDD. We compared the efficiency and intrusiveness of six different conditions when teaching leisure skills that require a motor response (e.g., assembling Lego structures). Data collected during this study were analyzed in three phases. During Phase 1, we evaluated whether we obtained orderly acquisition data during the brief and validation assessments for each participant and we evaluated the overall correspondence between the brief and validation assessments. Like Carrol et al. (2018), we wanted to develop and evaluate a decision-making model that might allow clinicians to use information from the brief assessment to make the most-informed decisions. However, Carrol et al. (2018) provided little in any rationale or justification for the model they presented. In contrast, we wanted to explore an empirical approach to developing a decision-making model and then evaluate its efficacy. Hence, during Phase 2, we developed a model for identifying the most relevant and predictive dependent measures related to acquisition (e.g., correct responding, errors) and intrusiveness (e.g., number of prompts delivered, protests). During Phase 3, the model identified in Phase 2 was applied to identify a target ECP for efficiency and target ECP for intrusiveness for each learner.
CHAPTER 2:

METHOD

Participants

Four adults with IDD participated in this research. All participants were able to follow 1-step directions and sit at a table and complete work with minimal or no problem behavior. Each participant’s legal authorized representative(s) reported deficits in functional skills that required a motor response (e.g., daily-living skills, leisure skills, vocational skills). None of the adults had motor impairments that competed with assembling Legos given support. All participants except Ann were receiving behavioral services at the time of the study. However, the participants that continue to receive behavioral services (i.e., Ron, Leslie, and Tom) have not received DTI for at least one year prior to the start of the study.

Ron was a 33-year-old male diagnosed with a mild-moderate intellectual disability who had a speech impediment but communicated vocally and in three- to five-word phrases. Leslie was a 23-year-old female diagnosed with autism spectrum disorder (ASD) who communicated vocally and in complete sentences. Leslie was also diagnosed with a sensory deficit disorder, but this did not affect her responding when assembling Legos. Ann was a 21-year-old female diagnosed with Down syndrome who communicated vocally in three- to five-word phrases. Tom was a 20-year-old male diagnosed with pervasive developmental delay and ASD who communicated vocally in complete sentences.

Each adult completed a cognitive impairment assessment prior to participating in this
research (see Appendix A). Eight questions were asked on the cognitive impairment assessment including (a) What is your name? (b) How old are you? (c) What day is it? (d) Who are we? (e) Do you have to participate in this study? (f) How long will you be participating in this study? (g) Do you engage in problem behavior? and (h) What do you say if you do not want to participate in this study. Adults were considered capable of providing assent if they provided a correct response vocally for six out of eight questions. All four participants passed the cognitive impairment assessment and signed for assent.

Setting

For a given participant, assessments were conducted in the same setting. Assessments for Ron and Leslie were conducted in a common area at their respective group homes. Staff and residents intermittently entered and left the common area at their discretion. Sessions for Ron and Leslie were conducted over the weekend when no activities were typically scheduled.

For Tom and Ann, sessions were conducted in a classroom at a post-secondary transition program for young adults. Sessions were conducted at the back of a classroom during instruction. Therefore, teachers and students engaged in class discussion at the front of the class during session.

Materials

Different colored shirts and matching mats were used to enhance discrimination between conditions. An array of edible stimuli was assessed using a multiple stimulus without replacement (MSWO) preference assessment (DeLeon & Iwata, 1996). Edible stimuli identified as highly preferred were delivered contingent on correct responding during the intervention phase of each assessment. Sessions were conducted at a table with two chairs for the therapist and participant respectively. Data were collected using paper and pencil (see
Appendix B for a sample data sheet). A video camera was used to record sessions when a second observer was not available.

Functional skills (e.g., leisure skills and daily-living skills) vary in the materials needed and complexity of motor responses required to complete each task, which can create challenges for researchers in selecting targets to teach during comparison studies that are equal in difficulty and complexity (Libby et al., 2008). Therefore, assembling arbitrary Lego structures consisting of the same number of pieces was chosen as the target behavior for this study, so that the difficulty and complexity of each skill targeted during intervention was comparable. During brief and validation assessments, three Lego pieces of various shapes, colors, and type (e.g., figure, brick, etc.) were presented prior to each trial. Each target Lego piece varied in the number pieces it consisted of and ranged from a single piece to multi-piece structures (e.g., pre-made car). Structures were developed by the primary investigator based on no external reference and therefore likely to be novel for each participant. Target Lego structures were randomly assigned to each condition prior to brief and validation assessments.

**Dependent Measures**

To compare ECPs, a set of 3 Lego structures were identified to teach participants during each condition. While teaching skills, data collectors recorded (a) correct responses, defined as the participant independently picking up and placing Legos to create the target Lego structure within 5-s of the initial instruction. Data were collected on the accuracy of the terminal response, and not the order each Lego piece was assembled to create the target Lego structure; (b) total correct responses, defined as the sum of independent correct responses following the initial instruction and correct responses made following the re-presentation of the trial during error-correction; (c) errors, defined as the participant using any part of their hand to engage in a
motor response other than the target response within 5-s of the initial instruction; (d) total errors, defined as the sum of errors made following the initial instruction, errors made following a model prompt, and errors made following the re-presentation of the trial during error-correction; (e) no responses, defined as failing to respond within a 5-s prompt delay; (f) model prompts, defined as the therapist providing a model of the correct response following a participant error. If the participant connected two out of three target Lego pieces correctly, the therapist provided praise to the participant for correctly assembling two target Lego pieces and provided a partial model prompt, where the therapist demonstrated how to correctly connect the final target Lego piece; (g) physical prompts, defined as the therapist manually guiding the participant by the forearm until a correct response was made; (h) total prompted responses, defined the sum of model and physical prompts; (i) protests, defined as statements made by the participant related to the difficulty of assembling Legos (e.g., “I can’t do this one”), receiving assistance from the therapist (e.g., “I don’t need any help”), gaining access to edibles (e.g., “Do I get a chip?”), and gaining access to breaks (e.g., “How many more left?”); (j) cumulative session duration, defined as the sum of all session durations across an assessment for a particular condition. Session duration was defined as the length of time between the therapist’s initial instruction during the first trial and either the participant’s response during the twelfth trial (baseline) or the completion of the therapist’s feedback procedure during the twelfth trial (intervention); (k) duration to mastery, defined as the cumulative session duration needed to meet brief or validation mastery criterion; (l) sessions to mastery, defined as the number of sessions conducted to reach brief or validation mastery criterion; and (m) trials to mastery, defined as number of trials (including error-correction trials) required to reach brief or validation mastery criterion. The definition for an error-correction trial varied across ECPs and are described below. Duration to mastery, trials
to mastery, and sessions to mastery were left undefined for conditions in which mastery criterion was not met.

**Assessment**

**Indirect assessment.** Each participant’s legal authorized representative (LAR) was asked to fill out a demographic questionnaire (see Appendix C) to identify age, diagnoses, and participant’s history with receiving applied behavior analytic services.

**Preference assessment.** A MSWO preference assessment (DeLeon & Iwata, 1996) was conducted prior to this research to identify edible reinforcers. The therapist began each session by placing five edible stimuli in a straight line on the table and instructing the participant to select one. Contingent on the participant selecting an edible stimulus, the therapist delivered the edible stimulus to the participant. The selected edible stimulus was not replaced for the remainder of the session. Prior to the next trial, the therapist rearranged the remaining edible stimuli by moving the left most edible stimulus to the far-right end of the line and shifting the other edible stimuli so that they were equally spaced (i.e., approximately 0.3 m apart). The therapist continued this procedure until all of the edible stimuli had been selected or the participant did not select an edible stimulus within 30 s of the instruction being delivered. Figures 1 to 4 show the results for each participant’s MSWO preference assessment.
Figure 1. MSWO preference assessment results for Ron.

Figure 2. MSWO preference assessment results for Leslie
Figure 3. MSWO preference assessment results for Ann

Figure 4. MSWO preference assessment results for Tom
**Play skills assessment.** We identified deficits in a participant’s Lego skills using a list of Lego structures (see Appendix D for sample pictures of Lego structures and Appendix E for an example datasheets). At the start of each trial during the play skills assessment, the therapist presented a dissembled Lego structure, gained the attention of the participant, and delivered a general instruction (e.g., “Play with the Legos,” or something similar). The therapist delivered no differential consequences contingent on the participant’s engaging in a correct response or an error. If the participant did not respond within 5 s of the therapist’s instruction, then the therapist re-presented the instruction every 5 s until the participant engaged in either a correct response or an error. This procedure was implemented to better evaluate the participant’s skill in assembling individual structures.

A Lego structure was included in brief and validation assessments if the participant engaged in an error for two consecutive trials or engaged in a correct response for an average of 33% of trials. Lego structures were evaluated until at least 36 targets were identified as deficits. For all participants except Ron, the therapist did not reassess a Lego structure if the participant engaged in a correct response and continued to assess other Lego structures. Figures 5 to 8 show the results for each participant’s play skills assessment.
Figure 5. Leisure skills assessment results for Ron.
Figure 6. Leisure skills assessment results for Leslie.
Figure 7. Leisure skills assessment results for Ann.
Figure 8. Leisure skills assessment results for Tom.
Interobserver Agreement

Reliability data was collected by a second observer for an average 37% of assessment sessions for each participant to assess reliability of the data collection system. Interobserver agreement (IOA) was calculated trial-by-trial by taking the number of exact agreements in a session, dividing it by the total number of agreements plus disagreements, and converting the result to a percentage. An agreement was scored if both observers recorded the same participant response on a specific trial. A disagreement was scored if observers recorded different participant responses on a trial (e.g., the primary observer scored the response as a no response and the secondary observer scored the response as an error). Observers’ data on the duration of each session was also compared. An agreement was scored if both observers recorded the same time within a 5-s window. If a second observer was not available to collect data, the therapist videoed session, and graduate students scored IOA via video recordings. The average IOA scores for each participant were 94% (range, 92%-100%) for Ron, 96% (range, 92%-100%) for Leslie, 99% (range, 92%-100%) for Ann, and 98% (range, 92%-100%) for Tom.

Treatment Integrity

Graduate students trained on the DTI procedures assessed the therapist’s treatment integrity an average of 37% of sessions per participant. Fidelity checklists (See Appendices F and G) were used to assess treatment integrity. Treatment integrity was calculated by dividing the number of steps correct by the number of total steps and multiplying by 100 to obtain a percentage. The average treatment integrity scores for each participant were 99% (range, 90%-100%) for Ron, 100% for Leslie, 99% (range, 91%-100%) for Ann, and 100% for Tom.

Experimental Design and General Procedure

A multielement design was used to compare the effectiveness, efficiency, and
intrusiveness of six commonly used ECPs when teaching participants to assemble arbitrary Lego structures using DTI. A total of 36 Lego structures were used as target responses: eighteen Lego structures were targeted during the brief assessment and a different set of 18 Lego structures were targeted during the validation assessment. Three target responses were randomly assigned to each of the six conditions.

Sessions consisted of 12 trials: three skills targeted four times in pseudo-random order. Prior to each session, therapists put on a predetermined colored shirt and placed a matching colored mat on the table that was specific to each condition, so as to enhance discrimination between conditions. A 5-s prompt delay was used to allow the participant an opportunity to respond following instruction. All correct responses during the intervention phase were reinforced with praise and edible reinforcement across brief and validation assessments.

**Baseline.** Therapists conducted at least two baseline sessions per condition prior to each assessment. Therapists collected baseline data until the participant’s responding was stable, and at or below chance levels. The therapist delivered no differential consequences if the participant engaged in a correct response, engaged in an error, or did not respond within the 5-s prompt delay.

If the participant engaged in a correct response for one target for at least 75% of trials that target was presented, the therapist replaced the single target and continued baseline until responding was stable. If the participant engaged in a correct response for 2 or more targets for at least 50% of trials those targets were presented, the therapist replaced the set of 3 Lego structures and continued baseline until responding was stable.

**Brief Assessment.** Sessions were conducted until all conditions met brief mastery criterion or a max of 5 sessions were conducted. Brief mastery criterion for each condition was
one session at least 92% correct responding. At the start of each trial during the brief assessment, the therapist presented the target Lego structure disassembled, gained the attention of the participant, and delivered a general instruction (e.g., “Play with the Legos”). Therapists compared the five conditions that were evaluated during Carroll et al. (2018). However, because the target behavior (i.e., assembling Legos) in the present study required a motor response, the single-response repetition and multiple response repetition conditions also included a least-to-most prompt hierarchy (LTM) component. In addition, the therapists evaluated a most-to-least prompting procedure with a delay (MTLD) similar to Libby et al (2008). The MTLD condition was included because results from research comparing response prompts shows participants acquired skills at comparable rates during both MLTD as LTM procedures, but the MTLD procedure resulted in fewer errors (e.g., Libby et al., 2008; Seaver & Bourret, 2014). The conditions that were compared during the brief assessment included:

**No error-correction (No EC).** If the participant engaged in an error or did not respond within the 5-s prompt delay, the therapist delivered no feedback and ended the trial. No error-correction procedure was conducted during this condition.

**Model.** If the participant engaged in an error or did not respond within the prompt delay the therapist modeled the correct response. If the participant engaged in the correct response within 5 s of the model prompt, the therapist delivered praise (e.g., “good job, that is how I would build the Legos”). However, if the participant engaged in an error or did not respond within the prompt delay following the model prompt, the therapist delivered no differential consequences contingent on the participant’s response and moved to the next trial. An error-correction trial was scored each instance that the therapist modeled the correct response following an error or no response.
**Single response repetition (SRR).** If the participant engaged in an error or did not respond within the prompt delay the therapist delivered a model prompt. If the participant engaged in the correct response within 5 s of the model prompt, the therapist delivered praise. However, if the participant engaged in an error or did not respond within the prompt delay following the model prompt, the therapist physically guided the participant to engage in the correct response and ended the trial. An error-correction trial was scored each instance that the therapist implemented the least-to most prompt hierarchy following an error or no response.

**Re-present until independent (RUI).** If the participant engaged in an error or did not respond within the prompt delay the therapist physically guided the participant to engage in the correct response, and immediately re-presented the trial. If the participant engaged in the correct response within 5 s of the re-presented trial, the therapist delivered praise. However, if the participant engaged in an error or did not respond within the prompt delay following the re-presented trial, the therapist physically guided the participant to engage in the correct response. The therapist continued this procedure until the participant independently engaged in the correct response following the re-presentation of the trial or the trial was re-presented 5 times without a correct response. An error-correction trial was scored each instance that the therapist physically guided the participant to engage in a correct response following an error or no response, and each instance the therapist re-presented the trial.

**Multiple response repetition (MRR).** If the participant engaged in an error or did not respond within the prompt delay the therapist modeled the correct response. If the participant engaged in the correct response within 5 s of the model prompt, the therapist delivered praise. However, if the participant engaged in an error or did not respond within the prompt delay following the model prompt, the therapist physically guided the participant to engage in the
correct response. This procedure was repeated until the participant engaged in the correct response a total of five times following either a prompt or the re-presentation of the trial. This procedure is the most intrusive error-correction procedure evaluated, because the participant must not only engage in the correct response but rehearse the correct response multiple times. An error-correction trial was scored each instance that the therapist implemented a least-to-most prompt hierarchy, and each instance the therapist re-presented the trial.

*MTLD.* If the participant engaged in an error or did not respond within the prompt delay the therapist implemented the target prompt level and moved to the next trial. Potential prompt levels during this condition included physical prompts, model prompts, and no error-correction. Criterion to advance to a less restrictive prompt level (e.g., model prompt, no error-correction) was two consecutive correct responses. Criterion to decrease to a more restrictive prompt level (e.g., physical prompt) was two consecutive errors. The prompt level of the final trial in the previous session was used as the prompt level for the first trial in the following session. An error-correction trial was scored each instance that the therapist delivered a prompt (e.g., model prompt, physical prompt) following an error or no response.

**Validation Assessment.** A validation assessment was conducted for each participant and targeted a different set of Lego structures during each condition than the brief assessment. The purpose of this assessment was to assess the predictive validity of the brief assessment by training a different set of skills to mastery and examining the correspondence between brief and validation assessment results across participants, condition, and dependent variable. Validation mastery criterion was defined as two consecutive training sessions with at least 92% correct responding. The validation assessment was terminated early if a participant did not master a set of target responses in one condition within approximately two times the number of sessions
required to master a set of target responses in another condition.
CHAPTER THREE:
DATA ANALYSES & RESULTS

Phase 1: General Results and Overall Correspondence Between Brief and Validation Assessments

One purpose of Phase 1 was to evaluate if orderly acquisition was obtained across brief and validation assessments. Generally, all participants responded at low levels in baseline and showed orderly increase in the percentage of correct responding across conditions with an ECP during the intervention phase of both brief and validation assessments. Figures 9 to 12 show session-to-session data collected on the percentage of correct responses across conditions for each participant during the brief and validation assessments. Figures are separated into four panels. The top two panels show percentage of correct responses across sessions, while the bottom two panels show the percentage of correct responses across cumulative assessment duration (min).

Figure 9 shows the results of Ron. Ron correctly responded to targets an average of 0.1% of trials during the baseline phase of the brief and validation assessments. In the top left panel Ron correctly responded to two thirds of targets for at least 50% of trials during the MTLD condition of the brief assessment, so the entire set of targets were replaced. In the top right panel, Ron correctly responded to one third of targets for at least 75% of trials during the No EC and SRR of the validation assessment, so each individual target in each condition was replaced. During the brief assessment, Ron only met brief mastery criterion (i.e., one session at 92%
correct responding or above) during the Model and RUI conditions, and did so during the same series (see top left panel). In addition, the duration to mastery for both the Model and RUI condition were the same (47 min), as shown in the bottom left panel. In the two right panels of Figure 9, results from Ron’s validation assessment show that he met validation mastery criterion during the Model condition in the fewest number of sessions and in the shortest duration to mastery (47 min 42 s). However, he met validation mastery criterion across all conditions that included an ECP. Ron’s accuracy during the No EC condition was variable across brief and validation assessments. Specifically, he met the criterion for a correct response for a single target on multiple occasions during both brief and validation assessments, but correct responding did not consistently maintain over time.
**Figure 9.** Session-to-session data collected on the percentage of correct responses for each ECP during the brief assessment (top left panel) and validation assessment (top right panel) for Ron. Cumulative duration and percentage of correct responses during the brief assessment (bottom left panel) and validation assessment (bottom right panel) for Ron. A (1) next to a condition label indicates the first set of targets evaluated that resulted in above-chance levels of correct responding, while a (2) indicated the second set of targets evaluated.

Figure 10 depicts the results of Leslie’s brief and validation assessments. Leslie correctly responded to targets an average of 0.1% of trials during the baseline phase. During the RUI condition of the brief assessment (see top left panel of Figure 10) and the No EC condition of the
validation assessment (see top right panel), Leslie correctly responded to one third of targets for at least 75% of trials, so those specific targets were replaced in each respective condition. In the top right panel of Figure 10, Leslie correctly responded to two thirds of targets for at least 50% of trials during the SRR condition of the validation assessment, so the entire set of targets were replaced. In the left two panels, results from Leslie’s brief assessment show that she met brief mastery criterion in the fewest number of sessions during the Model, SRR, MRR, and MTLD conditions, but required the shortest duration to mastery during the SRR condition (10 min 9 s). During Leslie’s validation assessment, she met validation mastery criterion during the Model, SRR, RUI, and MTLD conditions in the fewest number of sessions (see top right panel). In the bottom right panel, durations to mastery was comparable across these conditions (within 5 min of each other), but the RUI condition required the shortest duration to mastery (18 min 30 s).

Results from Leslie’s brief and validation assessments show no evidence of acquisition during the No EC condition.
Figure 10. Session-to-session data collected on the percentage of correct responses for each ECP during the brief assessment (top left panel) and validation assessment (top right panel) for Leslie. Cumulative duration and percentage of correct responses during the brief assessment (bottom left panel) and validation assessment (bottom right panel) for Leslie. A (1) next to a condition label indicates the first set of targets evaluated that resulted in above-chance levels of correct responding, while a (2) indicated the second set of targets evaluated.

Figure 11 show the results of Ann. Ann correctly responded to targets an average of 0.01% of trials during the baseline phase of the brief and validation assessments. Additionally,
Ann never met criteria to replace a target across conditions during brief and validation assessments (see top two panels). In the top left panel, Ann met brief mastery criterion in the fewest number of sessions during the Model and MRR conditions and did so during the same series. However, the duration to mastery for the model condition was the shortest (15 min), as shown in the bottom left panel. In the two right panels of Figure 11, results from Ann’s validation assessment show she met validation mastery criterion in the fewest number of sessions during the MRR and MTLD conditions but required the shorter duration to mastery during the MTLD condition (15 min 6 s). Note, Ann met brief and validation mastery criterion with the fewest number of sessions during the MRR condition, but this did not correlate with the condition with the shortest duration to mastery. During Ann’s validation assessment, there was an increase in accuracy during the No EC condition that was likely due to meeting the reinforcement contingency by chance for a single target.
Figure 11. Session-to session data collected on the percentage of correct responses for each ECP during the brief assessment (top left panel) and validation assessment (top right panel) for Ann. Cumulative duration and percentage of correct responses during the brief assessment (bottom left panel) and validation assessment (bottom right panel) for Ann.
Figure 12 depict the results of Tom. Tom correctly responded to targets an average of 0.1% of trials during the baseline phase of the brief and validation assessments. In the top right panel of Figure 12, Tom correctly responded to two thirds of targets for at least 50% of trials during the SRR condition of the validation assessment, so the entire set of targets were replaced. In the two left panels, Tom’s results show that he met brief mastery criterion in the fewest number of sessions across all conditions that included an ECP (i.e., Model, SRR, RUI, MRR, MTLD), but required the shortest duration to mastery during the RUI condition (6 min 36 s). In the two right panels of Figure 12, Tom met validation mastery criterion during the Model, SRR, and MRR conditions in the fewest number of sessions, but the condition that required the shortest duration to mastery was the SRR condition (8 min 52 s). Tom showed evidence of acquisition during the control condition (i.e., No EC) during both brief and validation assessments. This was likely due to meeting the reinforcement contingency for individual targets by chance responding.
Figure 12. Session-to-session data collected on the percentage of correct responses for each ECP during the brief assessment (top left panel) and validation assessment (top right panel) for Tom. Cumulative duration and percentage of correct responses during the brief assessment (bottom left panel) and validation assessment (bottom right panel) for Tom. A (1) next to a condition label indicates the first set of targets evaluated that resulted in above-chance levels of correct responding, while a (2) indicated the second set of targets evaluated.

A second purpose of Phase 1 was to examine overall correspondence between the brief and validation assessments, or said another way, determine whether participants’ performances
were similar across both assessments across a range of dependent variables related to acquisition and intrusiveness. Variables related to acquisition included (a) correct responses, (b) total correct responses, (c) cumulative assessment duration, (d) sessions to mastery, and (e) trials to mastery. Variables related to intrusiveness included (a) errors, (b) total errors, (c) model prompts, (d) physical prompts, (e) total prompts, and (f) protests. Because mastery criterion varied for brief and validation assessments, frequency measures (e.g., correct responses, errors, prompts) were defined as the average number of responses across all sessions. Data collected across all 11 dependent variables were included in correlational analyses conducted during Phase 1.

Figures 13 to 15 depict the results of correlational analyses between brief and validation assessments. Analyses were conducted to evaluate the predictive validity of the brief assessment. Data evaluated during these correlational analyses included all sessions conducted during brief and validation assessments, which also included data collected during conditions that did not meet mastery. The strength of association between brief and validation assessments was evaluated using Pearson’s $r$ following Cohen’s (1969) interpretation: A strong correlation was defined as an absolute value of correlation between 0.5 to 1.0, a moderate correlation was defined as an absolute value of correlation between 0.3 to 0.5, and a weak correlation was defined as an absolute value of correlation between 0.1 to 0.3.

Figure 13 depicts correlational analysis between brief and validation assessment separated by participant. The absolute value of correlation for each participant was at least 0.9, which suggests the results of the brief assessment predict the results of the validation assessment across participants. The absolute value of correlation for each participant was 0.99 for Ron, 0.98
for Leslie, 0.99 for Ann, and 0.98 for Tom. Data collected across conditions and dependent variables were used during these analyses.

Figure 13. Results of correlational analyses between brief and validation assessment across Ron, Leslie, Ann, and Tom. Data are listed in order from greatest absolute value of correlation to least. Results include data collected during all sessions of the brief and validation assessment, across conditions and dependent variables.

Figure 14 shows the correlational analyses between brief and validation assessments, separated by condition. Results from the No EC ($r = 0.95$), Model ($r = 0.92$), SRR ($r = 0.98$), RUI ($r = 0.95$), MRR ($r = 0.99$), and MTLD ($r = 0.98$) conditions all showed a strong correlation...
between brief and validation assessment results. These results provide additional evidence for the predictive validity of the brief assessment. Data collected across participants and dependent variables were used during these analyses.

Figure 14. Results of correlational analyses between brief and validation assessment across No EC, Model, SRR, RUI, MRR, MTLD conditions. Data are listed in order from greatest absolute value of correlation to least. Results include data collected during all sessions of the brief and validation assessment, across participants and dependent variables.
Figure 15 depicts results of correlational analyses between brief and validation assessments, separated by dependent variable. Dependent variables were further separated by variables related to acquisition and variables related into intrusiveness. Results show that all dependent variables showed strong correlation between brief and validation assessment results. Dependent variables related to acquisition are listed from highest absolute value of correlation to lowest: Cumulative assessment duration \((r = 0.94)\), trials to mastery \((r = 0.91)\), total correct responses \((r = 0.91)\), correct responses \((r = 0.82)\), sessions to mastery \((r = 0.61)\). Dependent variables related to intrusiveness are listed from highest absolute value of correlation to lowest: errors \((r = 0.84)\), protests \((r = 0.82)\), model prompts \((r = 0.77)\) physical prompts \((r = 0.74)\), total errors \((r = 0.74)\), and total prompts \((r = 0.72)\).
Figure 15. Results of correlation analyses between brief and validation assessment results across dependent variables. The panel on the left shows results of dependent variables related to acquisition, which include correct responses, total correct responses, cumulative assessment duration, trials to mastery, and sessions to mastery. The panel on the right shows results of dependent variables related to intrusiveness, which include errors, total errors, total prompts, model prompts, physical prompts, and protests. Results include data collected during all sessions of the brief and validation assessment, across participants and conditions.
Although there is strong correlation between brief and validation assessment results across dependent variables, it is unclear if each dependent variable evaluated is equally important in identifying the most efficient and least intrusive ECP for each learner. Following Phase 1, a total of 11 dependent variables (see Figure 15) seemed to speak to mastery. However, an evaluation of each dependent variables requires substantial time and effort for clinicians and may not be feasible in applied settings. Therefore, clinicians need a way to reduce and integrate the results of the brief assessment and make a single decision about the target ECP selected for each learner. This leads to the purpose of Phase 2, which was to empirically develop a decision-making model to reduce the number of dependent variables.

**Phase 2: Develop a Decision-Making Model**

The brief assessment developed by Carroll et al. (2018) is a time-sensitive tool that can be used to identify the most efficient and least intrusive ECP for individual learners. During the brief assessment, Carroll et al. (2018) collected data on the cumulative frequency of correct responses, errors, and error-correction trials during each condition. Researchers identified the target error-correction procedure by (a) assigning a score from 1 to 5 (1 being high, 5 being low) to each dependent variable, (b) adding scores together, (c) dividing the participant’s score by the total points possible and multiplying by 100 to determine the percentage of points earned, and (d) identifying the condition with the highest percentage as the target ECP for that participant. Results of the brief assessment were later compared to the results of a one or two validation assessments, where skills were trained to mastery (i.e., two consecutive sessions with at least 90% correct responding). Results showed high correspondence between the brief
assessment and one or both validation assessments for two out of four participants. Correspondence during this study was determined by comparing the rankings of each conditions during brief and validation assessments. Carroll et al. (2018) referenced the top three ranked conditions of each assessment when describing the results of correlational analyses. Although correspondence was demonstrated between brief and validation assessments, it is unclear why the dependent variables evaluated were selected and if each dependent variable was equally valuable in predicating the target ECP for each learner.

During this study, we collected data on the same dependent variables as Carroll et al. (2018), as well as other variables related to acquisition and intrusiveness. Variables related to acquisition included (a) correct responses, (b) total correct responses, (c) cumulative assessment duration, (d) sessions to mastery, and (e) trials to mastery. Variables related to intrusiveness included (a) errors, (b) total errors, (c) model prompts, (d) physical prompts, (e) total prompts, and (f) protests per session. Similar to Phase 1, frequency measures (e.g., correct responses, errors, prompts) were defined as the average number of responses across all sessions, because mastery criterion varied for brief and validation assessments.

To reduce the number of dependent variables, several statistical analyses were conducted to determine which variables were most useful in predicting the efficiency and intrusiveness of an ECP. Data collected during all conditions that met mastery during both brief and validation assessments were included in these analyses. Therefore, dependent variables that included all sessions conducted during brief and validation assessments, such as cumulative assessment duration, frequency of trials, and frequency of sessions were replaced with the dependent variables of duration to mastery, trials to mastery, and frequency to mastery. Average frequency per session was used as the dependent measure for the remaining dependent variables, so those
dependent variables were unaffected by the change in targeted data analyzed. Finally, data from each participant’s brief and validation assessments were combined.

During phase 2, dependent variables were compared using a common sequence of statistical analyses. First, correlational analyses were conducted between dependent variables. If the results showed strong correspondence between dependent variables, this suggested that both variables conveyed similar information. Therefore, it was the researcher’s discretion which dependent variable was selected for further analyses. If the results showed weak or moderate correspondence between two dependent variables, we conducted simple linear regression analyses between each of the targeted variables and another dependent variable related to acquisition (e.g., duration to mastery) or intrusiveness (e.g., protests). Simple linear regression analyses were conducted to provide additional evidence for the value of a dependent variable in predicting the efficiency or intrusiveness of an ECP. In addition, simple linear regression allowed us to examine two values: a slope (\(m\)) and a correlation coefficient (\(r\)). The slope speaks to the magnitude of the effect one variable has on the other. For example, an \(m\) of 1.0 indicates that a 1.0 increase in rate of one dependent variable would predict a corresponding 1.0 increase in rate in another dependent variable during the validation assessment. The correlation coefficient (\(r\)) speaks to the strength of the association between the variables, where stronger associations led to a greater ability for changes in one variable to describe changes in the other. For emphasis, the purpose of this analysis was to identify variables in the brief assessment that were most predictive of outcomes during the validation assessment, include those in the decision-making model, and omit those that were not.

Similar to research comparing ECPs, multiple measures of efficiency were evaluated during this research (Carroll et al. 2015; McGhan and Lerman, 2013). Figure 16 depicts the
results of correlational analyses between duration to mastery and trials to mastery ($r = 0.97$; see top panel), between duration to mastery and sessions to mastery ($r = 0.91$; see middle panel), and between sessions to mastery and trails to mastery ($r = 0.94$; see bottom panel). The absolute value of correlation was at least 0.9 across analyses, which suggests that all efficiency measures conveyed similar information. However, the weakest correlation was between duration to mastery and sessions to mastery, suggesting they conveyed different information. In addition to these results, duration to mastery is more representative of true values of time than other efficiency measures, such as sessions to mastery and trials to mastery. As a result, further logical analyses were conducted between these two efficiency measures.
Figure 16. Results of correlational analyses between duration to mastery and trials to mastery (top panel), between duration to mastery and sessions to mastery (middle panel), and between sessions to mastery and trials to mastery (bottom panel). Each data point represents a condition that met brief and validation mastery criterion across participants.
Carroll et al. (2015) found that ECPs that required the participant to engage in multiple active responses following an error (e.g., MRR) resulted in low correspondence between efficiency measures (e.g., total training time). Measuring the efficiency by sessions to mastery or trials to mastery may poorly estimate the efficiency of an ECP because these variables are artificially imposed to each condition by researchers and do not accurately measure time savings. In comparison, duration to mastery may be a more useful measure of efficiency because these data are more representative of the actual time necessary to meet mastery during each ECP. Results from Leslie’s brief assessment in the bottom left panel of Figure 10 support this point. Specifically, Leslie met brief mastery criterion during the SRR and MRR conditions on the same series, but the duration to mastery during the SRR condition (10 m 9 s) was shorter than the MRR condition (14 m 12 s). For these reasons, duration to mastery was selected for further data analyses.

Carroll et al. (2018) were limited to only presenting data on the frequency of correct responses and errors following the instruction at the beginning of each trial. In contrast, we collected data on the frequency of correct responses and errors following the discriminative stimulus, as well the frequency of correct responses (i.e., total correct responses) and errors (i.e., total errors) made by participants during ECPs. Figure 17 shows results of correlational analyses between two pairs of seemingly similar dependent variables. Specifically, the correlation between correct responses and total correct responses ($r = 0.45$; see top panel) and the correlation between errors and total errors ($r = 0.94$; see bottom panel). It was hypothesized that the additional errors made during ECPs may signal more restrictive prompt levels (e.g., physical prompts) or additional work for the learner, which may affect the intrusiveness of an ECPs. However, results show a strong correlation between errors and total errors, which suggests total
errors did not provide any additional information than errors. Similar to Carroll et al. (2018), errors were selected for further analyses. Results showed a moderate correlation between correct responses and total correct responses, which suggests that the additional correct responses made during ECP may provide different information than correct responses. Therefore, we decided to examine which variable best predicted efficiency during the validation assessment by conducting simple linear regression analyses between these variables and the other dependent variable related to acquisition, duration to mastery.

Figure 17. Results of correlational analyses between correct responses and total correct responses (top panel) and between errors and total errors (bottom panel). Each data point represents a condition that met brief and validation mastery criterion.
Figure 18 shows the results of simple linear regression analyses between correct responses and duration to mastery ($m = -13.96; r = -0.49$) in the top panel and between total correct responses and duration to mastery ($m = 1.36; r = -0.11$) in the bottom panel. Results showed stronger correspondence and a greater slope for correct responses. This provides evidence that correct responses better predict other measures of efficiency than total correct responses. As a result, the dependent variable of correct responses was selected for subsequent data analyses.

**Figure 18.** Results of simple linear regression analyses between correct responses and duration to mastery (top panel) and between total correct responses and duration to mastery (bottom panel). Each data point represents a condition that met brief and validation mastery criterion.
All of the skills targeted during this study required a motor response, so LTM prompt hierarchies (SRR, MRR) and MTL hierarchies (MTLD) were included in particular ECPs. As a result, data were collected on the average number of model prompts and physical prompts delivered during each ECP. McGhan and Lerman (2013) consider ECPs that require the learner to engage in a correct response one or more times are more intrusive than ECPS with less or no response requirements. Using this definition, physical prompts are inherently more intrusive than model prompts, because the learner is required to engage in a correct response following a physical prompt but is not required to respond following a model. For these reasons, model prompts and physical prompts were kept separated during data collection.

Figure 19 shows results of a correlational analysis between model prompts and physical prompts. Results showed a moderate correspondence \((r = -0.37)\) between variables. This low correspondence is likely because every condition that included an ECP did not use both model and physical prompts. For example, the Model condition only included model prompts, whereas the RUI condition only included physical prompts. This made it difficult to compare the value of model and physical prompts in predicting the intrusiveness of an ECP. Therefore, model prompts and physical prompts were combined to create the dependent variable, total prompts. Therefore, the variable of total prompts was used for further analyses.
Figure 19. Results of correlational analyses between model prompts and physical prompts. Each data point represents a condition that met brief and validation mastery criterion.

Correlational and linear regression analyses were also conducted to evaluate the relationship between dependent variables related to intrusiveness. Total prompts were included because these prompting procedures are directly related to the response requirement of the learner following an error. Errors relate to the intrusiveness of an ECP because errors made during training may signal aversive consequences (e.g., intrusive prompt, additional work). Finally, protests were used as a secondary measure to evaluate the intrusiveness of ECPs. Figure 20 shows the results of statistical analyses between total prompts and errors ($r = .81$; see top panel), between errors and protests ($r = .31$; see middle panel), and between total prompts and protests ($r = .53$; see bottom panel). The strongest correlation was between total prompts and errors, so additional simple linear regression analyzes were conducted between these variables and protests (see Figure 20). The analysis between total prompts and protests ($m = 0.25$; see middle panel) showed a greater slope than the analysis between errors and protests ($m = 0.21$; see top panel). As a result, the dependent variable of total prompts was used for further analyses.
**Figure 20.** Results of simple linear regression analyses between total prompts and errors (top panel), between total prompts and protests (middle panel), and between errors and protests (bottom panel). Each data point represents a condition that met brief and validation mastery criterion.
Following the analyses described above, the 11 dependent variables for which data were collected were narrowed down to 2 measures related to acquisition (correct responses and duration to mastery) and 1 measure related to intrusiveness (total prompts). To reduce the number of dependent variables to a single dependent variable related to acquisition simple linear regression analyses were conducted between brief and validation assessments across the remaining dependent variables. Only data from conditions that met brief and validation mastery criterion were included in these analyses.

Figure 21 depicts the results of simple linear regression analyses conducted between brief and validation assessments for correct responses ($r = 0.62$) in the top panel and duration to mastery ($r = 0.83$) in the bottom panel. Duration to mastery resulted in the higher absolute value of correlation and was selected as the single measure of acquisition when identifying the most efficient ECP for each learner. Figure 22 shows the results of simple linear regression analyses conducted between brief and validation assessments for total prompts ($r = 0.74$; see top panel), protests ($r = 0.69$; see middle panel), and errors ($r = 0.46$; see bottom panel). Total prompts per session resulted in the highest absolute value of correlation. These data provide additional evidence supporting the selection of total prompts as the single measure of intrusiveness when identifying the least intrusive ECP for each learner.
Figure 21. Results of simple linear regression analyses between brief and validation assessment results across the dependent variables of duration to mastery (top panel) and correct responses (bottom panel). Each data point represents a condition that met brief and validation mastery criterion.
Figure 22. Results of simple linear regression analyses between brief and validation assessment results across the dependent variables of total prompts (top panel), protests (middle panel), and errors (bottom panel). Each data point represents a condition that met brief and validation mastery criterion.
Phase 3: Identifying the target ECP

During phase 3, conditions were ranked by the dependent variables identified in Phase 2. Tables 1 and 2 show the raw data collected on duration to mastery and total prompts during each condition that met brief and validation mastery criterion. The condition that resulted in the shortest duration to mastery was ranked first, while the condition with the longest duration to mastery was ranked last. The condition ranked first was identified as the most efficient ECP for that learner. Similarly, the condition with the lowest average total prompts delivered per session was ranked first, while the condition with the highest average of total prompts per session was ranked last. The condition ranked first was identified as the least intrusive ECP for that learner.

**Table 1.** Duration to Mastery for Each Participant by Condition

<table>
<thead>
<tr>
<th>Participant</th>
<th>Assessment</th>
<th>Condition</th>
<th>Model</th>
<th>SRR</th>
<th>RUI</th>
<th>MRR</th>
<th>MTLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ron</td>
<td>Brief</td>
<td>47.32</td>
<td>-</td>
<td>47.38</td>
<td>-</td>
<td>-</td>
<td></td>
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<tr>
<td></td>
<td>Validation</td>
<td>47.7</td>
<td>-</td>
<td>113.78</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Leslie</td>
<td>Brief</td>
<td>12.29</td>
<td>10.15</td>
<td>19.11</td>
<td>14.20</td>
<td>12.47</td>
<td></td>
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<td></td>
<td>Validation</td>
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<td>23.58</td>
<td>18.84</td>
<td></td>
</tr>
<tr>
<td>Ann</td>
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<td>25.60</td>
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<td>17.60</td>
<td>18.07</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Validation</td>
<td>30.66</td>
<td>26.51</td>
<td>32.15</td>
<td>20.48</td>
<td>15.01</td>
<td></td>
</tr>
<tr>
<td>Tom</td>
<td>Brief</td>
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<td>7.86</td>
<td>6.60</td>
<td>8.01</td>
<td>7.39</td>
<td></td>
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<tr>
<td></td>
<td>Validation</td>
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<td>12.7</td>
<td>12.5</td>
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</table>
During this study all participants met both brief and validation mastery criterion during at least once condition. Therefore, conditions that met mastery during both brief and validation assessments were ranked. If a participant did not meet mastery during the brief or validation assessments, rank all conditions by cumulative assessment duration and total prompts. Note, the No EC procedure was used as the control during this research, so this condition was excluded when identifying the target ECP for each learner. If a participant only met brief and validation mastery criterion during one condition, that condition was selected as the target ECP for that learner. If multiple conditions led to the same duration to mastery, we identified the target ECP by selecting the least intrusive condition (i.e., condition with lower total prompts per session). If

<table>
<thead>
<tr>
<th>Participant</th>
<th>Assessment</th>
<th>Model</th>
<th>SRR</th>
<th>RUI</th>
<th>MRR</th>
<th>MTLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ron</td>
<td>Brief</td>
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<td>-</td>
<td>4.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Validation</td>
<td>2.0</td>
<td>-</td>
<td>4.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Leslie</td>
<td>Brief</td>
<td>1.0</td>
<td>1.5</td>
<td>1.7</td>
<td>1.0</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Validation</td>
<td>1.7</td>
<td>1.3</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Ann</td>
<td>Brief</td>
<td>5.5</td>
<td>4.0</td>
<td>3.0</td>
<td>3.0</td>
<td>1.0</td>
</tr>
<tr>
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<td>3.2</td>
<td>1.7</td>
<td>1.0</td>
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<tr>
<td>Tom</td>
<td>Brief</td>
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<td>2.0</td>
<td>1.0</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Validation</td>
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<td>1.0</td>
<td>1.5</td>
<td>1.3</td>
<td>0.8</td>
</tr>
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</table>
multiple conditions result in the lowest total prompts, we identified the target ECP by selecting
the most efficient condition (i.e., condition with shortest duration to mastery).

Table 3 shows the first and last ranked condition for each participant, separated by
duration to mastery and total prompts. Table 4 shows the level of correspondence between brief
and validation assessments in the target ECP identified for each participant. Correspondence
was categorized as high, partial, or low. High correspondence was defined as the target ECP
being ranked first in both brief and validation assessments. Partial correspondence was defined
as the target ECP being ranked first in the brief assessment and second in the validation
assessment. Low correspondence was defined as the target ECP being ranked first in the brief
assessment and two or more positions lower in rank in the validation assessment.

**Table 3.** Target ECP for each Participant by Priority

<table>
<thead>
<tr>
<th>Priority</th>
<th>Participant</th>
<th>Brief Assessment</th>
<th>Validation Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed of Acquisition</td>
<td>Ron</td>
<td>Model</td>
<td>RUI</td>
</tr>
<tr>
<td></td>
<td>Leslie</td>
<td>SRR</td>
<td>RUI</td>
</tr>
<tr>
<td></td>
<td>Ann</td>
<td>Model</td>
<td>SRR</td>
</tr>
<tr>
<td></td>
<td>Tom</td>
<td>RUI</td>
<td>MRR</td>
</tr>
<tr>
<td>Minimum Intrusiveness</td>
<td>Ron</td>
<td>RUI</td>
<td>Model</td>
</tr>
<tr>
<td></td>
<td>Leslie</td>
<td>Model</td>
<td>RUI</td>
</tr>
<tr>
<td></td>
<td>Ann</td>
<td>MTLD</td>
<td>Model</td>
</tr>
<tr>
<td></td>
<td>Tom</td>
<td>RUI</td>
<td>SRR</td>
</tr>
</tbody>
</table>

54
Ron required the shortest duration to mastery during the Model condition of the brief assessment, so the Model condition was identified as his most efficient ECP. The Model condition also required the shortest duration to mastery during the validation assessment, which shows high correspondence in the most efficient ECP identified between brief and validation assessments. The RUI condition led to the fewest total prompts during the brief assessment and was identified as the least intrusive ECP. However, the RUI condition ranked second in the validation assessment for total prompts, which demonstrates partial correspondence between brief and validation assessment results. Note, Ron only met brief and validation mastery criterion during the Model and RUI conditions, which may have artificially inflated the correspondence between the conditions identified as most efficient and least intrusive during brief and validation assessments. The remaining participants met brief and validation mastery criterion across all 5 conditions that included an ECP.

**Table 4.** Correspondence Between Brief and Validation Assessments in ECP Identified

<table>
<thead>
<tr>
<th>Priority</th>
<th>Participant</th>
<th>Speed of Acquisition</th>
<th>Minimum Intrusiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>Partial</td>
</tr>
<tr>
<td></td>
<td>Ron</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leslie</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ann</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tom</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ron</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leslie</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ann</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tom</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Ron required the shortest duration to mastery during the Model condition of the brief assessment, so the Model condition was identified as his most efficient ECP. The Model condition also required the shortest duration to mastery during the validation assessment, which shows high correspondence in the most efficient ECP identified between brief and validation assessments. The RUI condition led to the fewest total prompts during the brief assessment and was identified as the least intrusive ECP. However, the RUI condition ranked second in the validation assessment for total prompts, which demonstrates partial correspondence between brief and validation assessment results. Note, Ron only met brief and validation mastery criterion during the Model and RUI conditions, which may have artificially inflated the correspondence between the conditions identified as most efficient and least intrusive during brief and validation assessments. The remaining participants met brief and validation mastery criterion across all 5 conditions that included an ECP.
During the brief assessment, Leslie required the shortest duration to mastery during the SRR condition, so that condition was identified as her most efficient ECP. However, the SRR condition ranked fourth during the validation assessment in duration to mastery, which shows low correspondence between brief and validation assessments. In general, Leslie met brief and validation mastery criterion at comparable rates across ECPs, so differences in duration to mastery between conditions ranked first and last were less than 10 m across brief and validation assessments. This could potentially result in substantial differences in the ranking of each condition between brief and validation assessments, because differences in raw data were minimal. For example, the RUI condition required the longest duration to mastery during the brief assessment but required the shortest duration to mastery during the validation assessment. This result may be because Leslie required one additional session to meet mastery during the RUI condition of the brief assessment. The Model and MRR conditions were tied as having the fewest total prompts during the brief assessment, so the efficiency of each condition was compared. The Model condition resulted in a shorter duration to mastery than the MRR condition, so the Model condition was selected as the least intrusive ECP for Leslie. The RUI, MRR, and MTLD condition were tied as having the least total prompts during the validation assessment, but the RUI condition required the shortest duration to mastery. In comparison, the Model condition was ranked last during the validation assessment, which suggests low correspondence in the least intrusive ECP identified between brief and validation assessments.

Ann met brief mastery criterion with the shortest duration to mastery during the Model condition, so the Model condition was identified as the most efficient ECP. Interestingly, the Model condition also ranked last in intrusiveness during the brief assessment, because the average number of prompts delivered each session was the greatest during that condition. This
result is likely due to the lower percentage of correct responses made by Ann during the first session of intervention during the Model condition compared than other conditions that met mastery in similar assessment durations. During the validation assessment the Model condition ranked fourth in duration to mastery, which suggests low correspondence between brief and validation assessments when identifying the most efficient procedure for Ann. The least intrusive condition with the fewest total prompts was the MTLD conditions during the brief assessment. The MTLD condition also resulted in the lowest total prompts during the validation assessment. Therefore, correspondence was high between brief and validation assessments in the least intrusive ECP identified. Note, during Ann’s validation assessment, the MTLD condition was both the most efficient and least intrusive ECP identified.

During the brief assessment, Tom required the shortest duration to mastery during the RUI condition. As a result, the RUI condition was identified as the most efficient ECP for Tom. During the validation assessment, Tom required the shortest duration to mastery during the SRR condition, while the ECP identified as the most efficient during the brief assessment (i.e., RUI) was ranked fourth. This result shows low correspondence in the most efficient ECP identified between brief and validation assessment. The condition with the fewest total prompts during the brief assessment was tied between the Model and RUI conditions. The RUI condition required a shorter duration to mastery than the Model condition, so the RUI condition was identified as the least intrusive ECP for Tom. During the validation assessment, the MTLD condition resulted in the fewest total prompts despite requiring the longest duration to mastery. In contrast, the RUI condition, which was the least intrusive ECP following the brief assessment, was ranked last during the validation assessment. Similar to Leslie, Tom met validation mastery criterion for each condition at comparable rates, and because he required one additional session
to meet validation mastery criterion during the RUI condition, the ranking of the RUI condition changed substantially between brief and validation assessments.

In general, the decision-making model we developed to identify a target ECP following the brief assessment was partially effective in predicting the most efficient or least intrusive ECP in the validation assessment (see Table 3 and 4). Specifically, results showed high correspondence between brief and validation assessments in the most efficient ECP identified for one out of four participants, and low correspondence for the three remaining participants. Similarly results showed high correspondence between brief and validation assessments in the least intrusive ECP identified for one out of four participants, partial correspondence for one participant, and low correspondence for the remaining two participants.
CHAPTER 4
DISCUSSION

We evaluated the predictive validity of a brief assessment in identifying the most efficient or least intrusive error correction procedure for individual adult learners with IDD. Results from Phase 1 show that all conditions that included an ECP were effective in teaching targeted skills, which provided evidence for orderly acquisition across brief and validation assessments. In addition, data collected on all 11 dependent measures evaluated during this study (see Figure 15) showed a strong correlation between the results of brief and validation assessments across participants, conditions, and dependent variables. During Phase 2, several statistical analyses were conducted to determine the dependent variables that were most predicative of the efficiency and intrusiveness of an ECP. Results indicated that duration to mastery (min) was the most predictive of an ECPs efficiency, while total prompts were most predictive of the intrusiveness of an ECP respectively. During Phase 3, we ranked the conditions that met brief and validation mastery criterion using the dependent measures identified during phase 2. The results of Phase 3 show the decision-making model we developed predicted the most efficient ECP in only one out of four participants and predicted the least intrusive ECP in only one out of four participants.

The discrepancy between the results of Phase 1 and Phase 3 suggest that the strict, criterion-approach of the decision-making model we developed may not be the best way to characterize how well the brief and validation assessments match. This may be especially true
for learners that acquired target skills at similar rates across ECPs. For example, both Tom and Leslie met mastery criterion during each condition that included an ECP within 1 session of each other, and both participants showed low correspondence in the ECP identified as most efficient or least intrusive during brief and validation assessments. This result may due to the negligible differences in duration to mastery and total prompts delivered across conditions, which may have increased the likelihood of substantial ranking changes when using the strict decision-making model. In contrast, Ron only met brief mastery criterion during the Model and RUI conditions, and showed a greater correspondence in the most efficient and least intrusive ECP identified during brief and validation assessments when using the decision-making model. In addition, because only two ECPs were considered for Ron, the minimum correspondence level that could be achieved was partial correspondence.

Instead, a more correlational approach in evaluating the relationship between the brief and validation assessment should be considered. In support of this claim, results of Phase 1 showed a strong correlation between the results of brief and validation assessments when comparing data collected on several dependent variables. This finding is valuable because it suggests that each participant’s responding during brief and validation assessments were similar. This is in contrast to the results of Phase 3, which suggest lower correspondence between the results of brief and validation assessments.

This study extends error-correction research by evaluating the predictive validity of a brief assessment when teaching solitary play skills (i.e., assembling Legos) to adults with IDD. Similar to research comparing the effectiveness of ECPs, results from this study support that multiple ECPs of varying levels of intrusiveness were effective in teaching skills to learners with IDD (e.g., Carroll et al., 2015; Rodgers & Iwata, 1991). For example, each participant met
validation mastery criterion across all conditions that included an ECP.

This study also extends research comparing the effectiveness of prompting hierarchies. Unlike other error-correction assessments that targeted the acquisition of vocal-verbal (e.g., Carroll et al., 2015) or low-effort, matching-to-sample targets, both LTM (e.g., SRR, MRR) and MTLD procedures were evaluated. Research by Libby et al. (2008) show that MTL procedures often result in fewer errors during acquisition, while LTM procedures typically teach skills at a faster rate. However, results from this study show that conditions including MTL and LTM procedures were comparably effective and efficient in teaching skills and produced a comparable number of errors per session. For example, duration to mastery and average errors per session were comparable across ECPs that included an LTM or MTL procedure for Leslie, Ann, and Tom.

Similar to Carroll et al. (2018) the cumulative assessment duration of the brief assessment was substantially shorter than the validation assessment. The average assessment duration of brief assessments conducted by Carroll et al. (2018) was 2.6 hr (range, 1.7 hr -3.6 hr), which was less than half of the average time required to complete a validation assessment (average, 5.7 hr; range, 2.4 hr - 9.4 hr) where skills were trained to mastery. In comparison, brief assessments during this study required an average of 3.8 hr (range, 1.6 hr – 8.7 hr) to complete and validation assessments required an average of 5.2 hr (range, 2 hr – 12.3 hr). Therefore, 1.4 hr were saved by conducting the brief assessment, which is less time savings than those shown by Carroll et al (2018). The increased duration of assessments conducted during our study may be due to the the increased response effort of skills targeted during this study, the inclusion of an additional ECP (i.e., MTLD) to compare, or the differences in the termination criterion of the brief assessment across studies. Although the time savings of the brief assessment were greater during Carroll et
al. (2018), the scoring system used by researchers to identify the most efficient and effective ECP for individual learners has a few limitations.

In contrast to Carroll et al. (2018), we continued to run out each participant’s brief assessment until all conditions met brief mastery criterion or a max of 5 sessions were conducted. This resulted in a different number of sessions being conducted for each condition. Therefore, the average occurrence of dependent variables (e.g., correct responses, errors) per session were compared across ECPs. One benefit of this approach was that it allowed us to directly compare results of brief and validation assessments, instead of using a separate scoring system for the brief assessment. Another benefit of this method is that it allowed for conditions that met brief mastery criterion at a later session to be considered when identifying the target ECP for each learner. For example, a learner may meet brief mastery criterion during the MRR condition following 3 sessions (30 min) and during the Model condition following 4 sessions (25 min). Although the MRR condition met brief mastery criterion in fewer number of sessions, it is possible the duration to mastery was more than the Model condition. Therefore, the Model condition would be chosen as the most efficient ECP for that learner. A similar event may occur when identifying the target ECP related to intrusiveness. Using the same example as above, it may also be true that the model conditions resulted in fewer prompts per session than the MRR condition due to the increased response requirements of the learner during the MRR condition following an error.

Participants often engaged in high rates of correct responding in sessions following the first condition meeting mastery criterion. This made conditions that met brief mastery criterion later and conditions that did not meet brief mastery criterion at all, more comparable to conditions that met brief mastery criterion first. For example, during the brief assessment Leslie
first met brief mastery criterion during the SRR condition following 2 sessions and made an average of 10.5 correct responses per session, whereas she met brief mastery criterion during the RUI after 3 sessions and made an average of 10.3 correct responses per session. As a result, we also compared the average occurrence of dependence measures at the time of the first condition meeting brief or validation mastery criterion. Once again using Leslie’s results as an example, an analysis of Leslie responding at the time of the first condition meeting mastery showed that the average number of correct responses made during the SRR condition stayed the same at 10.5 correct responses per session, but decreased for the RUI to an average of 7 correct responses per session. This result shows that comparing conditions at the time of the first condition meeting mastery results in more differentiated results across conditions, which may assist researchers in identifying the ECP for each learner. Further statistical analyses were conducted to answer these questions.

Figure 2 shows the correspondence between brief and validation assessments when comparing (a) all sessions conducted during brief assessment and all sessions conducted during validation assessments, (b) all sessions up to the first condition meeting mastery criterion during the brief assessment and all sessions up to the first condition meeting mastery criterion during the validation assessment, and (c) all sessions up to the first condition meeting mastery criterion during the brief assessment and all sessions conducted during validation assessments. Results show that all correlational analyses resulted in a strong correlation ($r$ value of at least 0.9) between brief and validation assessments across conditions. However, the analyses with the widest range of correspondence ($r = 0.86$ to 0.98) across conditions was between all sessions up to the first condition meeting mastery criterion during the brief assessment and all sessions conducted during validation assessments. These results demonstrate the need for continue
research in determining the most effective procedure to interpret results of error-correction assessments so that the most efficient and least intrusive ECP is identified for each learner.

**Figure 23.** Results of correlational analyses between (a) all sessions conducted during brief and validation assessments, (b) all sessions up to the first condition that met mastery during the brief and validation assessments, (c) All sessions up to the first condition that met mastery during the brief assessment and all sessions conducted during the validation assessment. Each data point represents a condition.
This study also extends research on error-correction assessments by considering the relationship between ECPs and the occurrence of problem behavior. Specifically, data were collected on protests per session, which was used a secondary dependent measure for the intrusiveness of an ECP. Protests were selected as the target problem behavior because participants who engaged in more severe problem behavior (e.g., aggression SIB) were excluded from this study. In addition, protests may serve as a precursor behavior that approximates more severe problem behavior in participants. Protests generally occurred at low rates during brief and validation assessments across participants, as evidenced by Ron engaging in an average of 1.52 protests per session, Leslie engaging in an average of 0.89 protests per session, Ann engaging in an average of 0.03 protests per session, Tom engaging in an average of 0.03 protests per session. However, all participants reported that they liked playing with Legos at least once over the course of this research, so it is possible that assembling Legos is a preferred activity and was therefore less likely to evoke problem behavior in general.

It is also important to note that the rate of protesting was higher for participants where sessions were conducted in a group home (i.e., Ron and Leslie) than participants where sessions were conducted in a transition program (i.e., Ann and Tom). This finding may be related to the differing work requirements between settings. Parsons, Rollyson, & Reid (2004) suggest that the quality of a day program is related to the availability of functional activities and the amount that programs promote participation in these activities. For Ron and Leslie, sessions were conducted on the weekend during periods of free time, where no programmed activities were typically in place. Therefore, it is possible that the introduction of work during this time provided a substantial enough schedule change to evoke higher rates of protesting for these individuals. In comparison, sessions for Ann and Tom were conducted during the week at a transition program.
where functional skills (e.g., cooking, cleaning) were commonly taught each day. The targeted skill during this study was assembling Legos, which likely requires equal or less response effort to complete than their day-to-day tasks. Future research should continue to assess the relationship between the intrusiveness of ECPs and the occurrence of problem behaviors. In addition to the variables explicitly measured during this study (e.g., protests), other participant and therapist behaviors (e.g., off-topic conversation) occurred during assessments, which may have impacted the acquisition of skills.

Anecdotally, Ron engaged in high rates of off topic conversation during session. Responses to off-topic conversation made by the researcher were variable and included ignoring instances of off-topic conversation, reciprocating the conversation with a relevant statement or question, or redirecting the participant back to assembling Legos. Although, not formally evaluated, it is possible that the attention provided for off-topic conversation could have positively reinforced this disruptive behavior and resulted in artificially high cumulative assessment durations. This is evidenced by the cumulative assessment duration for Ron’s brief assessment (8.7 hr) and validation assessment (12.3 hr), which are substantially higher than the cumulative assessment duration of other participants.

Limitations of this study lay the foundation for future research. For example, there was no formal assessment conducted to ensure that the difficulty of each target Lego structure was equivalent. Therefore, it is unclear if the differentiated rate of acquisition across ECPs was a function of the ECP’s themselves or the varying difficulty of the targets randomly assigned to each condition. Similar to Libby et al. (2008), future research should consider having independent reviewers (e.g., teachers, clinicians) evaluate each target to ensure all targets are of equal difficulty or counterbalancing the same targets to different ECPs across participants.
(Cariveau, Batchelder, Ball, & La Cruz Montilla, 2020). However, the orderly acquisition of targets during brief and validation assessments provides evidence that Lego targets were comparably difficult.

Next, all of the participants in this research were fairly high functioning as evidenced by their refined verbal repertoires (e.g., communicating vocally and in complete sentences) and success in passing the cognitive impairment assessment that was part of the assent process. This likely contributed to the rapid acquisition of skills across assessments and masked the potential time savings of using the brief assessment when working with adults with IDD. To this point, there is a large population of adults with IDD that may have more substantial deficits in cognitive functioning that may affect their acquisition of skills and general level of independence (Van Bourgondien & Elgar, 1990). Future research should extend brief error-correction assessments to lower functioning adults with IDD, and specifically evaluate the time savings of the brief assessment.

Working with adults with IDD presents one of the most difficult challenges for caregivers (Fox, Holt, & Moist, 2009). For example, the severity of chronic behavior problems (e.g., aggression, stereotypy) may compete with learning more socially acceptable alternative skills (Volkamar, Lord, Bailey, Shultz, & Klin, 2004). In addition, the rate of acquisition for adults with IDD is typically slower than their neurotypical peers, which may increase the likelihood of problem behavior by the participant due to strain and increase staff frustration (Van Bourgondien & Elgar, 1990). The results of this study show that participant performance during the brief assessment had a high correspondence with performance during the validation assessment across a number of dependent variables, such as duration to mastery and total prompts delivered per session. Therefore, the brief assessment may be useful in identifying efficient and minimally
intrusive ECPS. However, this research is limited to only targeting solitary play skills (i.e., assembling Legos) so it is unclear if the results of this research can be extended to ECPS used when teaching other functional skills.

Therefore, future research should evaluate the predictiveness of a brief assessment targeting the acquisition of Lego targets to validation assessments that teach other functional skills that require a motor response, such as daily-living skills or vocational skills. Libby et al. (2008) suggest that the target ECP for different functional skills may vary, but further analysis is required to confirm this hypothesis. Other future research includes (a) evaluating the preference of ECPs for learners and instructors, (b) comparing the results of researcher- and caregiver-run brief error-correction assessments, (c) evaluating the predictive validity of a brief error-correction skills when targeting other skills that can be trained through DTI (e.g., social skills), and (d) evaluating other dependent variables when developing a decision-making model to identify the target ECP for each learner, such as percentage increase in correct responding from baseline, (e) evaluating the effect of a participant’s history with particular prompting procedures on rate of acquisition during assessments, (f) increasing the complexity of targets to reduce the likelihood of within-in stimulus prompts in targeted Lego structures, which may in turn result in increased differentiation in participant responding between ECPs, and (g) evaluating the predicative validity of a brief assessment conducted in differing stimulus conditions (e.g., clinic) than the typical training environment (e.g., group home, day-program).

This study provides evidence the brief assessment is a time-saving assessment tool that can be used by clinicians to identify efficient and minimally intrusive ECPs. One benefit of this research is that clinicians are allowed the flexibility to weigh the efficiency and intrusiveness of
ECPs individually. For example, if the priority is to increase the rate of acquisition for a specific adult learner with IDD, then clinicians may use the most efficient ECP identified during the brief assessment. However, if a clinician needs to prioritize safety by minimizing the occurrence of problem behavior or the delivery of physical prompts during intervention, they would select the least intrusive ECP identified instead. In practice, we recommend that the brief assessment is run out until the participant meets brief mastery criterion across all conditions or a max of 5 sessions of intervention are conducted. This is to control for the event that a more efficient or less intrusive ECP is not identified due to the premature termination of the brief assessment following the first condition meeting mastery criterion. However, it remains unclear whether the best way to evaluate the predictive validity of the brief assessment is through a strict, criterion-approach like that described in Phase 3 or a broad correlational approach like the one described in Phase 1. Therefore, future research should continue comparing different procedures used to analyze and interpret the results of the brief assessment, so that the clinical value of this tool is maximized.
REFERENCES


Kodak, T., Campbell, V., Bergmann, S., LeBlanc, B., Kurtz-Nelson, E., Cariveau, T., ... & Mahon, J. (2016). Examination of efficacious, efficient, and socially valid error-correction procedures to teach sight words and prepositions to children with autism


Appendix A: Cognitive Impairment Assessment

Cognitive Impairment Assessment

In order to determine that the individual is unable to provide assent due to cognitive impairment, we will complete the cognitive impairment assessment below. In the cognitive assessment we will ask the individual a series of questions. If the participant answers fewer than six questions correctly, they will be considered cognitively impaired and unable to provide written or verbal assent. If the participant answers six or more questions correctly, they will be considered capable of providing written or verbal assent.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Did the individual answer correctly?</th>
</tr>
</thead>
<tbody>
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<td>What is your name?</td>
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</tr>
<tr>
<td>How old are you?</td>
<td>Y / N</td>
</tr>
<tr>
<td>What day is it?</td>
<td>Y / N</td>
</tr>
<tr>
<td>Who are we?</td>
<td>Y / N</td>
</tr>
<tr>
<td>Do you have to participate in this study?</td>
<td>Y / N</td>
</tr>
<tr>
<td>How long will you be participating in this study?</td>
<td>Y / N</td>
</tr>
<tr>
<td>Do you engage in ____ (problem behavior)?</td>
<td>Y / N</td>
</tr>
<tr>
<td>What do you say if you do not want to participate in this study?</td>
<td>Y / N</td>
</tr>
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Number Correct ____ / 8
### Appendix B: Error-Correction Assessment Data Sheet

**Subject:** Error-Correction Assessment Datasheet

<table>
<thead>
<tr>
<th>Condition Key:</th>
<th>No E.C.: No error-correction</th>
<th>M: Model</th>
<th>SRR: Single response repetition</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>RUI: Re-present until independent</td>
<td>MRR: Multiple response repetition</td>
<td>MTLD: M à L Prompt w/ Delay</td>
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<table>
<thead>
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<th>Condition:</th>
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**Session Duration:**

**Percentage Correct:**

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Data collector: Session: Condition: Assessment (circle one): Brief / Validation

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<th>Trial</th>
<th>Order</th>
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<th>Model (Tally)</th>
<th>Physical (Tally)</th>
<th>Prompted R (Tally)</th>
<th>Correct R w/ E.C. (Tally)</th>
<th>Error w/ E.C. (Tally)</th>
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**Percentage Correct:**

**Session Duration:**

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76
## Appendix C: Demographic Questionnaire

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<td>What is the individual diagnosed with?</td>
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<td>Where is the individual’s primary residence?</td>
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<td>What medication(s) is the individual currently taking?</td>
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<td>Does the individual have a guardian? (e.g., power of attorney, limited guardianship, etc.)</td>
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<td>What is the individual’s primary mode of communication? (e.g., speaking, sign-language, picture exchange, etc.)</td>
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<td>What language(s) does the individual speak?</td>
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<td>Is the individual currently receiving applied behavior analytic services?</td>
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<td>What additional services does the individual receive? (e.g., speech therapy, occupational therapy, etc.)</td>
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<td>What day activities does the individual engage in? (e.g., school, day program, companion service, etc.)</td>
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<td>Does the individual have a crisis management plan in place to manage problem behavior?</td>
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<td>What self-care skills can the individual complete independently?</td>
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Appendix D: Lego Structure Master List (Sample)

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### Appendix E: Play Skills Assessment (Sample)

(+) : Correct response  
(-) : Error  
N/R: No response

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Appendix F: Baseline Fidelity Checklist (Brief and Validation Assessment)

Subject: Baseline Fidelity Checklist (Brief and Play Skills Validation Assessment)

Condition Key:
- No E.C.: No error-correction
- M: Model
- SRR: Single response repetition
- RUI: Re-present until independent
- MRR: Multiple response repetition
- MTLD: M à L Prompt w/ Delay

Steps:
1. The therapist places the relevant Lego pieces on the table in front of the subject.
2. The therapist waits to present the instruction until the subject attends (i.e., makes eye-contact) to the target stimuli.
3. The therapist presents the correct instruction (i.e., “Play with the Legos” or something similar).
4. If subject engages in a correct response, the therapist delivers no feedback and ends the trial.
5. If subject engages in an error or does not respond within the allotted prompt delay (i.e., 5 s), the therapist delivers no feedback and ends the trial.

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Percentage of Steps Correct:
### Appendix G: Training Fidelity Checklist (Brief and Validation Assessment)

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<th>Condition Key</th>
<th>No E.C.: No error-correction</th>
<th>M: Model</th>
<th>SRR: Single response repetition</th>
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<tr>
<td></td>
<td>RUI: Re-present until independent</td>
<td>MRR: Multiple response repetition</td>
<td>MTLD: M → L Prompt w/ Delay</td>
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#### Steps:

1. The therapist places the relevant Lego pieces on the table in front of the subject.
2. The therapist waits to present the instruction until the subject attends (i.e., makes eye-contact) to the target stimuli.
3. The therapist presents the correct instruction (i.e., “Play with the Legos” or something similar).
4. If subject engages in a correct response following the instruction, the therapist delivers behavior-specific praise and an edible reinforcer.
5. If subject engages in an error or does not respond within the allotted prompt delay (i.e., 5 s), the therapist:
   - a) No E.C.: Delivers no feedback and ends the trial
   - b) M: Models the correct response and ends the trial
   - c) SRR/MRR: Models the correct response
   - d) RUI: Physically guides the subject to engage in the correct response and re-presents the trial
   - e) MTLD: Increases prompt level following two incorrect responses (model → physical) or fades prompt level following two correct responses (model → no E.C.)
6. If subject engages in an error or does not respond within the allotted prompt delay (i.e., 5 s) following the first error-correction trial, the therapist:
   - a) SRR/MRR: Physically guides the subject to engage in the correct response
   - b) RUI: Repeat procedure described in step 5d until the subject engages in a correct response following the therapist representing the trial or until a total of 10 error-correction trials were presented without a correct response.
   - c) MTLD: Increases prompt level following two incorrect responses (model → physical) or fades prompt level following two correct responses (model → no E.C.)
7. If subject engages in an error or does not respond within the allotted prompt delay (i.e., 5 s) following the first error-correction trial, the therapist:
   - a) MRR: Repeat procedure described in step 3c and 6a until the subject engages in a correct response a total of five times or until a total of 10 error-correction trials were presented without five correct responses.

#### Data collector:

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#### Percentage of Steps Correct: ____________________
### Brief Assessment

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Appendix I: Multiple Stimulus Without Replacement Data Sheet

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<td><strong>Item Selected</strong></td>
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Appendix J: IRB Approval Letter

July 9, 2019

J Turner Braren
CFBH-Child and Family Behavioral Health Tampa, FL 33612

RE: Expedited Approval for Initial Review

IRB#: Pro00040819

Title: Extending Brief Error-Correction Assessments to Adults with Intellectual or Developmental Disabilities

Study Approval Period: 7/9/2019

Dear Mr. Braren:

On 7/9/2019, the Institutional Review Board (IRB) reviewed and APPROVED the above application and all documents contained within, including those outlined below. Please note this study is approved under the 2018 version of 45 CFR 46 and you will be asked to confirm ongoing research annually in place of a full Continuing Review. Amendments and Reportable Events must still be submitted per USF HRPP policy.

Approved Item(s): Protocol Document(s):

Protocol, Version #1, 7/1/19

Consent/Assent Document(s)*:
LAR Consent, Version #1, 7/8/19.pdf

Adult Assent Form, Version #1, 7/2/19

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved. The Adult Assent is not a stamped form.
It was the determination of the IRB that your study qualified for expedited review which includes activities that: (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45 CFR 46.110. The research proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your study qualifies for a waiver of the requirements for the documentation of informed consent as outlined in the federal regulations at 45 CFR 46.117(c), which states that an IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds any of the following: (1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject (or legally authorized representative) will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern; (2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context; or (3) if the subjects or legally authorized representatives are members of a distinct cultural group or community in which signing forms is not the norm provided that the research presents no more than minimal risk of harm to subjects and provided there is an appropriate alternative mechanism for documenting that informed consent was obtained. (Adult Assent)

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB via an Amendment for review and approval. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) business days.

We appreciate your dedication to the ethical conduct of human subjects research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Melissa Sloan, PhD, Vice Chairperson USF Institutional Review Board