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Compliance Training Produces Increases in Skill-Based Assessments in Typically-Developing Children

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by

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Abstract

Early intensive behavioral intervention therapy (EIBIT) practitioners have been documented to use both standardized psychological and behavioral assessments in assessing outcomes of children diagnosed with autism. Assessments are necessary to inform stakeholders if EIBIT is effective, for which children, and under what conditions. However, the extent to which variables like compliance influence the results of existing EIBIT assessments is yet unknown. This study evaluated the influence of compliance training on the results of the Early Learning Measure (ELM), one assessment used in EIBIT. Two participants underwent repeated compliance training sessions followed by re-testing of the ELM assessment. Mean scores on the ELM increased over baseline following compliance training alone for both participants. A compliance reversal training protocol was then conducted. Mean scores on the ELM decreased for one participant and remained stagnant for the second following compliance reversal. The study's findings support variables like compliance may influence scores on EIBIT assessments and provide a preliminary evidence for the need to systematically manipulate these variables in applied settings.

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Chapter 1: Introduction and Literature Review

Early intensive behavioral intervention therapy (EIBIT) is an evidence-based treatment found to be effective for many young children diagnosed with autism (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993; Rogers & Vismara, 2008). EIBIT was developed from the field of applied behavior analysis and uses behavior analytic principles to guide systematic teaching to address autism-related features (see Lovaas, 2003 for a review of EIBIT principles). While findings support that most children who receive EIBIT benefit more than receiving no intervention, there appears to be a wide range of outcomes among individuals (Eldevik, et al., 2009; Reichow, 2012). Some studies report that just under half of children receiving EIBIT achieve normal functioning, and another substantial percentage of achieve significant gains in IQ, language, and other skill areas (Lovaas, 1987; McEachin, et al., 1993; Rogers & Vismara, 2008).

While the outcomes of EIBIT are promising, it can be expensive for families and funding agencies. Direct therapy costs for intensive behavioral treatments are reported to be as high as $60,000 per child per year (Chasson, Harris, & Neely, 2007). This cost is in addition to the substantial financial and social costs of raising a child diagnosed with autism families already incur (Ganz, 2007; LaValle, et al., 2014; Leigh & Du, 2015). Costs of raising a child diagnosed with autism in the United States, including healthcare, education, therapies, and caregiver time are reported to be as high as $17,000 per year in addition to costs of traditional parenting (LaValle, et al., 2014). Many families also incur indirect costs, including parents' loss of working hours or leaving the workforce as a result of a child receiving treatment (Ganz, 2007).

With such steep costs and such wide-ranging treatment outcomes, it becomes increasingly more important for all stakeholders to understand which children are likely to benefit from EIBIT.

Comparative Effectiveness of Assessing EIBIT Outcomes

The field of applied behavior analysis relies on assessments to better predict which individuals might benefit the most from a particular treatment (Nelson & Hayes, 1979). Families and EIBIT practitioners also use assessment data to guide treatment decisions and demonstrate the benefits of EIBIT over other treatments. Yet few empirical evaluations are conducted on the treatment utility of conducting particular behavioral assessments. If families and stakeholders are to make important decisions about care and resource allocation, more information is needed about the comparative effectiveness of behavioral assessments. Researchers should provide a better understanding of what behavioral assessments yield the best EIBIT outcomes for a given population of children, and under what conditions.

Current Research on Assessments in EIBIT

In 2007, MacDonald, Parry-Cruwys, Dupere, and Ahearn reviewed the common assessments used in evaluating progress and outcomes for toddlers receiving EIBIT. Their findings indicated that while no standard EIBIT assessments exist, practitioners frequently use a combination of psychological and behavioral assessments to evaluate progress and outcomes.

Psychological assessments. Norm-referenced standardized psychological assessments are frequently used as measures of progress and outcomes in EIBIT (MacDonald, et al., 2007). These include pre- and post-treatment scores on standardized measures of IQ (e.g., *Bayley, Wechsler Preschool and Primary Scale* [WPPSI], *Merrill-Palmer*, *Stanford-Binet*) and composite scores of adaptive functioning (e.g., *Vineland Adaptive Behavior Scale, Adaptive*

Behavior Assessment System [ABAS]). It is argued that individuals who have achieved successful outcomes as a result of EIBIT reflect statistically significant increases in scores, and in many cases achieve scores in the normative range (Lovaas, 1987; McEachin, et al., 1993; Rogers & Vismara, 2008).

While standardized psychometric evaluations like IQ and adaptive behavior can be indicative of global changes in functioning, they offer little information about the target behaviors to address in treatment or about which changes resulted in the best outcomes for the individual (Nelson & Hayes, 1979). In addition, there is some evidence to support these measures lack the sensitivity to measure and predict changes to autistic features (MacDonald, et al., 2007).

Autism-specific assessments. Other assessments attempt to remedy this lack of sensitivity by directly assessing changes in autism-specific deficits, including language development and social functioning. The *Autism Diagnostic Observation Schedule* (ADOS-2; Lord, DiLavore, & Gotham, 2012) and the *Childhood Autism Rating Scale* (CARS-2; Schopler, Reichler, & Renner, 2002) are two such measures used with children receiving EIBIT (MacDonald, et al., 2007). In both assessments, an evaluator uses a rating scale to rank the child's performance across a variety of autism-related skill areas. Information on the child's performance is reported by the caregiver or teacher. The scores on each rating scale are calculated to form a composite, which then contributes to a diagnosis of the severity of autism. Therefore, it is presumed that a child who achieves an autism diagnosis pre-treatment and loses that diagnosis post-treatment can be said to have achieved optimal functioning as a result of EIBIT (Sallows & Graupner, 2005).

While these autism-specific assessments are designed with more sensitivity to the core behavioral deficits and excesses of the disorder than standardized psychological evaluations, both are indirect measures of individual performance and rely on parent and teacher report. As such, they do not require the repeated observation of the individual's performance over time, and in many cases the evaluator must make conclusions based on the caregiver's subjective reports (MacDonald, et al., 2007). While these types of descriptive assessments have value in identifying patterns or global excess and deficits, it can be argued they lack the experimental control and repeated observation necessary to understand what elements of treatment were effective and why (see Nelson & Hayes, 1979).

Rate of learning assessments. In addition, MacDonald et al., (2007) identified two studies that remedy the above deficits in assessment through direct observation of the child's rate of learning. Rate of learning, or sometimes rate of acquisition can be described as the duration needed to meet pre-determined mastery criteria for a particular skill (Cooper, Heron, & Heward, 2007; Weiss & Delmolino, 2006). According to these studies, rapid acquisition of skills—especially in vocal imitation—during the initial months of EIBIT has been strongly correlated with children who achieved normal functioning after treatment (Sallows & Graupner, 2005; Smith, Groen, & Wynn, 2000). Other examinations in EIBIT show more moderate correlations between rate of learning and later status of the child (Weiss, 1999). The findings suggest those who demonstrated high initial learning rates during the assessment continued to demonstrate high rates of learning. Children who demonstrated lower rates of skill acquisition continued to demonstrate higher rates of autistic behavior after treatment (Smith, Groen, & Wynn, 2000; Weiss, 1999).

While Weiss (1999) suggested that rate of skill acquisition may be indicative of EIBIT outcomes, it was also suggested that rate of learning may be influenced by other confounding variables. In the study the rate of learning of 19 children diagnosed with autism receiving in-home EIBIT was measured across nine programs. Initial rapid rates of learning were correlated with later improvements in autistic behavior (Weiss, 1999). However, no controls were made for variability in individual responsiveness to reinforcement and basic compliance among the participants. Without these controls, it is unclear how success on rate of learning assessments is influenced by confounding variables.

Measuring the Influence of Variables in Rate of Learning Assessments

There are many variables which may influence rate of learning assessments. To date, no empirical research has been published examining how variables like compliance, responsiveness to social reinforcement, or instructor experience influence outcomes on these types of assessments. This study seeks to increase the available information by developing a methodology for assessing the influence of variables like compliance in rate of learning assessments.

The Role of Compliance

In many EIBIT programs, the initial months of treatment are focused on building rapport and establishing basic compliance (Lovaas, 2003). Failure to comply with instructions is frequently identified as a behavioral problem in children with developmental disabilities (Cataldo, Ward, Russo, Riordan, & Bennett, 1986; Mace, et al., 1988; Lovaas, 2003; Wilder, Fischetti, Myers, Leon- Enriquez, & Majdalany, 2013). Schoen (1983) operationally defined compliance as demonstrating a specific requested response within a designated time. Not only

does complying include response accuracy, it must also be performed when instructed. Schoen also described the counterpart of 'non-compliance' as demonstrating a different response than the one requested, responding outside of the designated time, or no response when requested.

Compliance Training in EIBIT

A myriad of behavioral interventions have been developed to address compliance deficits in children. Houlihan, Sloane, Jones, and Patten (1992) reviewed literature on behavioral treatments to increase compliance. Consequence-based procedures, including contingent reinforcement and punishment, were cited as effective in increasing compliance. These procedures were used with a variety of instructions and across various environments. Antecedent strategies including changing the form of the instruction or the context of the instruction were also found to be effective in increasing compliance. Manipulating high probability and low probability instructions to promote compliance (Mace et al., 1988; McComas, Wacker, & Cooper, et al., 1998; Zuluaga & Normand, 2008) has also been studied in EIBIT programs.

Lovaas (2003) described procedures to establish compliance in the early stages of EIBIT. Compliance with sitting in a chair is frequently the first response taught in many EIBIT programs, followed by compliance with simple instructions (e.g. "Come here," "hands quiet," "drop block") in the initial weeks of treatment. Training compliance with these beginning tasks is described as essential to developing other more complex behaviors.

Yet despite the evidence of the effectiveness of compliance training, little is known about how compliance influences results on many behavioral assessments, particularly rate of learning assessments. Specifically, researchers must better understand the role of compliance has in

altering scores on assessments independent of EIBIT programming. If rate of learning assessments are indicative out EIBIT outcomes, perhaps compliance may also be a stand-alone indicator of outcomes. Additional empirical examination is necessary to understand and evaluate this relation in rate of learning assessments.

The Early Learning Measure

The Early Learning Measure (ELM) is one rate of learning assessment well-suited for an empirical study of compliance. The ELM was developed by many of the early pioneers of EIBIT (Lovaas & Smith, 1988; Smith, Buch, & Ganby, 2000; Smith, Groen, & Wynn, 2000), and first appeared as part of long-term outcome studies of children who received EIBIT under the UCLA treatment model (Smith, et al., 2000). The ELM emphasizes initial rates of learning in the first few months of EIBIT as a predictor of which children will achieve optimal functioning at the end of treatment. A number of sources have supported the use of the ELM by EIBIT practitioners (Lovaas & Smith, 1988; Sallows & Graupner, 2005; Smith et al., 2000). The assumptions, administration, and varied empirical support of the ELM make it particularly well-suited for an evaluation of the effects of compliance on outcomes. It is to these three aspects that I now turn.

Assumptions of the Early Learning Measure

There are several assumptions that supported the initial development of the ELM. Described by Weiss (1999), the foundation of the ELM resides in the assessment of initial rates of learning in the first several months of EIBIT. The evaluator assesses rate of learning across four core areas of basic skills: non-vocal imitation, vocal imitation, responding to commands, and expressive labels (i.e., tacting objects) in the first five months of treatment (Smith, et al.,

2000). The ELM assumes that children with autism who benefit from EIBIT the most are those who experience the most gains in the initial stages of treatment. If these children must make up significant ground in order to "catch up" to their same-aged peers, the first months of EIBIT are critical to establish the necessary conditions to accelerate learning.

Assessment Administration

Smith, Buch, and Ganby (2000), Sallows and Graupner (2005), and Lovaas Institute for Early Intervention (1998) describe the procedure for administering the ELM. The assessment is traditionally conducted under controlled conditions in the environment in which the EIBIT program is to take place (i.e., if the EIBIT program is in-home, the ELM is conducted in the child's home; it should be conducted in the therapy center for children attending center-based programs). Stimuli are gathered from the available materials in the child's environment and the child is seated across from the evaluator during the assessment. ELM assessments are frequently videotaped for later reference.

Baseline. Baseline is established at intake, prior to the start of any EIBIT programming with the child. At baseline the evaluator identifies failures across each of the four core skill areas. Failures can include: the child provides no response to an instruction, the child provides an inaccurate or incomplete response (e.g., the child says "cup" when the evaluator presents a shoe), the child engages in refusal or tantrum behavior following an instruction, or the child demonstrates the response the first time the instruction is given, but does not demonstrate it on a consecutive administration.

The evaluator identifies 40 instructions the child fails to respond to, 10 in each of four core skill areas: 10 non-vocal imitation tasks (e.g., evaluator says "Do this." and models

clapping hands. Child stomps feet), 10 vocal imitation tasks (e.g., evaluator says "Say Mama." Child says "Dada"), 10 receptive commands, (e.g., evaluator says, "Touch head." Child touches knees), and 10 expressive object labels (e.g., evaluator presents a shoe and says "What's this?" Child says "shirt"). Once the evaluator identifies the 40 items, a second baseline evaluation is conducted up to one week later. If the child responds correctly to an instruction in the second baseline evaluation that was previously identified as a failure it is removed from the test items and a new failure to respond is identified. These 40 instructions are then evaluated through the rest of the assessment (see Appendix A for a sample of ELM instructions).

Treatment. Following the onset of EIBIT programming, the ELM is re-administered every four to five weeks of treatment for the next five months. During this time, the EIBIT programming may or may not include items from the ELM. At each re-administration, the evaluator presents the 40 items and measures mastery for each. Mastery is defined as demonstration of the response on two consecutive opportunities to respond. If the child demonstrates mastery of an item, it is no longer assessed in upcoming administrations of ELM. Therefore, as the child demonstrates mastery of items in each ELM, fewer items are administered on the subsequent assessments. The test is continued until the child responds to all 40 items or until the end of the first five months of treatment, whichever occurs first.

Data analysis. At the end of the first five months of treatment, the evaluator has a visual depiction of the rate of the child's skill acquisition across the four skill areas (see Figure 5 for an example). The primary measure obtained at the end of assessment is the number of weeks required for the child to learn 90% (9 of 10 items) of items in each skill area and assumes that children who acquire these items during the first five months of treatment have a promising

prognosis for responding to EIBIT (Sallows & Graupner, 2005). While not empirically validated, it follows logically that children who demonstrate slower acquisition of skills (i.e., the child only masters a few items in each of the core skill areas) or more moderate acquisition of skills on the ELM (i.e., the child masters all items in one or two core skill areas but limited items in the others) are likely to demonstrate more moderate outcomes after receiving EIBIT.

Considerations and Limitations of the Early Learning Measure

Upon initial review, the ELM offers promising data for parents and EIBIT practitioners. Given there is a relatively brief intake baseline period and the results can be calculated concurrently with treatment (no need to discontinue treatment or return to baseline), the ELM avoids critical teaching time in assessments rather than EIBIT programming. The response effort and specialized training to administer the assessment is also low with only 40 items to test and very simple instructions for the evaluator.

In addition, early assessment data provided by the ELM may influence treatment. Completing the assessment every five weeks of treatment provides frequent and consistent feedback about the progress in treatment. Practitioners' behavior may adjust based on ELM results as well. Positive assessments may be an indication the EIBIT programming in place is aiding in the rapid acquisition of skills. If the results are more moderate in the initial ELM assessments, parents and practitioners may make adjustments to the EIBIT programming to increase the rate of skill acquisition (e.g. increased intensity of hours, revision to reinforcement contingencies, more staff training).

However, many of the conclusions listed above must be interpreted cautiously as there are a number of considerations and limitations to the ELM. The results of the assessment should

be interpreted with an understanding of the limited empirical validation for the assessment and the influence of potential confounds like compliance.

Empirical Validation of the Early Learning Measure

One of the most critical concerns regarding the treatment utility of the ELM is the limited empirical validation of the assessment. To date, the body of research using rate of learning in EIBIT has been limited to a few long-term outcome EIBIT studies, primarily from the developers of the assessment (Lovaas & Smith, 1988; Smith, et al., 2000). While the results of these studies are encouraging, conclusions are corollary in nature and do not necessarily indicate that the assessment can *predict* which children will achieve normal functioning following EIBIT treatment. It is erroneous to suggest that at this time results from the ELM alone could indicate to a practitioner or parent what the long-term prognosis of a child with autism may be after receiving EIBIT.

In addition, no empirical studies have been published indicating how the results of the ELM might guide modifications to EIBIT programs to alter a child's prognosis. A practitioner who conducts the initial ELM assessments might see rapid gains in one area but slow acquisition of skills in another area and make adjustments accordingly. A child might receive lower intensity or lower quality treatment in the first five months as EIBIT staff are trained to implement the program and as the staff build rapport with the child which may underestimate progress on the ELM. Problem behavior may interfere with responding during the initial stages of treatment, which may take more than five months to address; yet with modifications the child may demonstrate rapid acquisition of skills after the mastery cut-off for the ELM. It is yet unknown if or how these types of adjustments to treatment at early or later stages of EIBIT may

alter later outcomes. Studies on how treatment intensity, staff training, or rates of problem behavior influence ELM results are also limited in scope and number.

The Influence of Compliance Training on the ELM

While the ELM is considered to be an assessment of rate of learning, the measurement criteria mirrors a measurement of compliance. A correct response on the ELM is by definition a compliant response in that the child performs the skill with accuracy and fluency when instructed. In this way, one must question whether the outcomes on an ELM assessment reflect a measure of rate of learning or a measure of compliance. Logically then, if the ELM results correlate with basic compliance rather than skill acquisition, one must also question if compliance is a similar or better predictor of child outcomes than rate of learning.

Finally, although compliance appears to be a component of the ELM assessment, little is known about if or how compliance interventions improve outcomes on the ELM or improve outcomes in EIBIT. Perhaps emphasis on compliance training in the initial stages of EIBIT is more critical than targeting specific skill deficits as suggested by other standardized or autism-specific assessments. Of course, such questions are empirical in nature, and require data that currently do not exist. Prior to answering these important questions, an assessment of the degree to which compliance influence ELM results is needed.

Statement of the Problem

Given the results of previous EIBIT outcomes research using of rate of learning (Lovaas & Smith, 1988; Smith, et al., 2000; Weiss, 1999), further research on these assessments is needed. Assessments are necessary to inform stakeholders if EIBIT is effective, for which children, and under what conditions. However, the extent to which variables like compliance

influence the results of existing EIBIT assessments like the ELM is unknown. A standardized empirical method to evaluate these variables is also yet undeveloped. The purpose of the current study was to develop a rudimentary methodology to evaluate the influence of compliance training on the results of the ELM in an applied setting.

Chapter 2: Methods

Participants, Setting, and Materials

Participants. Data were collected from two participants. Both participants were siblings of a child currently enrolled in an in-home EIBIT program located in a large Midwest metropolitan area. The EIBIT program was currently using the ELM as part of the intake and semi-annual assessment package. Sibling participants were selected to avoid interference with the intake assessment procedure of a child currently undergoing EIBIT, to avoid an interference with a current EIBIT program which may already be targeting compliance and to avoid practice effects from prior intake assessments.

Families were recommended to the investigator by the agency's clinical director based on the following selection criteria: 1) participant was at least 3 years of age at the onset of the study, 2) participant was described by the clinical director as possibly benefitting from additional compliance training (in some circumstances, the EIBIT program addresses sibling compliance to promote successful modeling of appropriate behavior for the child in treatment), and 3) participant had not had prior compliance training with the EIBIT team.

Sam. Sam was a 4-year-old male whose older brother was currently receiving in-home EIBIT services for ASD. The clinical supervisor overseeing the older brother's case reported that Sam engaged in non-compliant behaviors with his family members, including frequent

whining and protesting. He was also observed to engage in some aggression (chasing and hitting his siblings) when he was asked to do difficult tasks or preferred activities were disrupted by his siblings.

Sam was enrolled in a preschool classroom for 3-5 year olds three days per week prior to and during the duration of the study. Sam's mother reported that he had been evaluated for ASD the previous year due to reported challenges with social interactions by his preschool teachers. Sam would prefer to play alone at preschool or would have difficulty engaging appropriately with his classmates. At the time of evaluation, Sam did not meet the diagnostic criteria for ASD and no additional diagnostic recommendations were made. Sam's mother reported he scored "above his age level" for expressive language, but would start to "shut down" when the receptive language assessments were conducted.

Bailey. Bailey was 5 years old at the onset of the study. His twin brother was currently receiving in home EIBIT services for ASD. Bailey had not been previously evaluated for ASD; however, his mother reported concerns about his 'anxiety issues' and stress related to his brother's severe aggressive behaviors and inability to communicate.

Bailey was enrolled in a preschool classroom for 4-5 year olds three mornings per week prior to and during the study. Bailey's mother reported that he was responding well in the preschool setting and had several close friends. At home, he was observed to have tantrum behaviors when asked to complete simple tasks. He also demonstrated overly emotional responses to unpredictable events (e.g., screaming and crying if his block tower collapsed, aggression towards his caregivers if refused).

Setting and Materials. All sessions were conducted in the participants' home, which comports with the assessment conditions for the ELM. Sessions were conducted once per day by a member of the EIBIT program staff. Written instructions for each session were provided to the assessor prior to experimentation and at the onset of each session (see Appendix C). The assessor scored all session measures on a provided data collection sheet (see Appendix B). Finally, the principal investigator directly observed the assessor's implementation of the ELM and compliance training sessions using a fidelity checklist (see Appendix D) to confirm correct and incorrect implementation of each experimental condition.

Experimental Design

A replicated ABCBD design with embedded probes was used in this study to determine the existence of and extent to which compliance training influences scores on the ELM assessment. Three conditions were examined: compliance training, compliance reversal, and task training.

Response Measurement

Child measures. The primary dependent measure for this study was correct and incorrect responses to instructions during the ELM assessment and during compliance training sessions.

Correct/incorrect responses to instructions. For each session, the assessor scored correct and incorrect responses to instructions. Correct responses were defined as the child accurately completes the instruction within 5 seconds. Incorrect responses or "failures" were defined as: non-response (i.e., the child does not respond within 5 seconds of the instruction), inaccurate response (i.e., the child completes a different response than the one requested by the

assessor and does so within 5 seconds of the instruction), incomplete response (i.e., the child completes part of the instruction but not all components within 10 seconds of the instruction), or any maladaptive behavior (i.e., the child vocally refuses, disrupts the environment, leaves the assessment area, tantrums, or aggresses) at any point during or following the instruction delivery. The type of failure and maladaptive behavior for each instruction delivered was also recorded when applicable. In addition, for each session the percentage of correct responses was calculated by dividing the number of correct responses in the session by the total number of instructions delivered during the session.

Procedures

Assessor training. Prior to experimentation, the staff (clinical supervisor, senior behavior therapist, or behavior therapist) overseeing the client's EIBIT program completed assessor training. One week prior to the training, the investigator provided written instructions for each experimental session and the fidelity checklists. The principal investigator then conducted a 30-minute training session with each assessor, including modeling, role play, and feedback on the assessor delivery of experimental conditions.

Following the training session, each assessor was observed completing the experimental conditions with the child. The assessor was required to demonstrate 90% correct responding on the fidelity checklist in order to proceed. The fidelity checklist was completed to ensure consistent responding on a total of 10% of sessions.

ELM baseline. Each participant completed the standard baseline data condition of the ELM as outlined in Smith, Buch, and Ganby (2000), Sallows and Graupner (2005), and Lovaas Institute for Early Intervention (1998). For each session, the assessor reviewed pre-written

session instructions from the principal investigator, gathered all materials necessary for the session, and conducted the session according to the written instructions (see Appendix C). All sessions were video recorded using the camera application on an iPod for later review.

The assessor began with a sampling procedure to identify a putatively reinforcing activity (i.e., present the item to the child, prompt the child to engage with the item, observe if the child reaches for the item, makes eye contact with the item, or requests access to the item). When a putatively reinforcing activity or item was identified (or when a maximum of five putatively reinforcing activities or toys were sampled), the assessor prompted the child to begin the first test section.

After each instruction, the assessor observed and recorded the child's response. The assessor delivered the statement "OK" in a neutral tone following all correct and incorrect responses. One to two minutes of noncontingent access to putatively reinforcing activities or stimuli was delivered after every three instructions. Two consecutive correct responses were required for the child to demonstrate mastery of any particular instruction. No prompting occurred following incorrect responses and any maladaptive behavior was ignored.

Instructions were administered in blocks of ten before repeating the same instructions again (e.g., the assessor tests motor imitation instructions #1-10 in order. The child demonstrates instruction #1 & #2 only. The assessor repeats these two instructions, then begins testing instructions #11-20 to identify a total of 10 failures). This process was continued until 10 failures were identified in each test section. Between each section of the ELM, the assessor provided the child with a 2-3 minute break without reinforcement or demands before beginning the sampling and test procedure again until 40 failures were identified.

A second administration of the ELM baseline was conducted approximately 1 week after the first administration using similar reinforcement and prompting procedures. The assessor began by testing the 40 failures identified during the first baseline collection. If the child demonstrated a second failure, the instruction was carried forward into the ELM probe sessions. However, if the child demonstrated the mastery criteria for any item during the second baseline probe, the assessor introduced a new instruction until another failure occurred. This process was continued until 10 failures were identified in each test section.

High-probability instruction sequencing. Following the completion of ELM baseline condition, a sequence of high- and low-probability instructions was established for each participant. In a high-probability instructions sequence, the bottom of the hierarchy is composed of instructions the participant is most likely to comply with (high-probability). The upper levels of the hierarchy represent instructions the participant is less likely to comply with (low-probability) or has a history of maladaptive behavior with. Positive reinforcement delivered for compliance with high-probability instructions can be used to influence performance on low-probability instructions (see Killu, 1999 for a review of high-probability instruction sequencing).

The high-probability instruction sequence for each participant was developed using data from the ELM baseline assessments. Level 1 high-probability instructions were those instructions that were demonstrated on two consecutive administrations in the initial ELM baseline assessment. All other instructions were considered at a higher level in the hierarchy and discarded for the remainder of the study. When the demand sequencing was completed, Sam had 50 high-probability instructions in the Level 1 hierarchy and Bailey had 16.

Compliance training. Compliance training sessions were conducted once per day in the participant's home by a staff member overseeing EIBIT treatment in the home. The therapist gathered any treatment materials needed and video recorded the session. Each session began by conducting the same sampling procedure as outlined in the ELM experimental conditions. When a putatively reinforcing activity or item was identified (or when a maximum of five potential activities or toys have been sampled), the therapist issued a Level 1 instruction and observed the child's response.

All correct responses were reinforced with access to the preferred item for 1-2 minutes. Following access to reinforcement, the therapist issued another Level 1 instruction from the hierarchy. This procedure was repeated until reinforcement was delivered 10 times. Level 1 instructions were randomly rotated across compliance training sessions. If the child did respond to a Level 1 instruction or engaged in maladaptive behavior during the compliance training sessions, the therapist re-issued the instruction and provided a prompt using least-to-most intrusive prompting methods (see Libby, Weiss, Bancroft, & Ahern, 2008) for a review of least-to-most-intrusive prompts). Following the prompted instruction, the therapist reissued the instruction until the child demonstrated compliance without prompting. No access to reinforcement was provided until the child demonstrated the correct response without prompting.

ELM probes. After every 5 compliance training sessions, the ELM was administered. During ELM probes, the assessor conducted reinforcement sampling as in baseline and no prompting was provided following incorrect responses. As in baseline, non-contingent access to putative reinforcement was provided for 1-2 minutes after every third item during probe sessions.

In the ELM instructions outlined by Smith et al. (2000), Sallows and Graupner (2005), and Lovaas Institute for Early Intervention (1998), when the participant demonstrates mastery of an instruction it is removed from subsequent ELM probes. Removing mastered items serves to minimize the confounding effects of delivering high rates of non-contingent access to highly preferred activities during the ELM probes. For example, the assessor administers all 40 items in the first probe. The participant demonstrates mastery of 5 items in the first probe. The assessor will then remove the 5 items from the next ELM probe and only administer the remaining 35 items. In each ELM probe conducted for the current study, all 40 items were tested in each ELM probe. This was a deviation from the standard protocol, but was intended to collect a more robust sample of the participant's compliance following compliance training and compliance reversal sessions. Participants were informed of this deviation and any potential risks.

Compliance reversal training. Following the compliance training phase, a compliance training reversal condition was used. Due to the sensitive nature and risks of reversing compliance training (i.e., training non-compliance with instructions may result in disruption to the family and deterioration of the child's social responding), additional considerations were made to protect the welfare of participants. The following set of conditions were established to determine when the reversal condition was conducted for each participant: 1) the participant demonstrated an increase in ELM scores on three consecutive probe sessions above baseline, 2) additional consent was obtained from the participant's parent to enter the compliance training reversal phase, 3) sufficient time and staffing resources were available at the time to ensure compliance training sessions could be conducted again following the reversal phase.

Compliance reversal sessions were conducted once per day in the participant's home by the staff overseeing the EIBIT program in the home. The therapist gathered any treatment materials needed and video recorded the session.

The therapist began by sampling to identify potential reinforcement in the same manner as the previous conditions. When a potentially reinforcing activity or item was identified (or when a maximum of five potential activities or toys were sampled), the therapist issued a Level 1 instruction and observed the child's response. Unlike in the compliance training condition, access to 1-2 minutes of preferred items and activities was provided for incorrect responses, incomplete responses, and non-responding to instructions. Correct responses within 5 seconds were ignored and the inter-trial interval of 1 minute was started followed by another Level 1 instruction. Aggression, tantrumming, or bolting were ignored. Following access to 1-2 minutes of reinforcement for failures, the therapist began a 1-minute inter trial interval with no demands and no-access to reinforcement. The procedure was continued until either 1) reinforcement was delivered 10 times or 2) 40 instructions were delivered.

Two compliance training reversal sessions were conducted prior to each probe of the ELM assessment. Using a reduced number of training sessions aimed to reduce the risks to the participant of reinforcement delivery for non-compliance. Compliance training reversal sessions were discontinued when the participant demonstrated two consecutive decreasing ELM scores of at least 20% from ELM probes during compliance training or until 3 total ELM probes have been conducted. When discontinued, the compliance training sessions were re-introduced as outlined above.

ELM task training. After re-instating compliance training for Sam, an additional experimental phase was introduced. Sam demonstrated below 50% of the ELM items during any of the conditions, indicating that compliance alone may not be sufficient to meet mastery criteria of the ELM. An additional task training phase was completed. During this phase, any ELM instruction that did not meet the mastery criteria were targeted in a "teach-to-the-test" training.

The assessor gathered any treatment materials needed and video recorded the session. Each session began by conducting the same sampling procedure as outlined in the other experimental conditions. When a putatively reinforcing activity or item was identified (or when a maximum of five potential activities or toys have been sampled), the therapist issued an ELM instruction and observed the child's response.

The assessor responded to all correct responses with a neutral "OK" and proceeded to the next instruction. After every 3 correct responses, the assessor delivered access to 1-2 minutes of the preferred activity. If Sam did not respond to an ELM instruction, the assessor re-issued the instruction and provided a prompt using least-to-most intrusive prompting methods until the child demonstrated the response without prompting or up to 3 prompted trials, whichever came first. Following the prompting sequence, the assessor delivered access to the preferred activity for 1-2 minutes. After reinforcement delivery, the assessor continued to the next ELM instruction until all 40 ELM instructions were targeted.

Treatment Integrity and Observer Agreement

Treatment integrity data were collected on 10% of sessions. Treatment integrity was scored using a fidelity checklist and direct observation by the investigator (see Appendix D for a sample fidelity checklist). Average score on the treatment fidelity checklist across all assessors

was 94.6%. Interobserver agreement was conducted either by direct observation or by an independent evaluator scoring a video recording of the session during 19% of all sessions conducted (50% of ELM baseline sessions, 24% of total compliance training sessions, and 9% of ELM probe sessions). Agreement was calculated using a Kappa coefficient for the child's correct and incorrect responses. Responses were scored by both raters giving the exact rating—correct or incorrect—for each instruction delivered in the condition. Mean Kappa coefficient calculated for sessions was 0.778. This is considered acceptable agreement.

Chapter 3: Results

The percent correct during compliance training sessions and total ELM scores across the experimental conditions are displayed in Figures 3 and 4. Results indicate that compliance training resulted in high rates of compliance with instructions for both participants. In addition, ELM scores increased for both participants after compliance training sessions (32-50% of mastery of the ELM). However, neither participant met mastery criteria of the ELM during compliance training.

Baseline ELM Outcomes

During baseline assessments of the ELM, both participants demonstrated 10 failures in each skill section for a total of 40 failures. Figure 1 displays the total number of items assessed and the number of items tested in each skill section before 40 failures were identified. A total of 193 items were tested with Sam and a total of 129 items were tested with Bailey to establish a baseline for the ELM.

Compliance Training Sessions

Figure 2 summarizes compliance with adult instructions for each participant during the experimental conditions. Participants demonstrated an average of 97% (range 80-100%) correct responses during compliance training sessions. The participants demonstrated 100% compliance on 25 of the 35 compliance training sessions conducted.

Compliance Reversal Sessions

In contrast, compliance with instructions decreased during compliance reversal sessions to an average of 87% (range 80-93%) across participants. Sam's compliance with instructions decreased to 90% during compliance reversal sessions. Bailey's compliance with instructions decreased to 84% during compliance reversal sessions (see Figures 3 and 4).

Following the compliance reversal, compliance training was re-instated with both participants. Compliance with instructions increased to an average of 98% (range 80-100%) across participants. Sam's compliance with instructions increased to 96% and Bailey's compliance with instructions increased to 100%.

ELM Skill Area Outcomes

Figures 5 and 6 summarize the ELM skill acquisition for each participant during the study. Both participants demonstrated an increase in ELM items following compliance training than at baseline. Sam demonstrated the greatest increases in motor imitation and receptive commands areas and more limited increases in the vocal imitation and expressive label skill areas. With the exception of receptive commands, all of Sam's skill areas decreased or were held stagnant during the compliance reversal condition. Bailey demonstrated a decrease in 2 of the 4 skill areas with an increase in receptive commands and stagnant responding in the motor imitation area. Both participants ELM scores returned to the levels demonstrated when

compliance training was re-instated. Following the two ELM skill training sessions, Sam acquired an additional 8 items on the ELM over the previous assessment, an increase of 20% of the total assessment items.

Chapter 4: Discussion

While behavioral assessments continue to be used in EIBIT programs to inform treatment decisions, the variables that contribute to positive outcomes on these assessments are not widely understood. The primary goal of this study was to assess the influence of compliance in EIBIT behavioral assessments like the ELM. The findings above provide preliminary evidence that variables like compliance may influence outcomes on these assessments. The introduction of a reinforcement procedure for compliance with instructions unrelated to upcoming ELM probes increased responding for both participants in ELM probes over baseline. Reversal of this procedure decreased ELM scores in one participant and moderated ELM progress in the other.

Taken together, these results suggest that rate of learning assessments like the ELM may not be a measure of skill acquisition alone. If ELM scores solely measured skill acquisition, scores should remain stable or low following compliance training. Instead, the results presented here suggest that the ELM score may be a composite of both skill acquisition (adding new skills to a behavioral repertoire) and compliance (instructional control). These findings are significant for several reasons including the accurate depiction of baseline responding, variability in performance over time, and the implications for EIBIT standards of practice.

Accuracy of Measurement

If proponents of rate of learning assessments support that children who demonstrate increases in skill acquisition in the initial months of EIBIT have better outcomes, it is important

that ELM baseline scores accurately reflect skills that are not in a child's behavioral repertoire at intake. However, the results indicated here suggest that baseline scores on the ELM may include failures in skill and failures in compliance. For example, at baseline and during ELM probe sessions Sam repeatedly identified the expressive labeling task of saxophone as "a trumpet." Compliance training was not sufficient to increase Sam's performance on the task during any of the assessments. However, when the correct answer was taught in the skill acquisition phase, Sam met the mastery criteria for 'saxophone' on two consecutive assessments. This suggests a failure in skill; saxophone was not established in the behavioral repertoire until the skill was taught.

In contrast, at baseline Bailey responded to many of the ELM instructions with correct terms but in a 'silly monster voice.' This behavior decreased during compliance training sessions and resulted in improved scores on subsequent ELM assessments. The same type of failure returned during compliance reversal sessions, dropping the mean ELM score across two consecutive assessments. This suggests that Bailey's compliance (i.e., responding to the instructions with an appropriate vocalization) with ELM instructions rather than the skills themselves may be influencing the ELM score.

Although compliance is not a skill specifically targeted on the ELM, the score increases after compliance training suggest a percentage of both children's baseline scores on the ELM were directly related to compliance failures and not failures in skill. This has serious implications for EIBIT programs that uses rate of learning assessments in outcomes data. If large numbers of failures at baseline were related to compliance as in the case of Bailey, large increases in rate of learning may be inflated at later assessments. Instead ELM scores should be

described as not only the acquisition of skills, but also learning to demonstrate these skills when requested by an assessor.

Variability in Performance Across Time

Performance across the ELM skill areas was variable between and among each participant. Sam demonstrated gains in some areas like motor imitation and receptive commands with limited gains in vocal imitation and expressive labels. Bailey demonstrated gains in all skill areas, but variability in demonstrating these skills across different ELM assessments. This variability was not fully examined in the scope of this study but it does suggest that for both children, ELM scores may be a composite of skill acquisition and other variables, rather than a measurement of rate of learning alone.

The standard ELM protocol suggests removing items from the assessment battery once demonstrated. Once the item is mastered it is considered mastered for the remainder of the treatment probes, even though it is no longer tested. However, the current experimental protocol tested all items during all ELM probes. Additional variability was identified for both Sam and Bailey as a result of this variation in the assessment protocol. Some items were demonstrated in the initial ELM probe following compliance training but not demonstrated in a later probe. After additional compliance training sessions, the skills were again demonstrated in a subsequent probe. This variability would not be captured in the standard ELM protocol and again indicates that scores may not be an accurate measure of rate of learning alone.

It should be noted that neither participant met mastery criteria of the ELM during the study. While the assessment items tested reflect the individualization procedure outlined in the standard ELM protocol, it is possible that the assessment tasks themselves may need additional

examination. This could be addressed by systematic replication of the ELM procedure with alternative lists of assessment items or replicating the compliance training procedure with a different behavioral assessment used in EIBIT.

Implications for EIBIT

If there may be other variables present in the measurement of rate of learning assessments like the ELM it should also be considered how these variables related to EIBIT outcomes. The above findings suggest that addressing compliance as a component of EIBIT treatment may result in increased scores on some behavioral assessments like the ELM regardless of what skills are taught during EIBIT. It also suggests that the children who perform better on the ELM (and subsequently are more strongly correlated with achieving normal functioning after treatment) may also be more compliant with adult instructions.

What may be the more important question for EIBIT practitioners then is whether the child must overcome barriers to compliance, barriers to skill, or a combination of both. While the procedure of assessing the ELM may provide some anecdotal information to the practitioner, the outcome data of the assessment alone does not indicate if and how much compliance contributes to a particular child's score. The assessment also does not capture if improvements over time were the result of skill training or compliance training during EIBIT. This suggests that a hybrid assessment that captures both rate of skill acquisition and compliance may be more valuable to EIBIT practitioners. At minimum, a careful examination of the type of failures (compliance or skill-related) demonstrated by each child in each assessment may be more valuable in informing treatment conditions.

Limitations

Several limitations of the study warrant noting. Neither participant decreased compliance to 0% during compliance reversal sessions. While the compliance reversal phase was kept short to reduce risks to the participants, it suggests the phase may have been too short to fully capture treatment effects (i.e., it may take equal or more sessions to fully reverse the compliance training effects from the previous phase) or that the protocol may need refinement to allow for more salient discrimination of the reinforcement contingencies by the participants. In addition, the study was not implemented with children diagnosed with ASD, the population the ELM was targeted for. If replicated with children with ASD, the relationship between compliance and skill acquisition may differ. Additional research is needed to examine these questions.

Other Areas of Future Research

While refinements are necessary, at the very minimum the findings presented suggest that alternative conclusions can be made from the results of behavioral assessments like the ELM. Given that the ultimate goal of behavioral assessment is to inform practitioners, funding agencies, and other stakeholders in making EIBIT treatment decisions, the outcomes of this study present a strong case for a more thorough examination of the current field of practice. This study lays the foundation for future research on the scope and depth of assessments in EIBIT.

Practitioners and researchers should examine which behavioral assessments are influenced by unaccounted variables like compliance, as well as should work to identify the most effective methods to systematically determine the influence of these variables. Future research should identify necessary refinements to current assessments in EIBIT to increase sensitivity to compliance and skill acquisition, since improved measurement may subsequently lead to improved treatment outcomes.

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Appendix A: Figures

Table 1

Number of Items Assessed to Establish Early Learning Measure Baseline

	Sam		Bailey	
ELM Skill Area	Baseline 1	Baseline 2	Baseline 1	Baseline 2
Motor Imitation	39	14	16	13
Vocal Imitation	28	15	14	20
Expressive Labels	33	19	15	20
Receptive Commands	27	18	13	18
Total Items Tested	127	66	58	71

Figure 1. Number of Items Assessed to Establish Early Learning Measure Baseline. This table represents the total number of items tested across each of the four skill areas of the Early Learning Measure required to establish baseline with participants Sam and Bailey. Testing was discontinued in each section when 10 failures were identified.

Table 2

Mean Percentage of Correct Responses During Experimental Sessions

	Sam			Bailey		
Experimental Phase	*M*	*SD*	*Range*	*M*	*SD*	*Range*
ELM Baseline Probes	69%	0.14	(50-89%)	49%	0.14	(29-71%)
Compliance Training	95%	6.40	(80-100%)	98%	5.23	(80-100%)
Compliance Reversal	90%	1.84	(88-93%)	84%	6.16	(80-93%)
Compliance Training	96%	8.94	(80-100%)	100%	0	100%
ELM Task Training	55%	24.04	(38-72%)	**	**	**

Figure 2. Mean Percentage of Correct Responses During Experimental Sessions. This table displays the mean percentage of responding to instructions, standard deviation, and range across each experimental phase with participants Sam and Bailey. Due to scheduling restrictions, ELM Task Training was not completed with Bailey during the study.

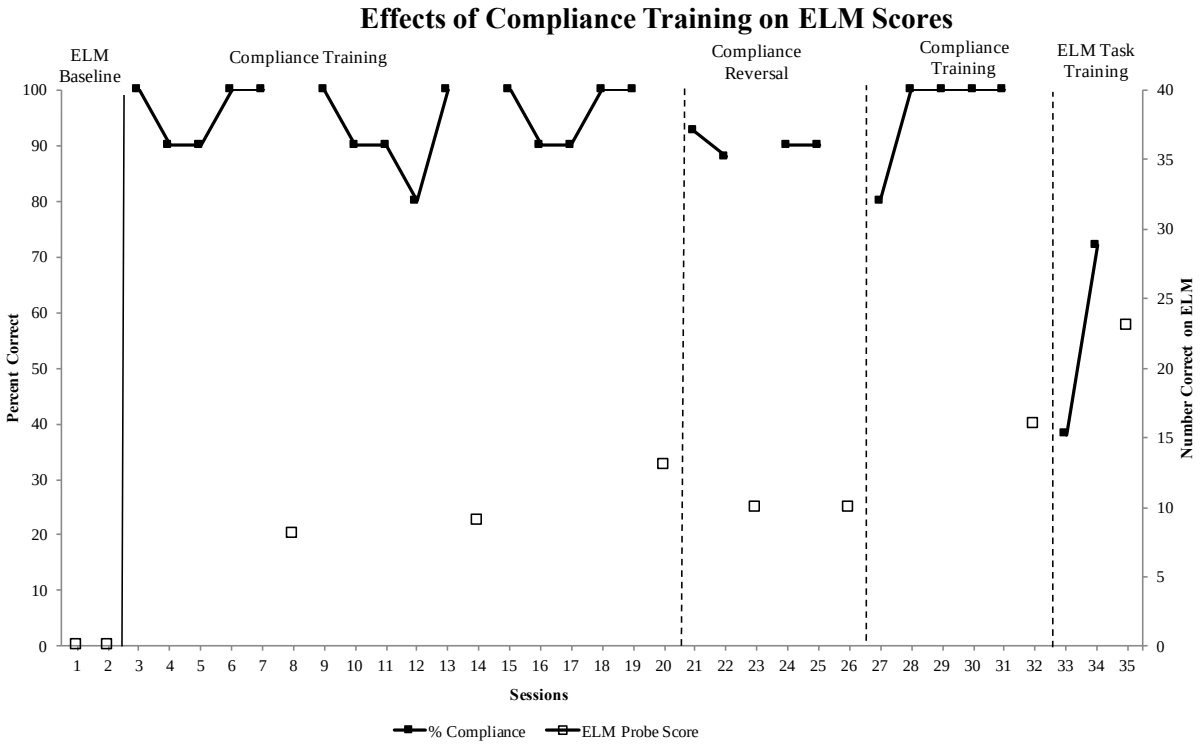


Figure 3. Percentage of correct responses during compliance training and reversal sessions and ELM scores for participant Sam. This graph represents the raw ELM scores during baseline and ELM probe sessions as outlined on the right y-axis. Percent compliance across compliance training, compliance reversal and ELM task training conditions is represented on the left y-axis.

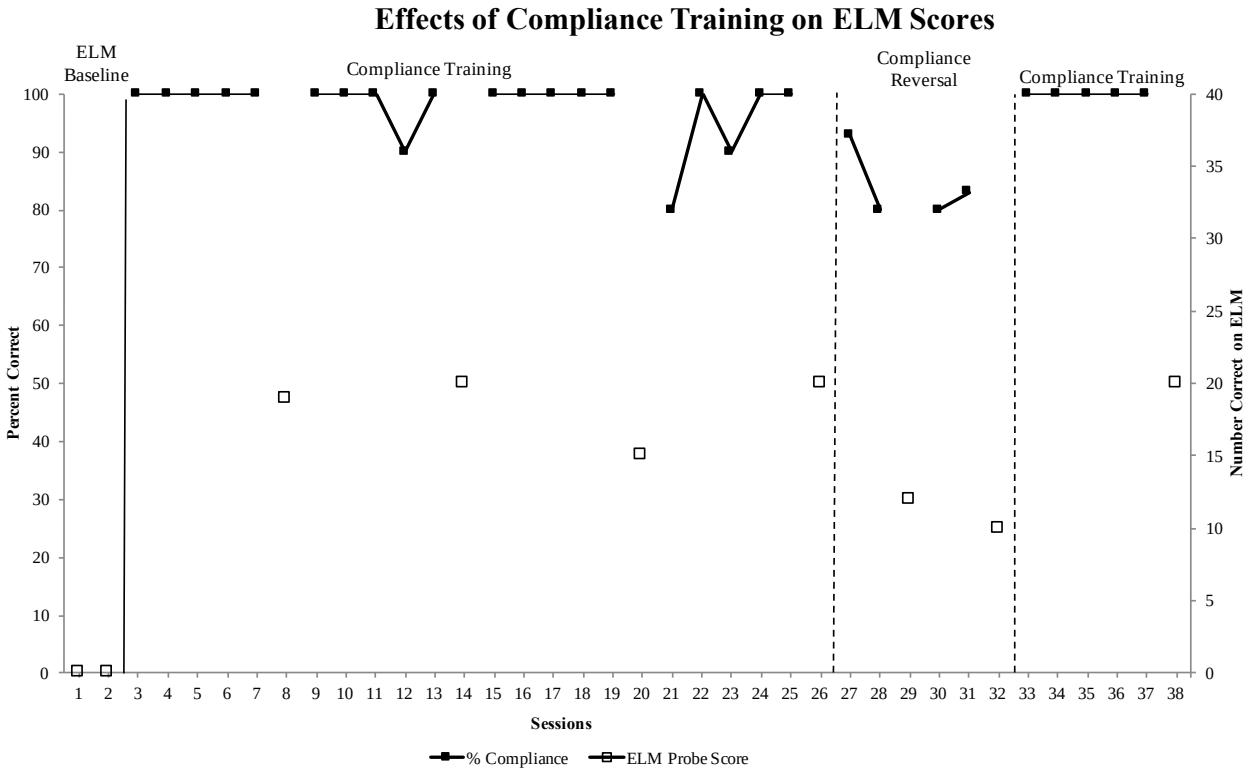


Figure 4. Percentage of correct responses during compliance training and reversal sessions and ELM scores for participant Bailey. This graph represents the raw ELM scores during baseline and ELM probe sessions as outlined on the right y-axis. Percent compliance across compliance training, compliance reversal and ELM task training conditions is represented on the left y-axis.

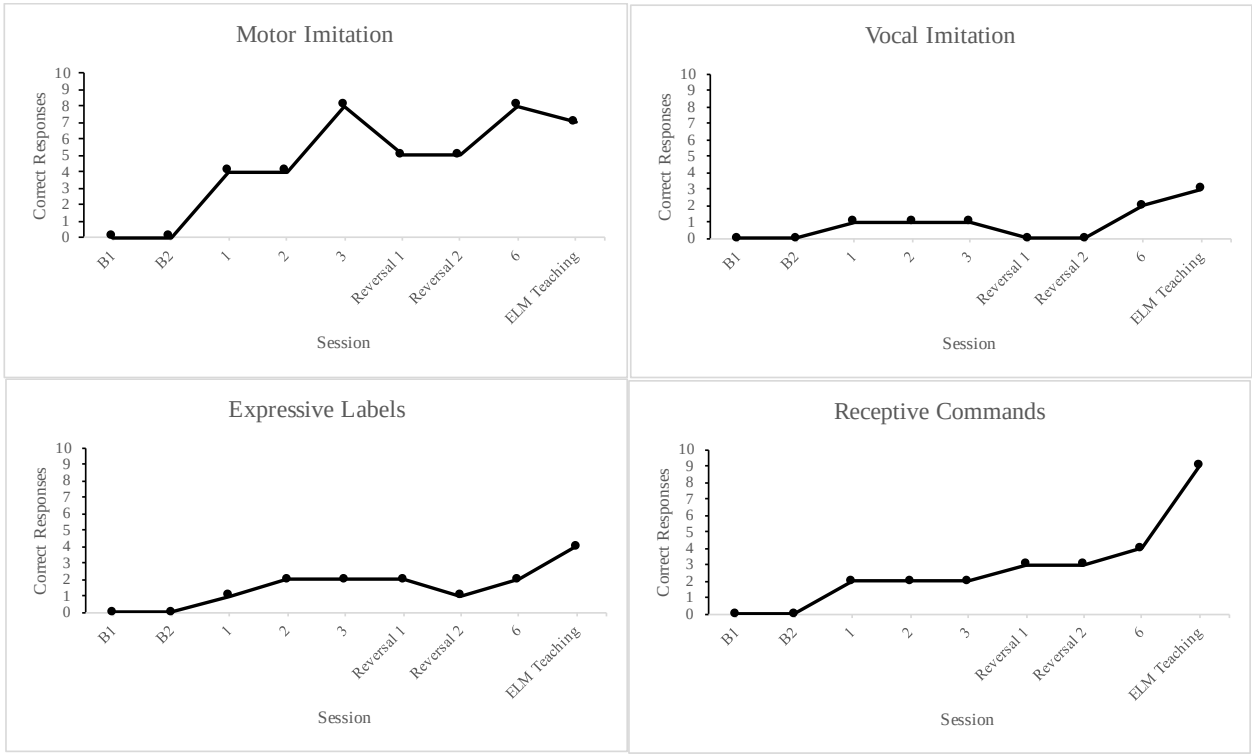


Figure 5. Scores on the Early Learning Measure for Sam. ELM scores are graphed across each skill area tested during baseline, compliance training, compliance reversal, and re-instating compliance training.

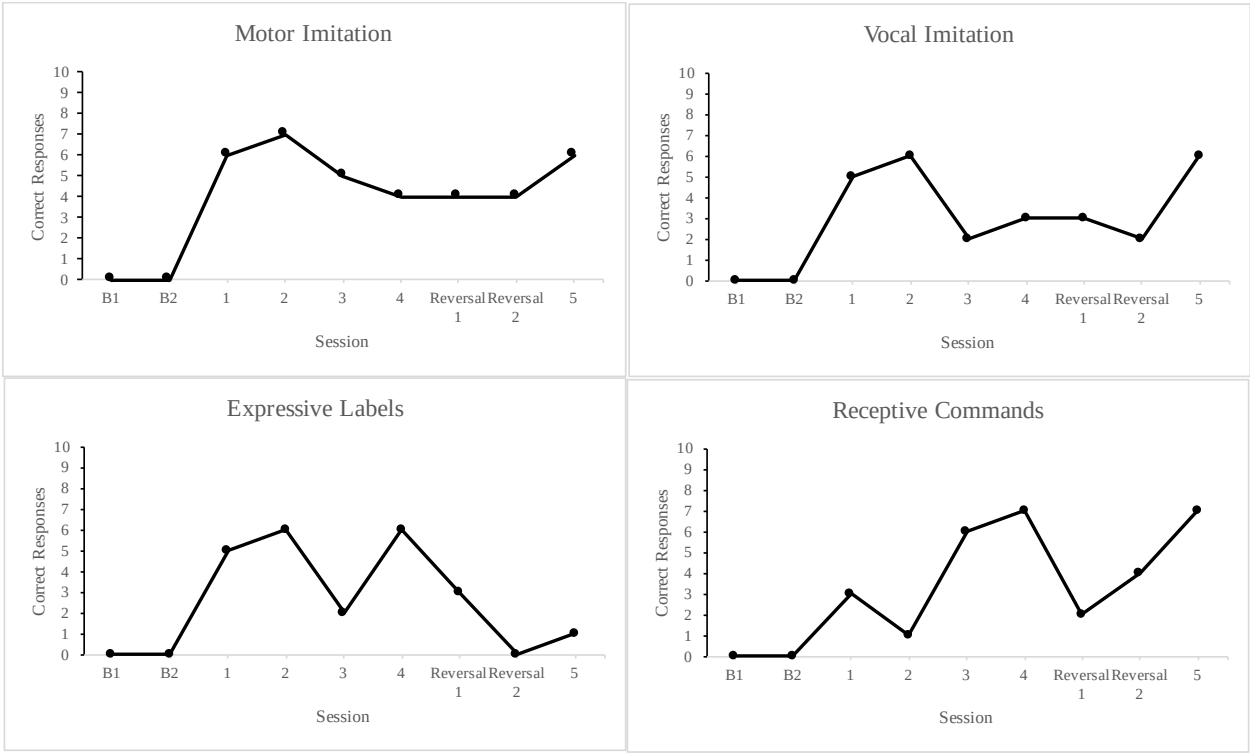


Figure 6. Scores on the Early Learning Measure for Bailey. ELM scores are graphed across each skill area tested during baseline, compliance training, and compliance reversal.

Appendix B: Sample Data Sheets

Early Learning Measure --- Probe #1 Data Collection
Prior to administration, enter in the 40 test items from baseline #2

Assessment Date: Session Start
Child Initials:
Assessor: Session End
Video Code:

Motor Imitation **SD - "DO THIS" followed by a 2 sec. model**	**Data**		**Incorrect Response** - circle one NR = non response after 5 seconds IR = inaccurate response IC = incomplete response MA = maladaptive behavior (list behavior)
1. Arms out (to sides)			**NR IR IC MA:**
2. Clap (twice)			**NR IR IC MA:**
3. Touch head			**NR IR IC MA:**
4. Touch tummy			**NR IR IC MA:**
5. Touch shoulders			**NR IR IC MA:**
6. Arms up (over head)			**NR IR IC MA:**
7. Touch knees			**NR IR IC MA:**
8. Touch table			**NR IR IC MA:**
9. Touch elbow			**NR IR IC MA:**
10. Touch ears			**NR IR IC MA:**
Total Correct			

Vocal Imitation **SD - "SAY" followed by the model**	**Data**		**Incorrect Response** - circle one NR = non response after 5 seconds IR = inaccurate response IC = incomplete response MA = maladaptive behavior (list behavior)
1. A (pronounce letter label)			**NR IR IC MA:**
2. M			**NR IR IC MA:**
3. K			**NR IR IC MA:**
4. D			**NR IR IC MA:**
5. P			**NR IR IC MA:**
6. E			**NR IR IC MA:**
7. Mama			**NR IR IC MA:**
8. Dada			**NR IR IC MA:**
9. Baby			**NR IR IC MA:**
10. Cookie			**NR IR IC MA:**
Total Correct			

Appendix B.1. Sample Early Learning Measure Probe Data Collection Form. This data sheet was used to collect observational assessment data for Motor Imitation and Vocal Imitation Sections of the Early Learning Measure Probe Sessions. Similar data collection forms were used for Receptive Commands and Expressive Labels sections.

Early Learning Measure --- Baseline #1 Data Collection

Assessment Date: Session Start
Child Initials:
Assessor: Session End
Video Code:

Motor Imitation **SD - "DO THIS" followed by a 2 sec. model**	**Data**		**Incorrect Response** - circle one NR = non response after 5 seconds IR = inaccurate response IC = incomplete response MA = maladaptive behavior (list behavior)
1. Arms out (to sides)			**NR IR IC MA:** _____
2. Clap (twice)			**NR IR IC MA:** _____
3. Touch head			**NR IR IC MA:** _____
4. Touch tummy			**NR IR IC MA:** _____
5. Touch shoulders			**NR IR IC MA:** _____
6. Arms up (over head)			**NR IR IC MA:** _____
7. Touch knees			**NR IR IC MA:** _____
8. Touch table			**NR IR IC MA:** _____
9. Touch elbow			**NR IR IC MA:** _____
10. Touch ears			**NR IR IC MA:** _____
11. Make fist w/LH			**NR IR IC MA:** _____
12. Wave (to side and back)			**NR IR IC MA:** _____
13. Stomp feet (twice)			**NR IR IC MA:** _____
14. Shake head (no side to side)			**NR IR IC MA:** _____
15. Blow kiss			**NR IR IC MA:** _____
16. Turn around (stands up)			**NR IR IC MA:** _____
17. Jump (once)			**NR IR IC MA:** _____
18. Hit table (with block)			**NR IR IC MA:** _____
19. Raise right arm			**NR IR IC MA:** _____
20. Touch toes (sitting)			**NR IR IC MA:** _____
21. Clap / wave			**NR IR IC MA:** _____
22. Nose / head			**NR IR IC MA:** _____
23. Tummy / elbow			**NR IR IC MA:** _____
24. Turn around / jump			**NR IR IC MA:** _____
25. Ears / head			**NR IR IC MA:** _____
26. Clap / slap table (without block)			**NR IR IC MA:** _____
27. Cross arms / nose			**NR IR IC MA:** _____
28. Raise right arm / stomp			**NR IR IC MA:** _____
29. Arms out / tummy			**NR IR IC MA:** _____
30. Jump / clap			**NR IR IC MA:** _____
31. Stomp feet / wave			**NR IR IC MA:** _____
32. Knock / touch nose			**NR IR IC MA:** _____
33. Clap / arms out			**NR IR IC MA:** _____
34. Arms Out/ Head / Stand Up			**NR IR IC MA:** _____
35. Elbow / Wave w/RH Make fist w/LH			**NR IR IC MA:** _____
36. Stand Up / Arm Circles 2x / Clap			**NR IR IC MA:** _____
37. ASL: Flower (RH to side of nose, move over nose)			**NR IR IC MA:** _____
38 .ASL: Water (two thumbs up; up and down infront of chest)			**NR IR IC MA:** _____
39. ASL: Apple (RH fist to mouth, twist forward 2x)			**NR IR IC MA:** _____
Total Incorrect =			

Appendix B.2. Sample Early Learning Measure Baseline Data Collection Form. This data sheet was used to collect observational assessment data for the Motor Imitation section of the Early Learning Measure baseline sessions. Similar data sheets were used for the other ELM sections.

Compliance Training Data Collection - Sessions 1-5
Prior to administration, ensure high-probabilty compliane training has been completed

Assessment Date: Session Start
Child Initials:
Assessor: Session End
Video Code:

Possible SD's for Compliance Training Sessions **MI SD - "DO THIS" followed by a 2 sec. model** **VI SD - "SAY" followed by the model** **EL SD - "WHAT'S THIS" paired with a 2 sec. presentation of the item** **RC SD - Give Instruction**	**Data**				**Incorrect Response** - circle one NR = non response after 5 seconds IR = inaccurate response IC = incomplete response MA = maladaptive behavior (list behavior)
1.					**NR IR IC MA:** _____
2.					**NR IR IC MA:** _____
3.					**NR IR IC MA:** _____
4.					**NR IR IC MA:** _____
5.					**NR IR IC MA:** _____
6.					**NR IR IC MA:** _____
7.					**NR IR IC MA:** _____
8.					**NR IR IC MA:** _____
9.					**NR IR IC MA:** _____
10.					**NR IR IC MA:** _____
Total Correct					

Assessment Date: Session Start
Child Initials:
Assessor: Session End
Video Code:

Possible SD's for Compliance Training Sessions **MI SD - "DO THIS" followed by a 2 sec. model** **VI SD - "SAY" followed by the model** **EL SD - "WHAT'S THIS" paired with a 2 sec. presentation of the item** **RC SD - Give Instruction**	**Data**				**Incorrect Response** - circle one NR = non response after 5 seconds IR = inaccurate response IC = incomplete response MA = maladaptive behavior (list behavior)
1.					**NR IR IC MA:** _____
2.					**NR IR IC MA:** _____
3.					**NR IR IC MA:** _____
4.					**NR IR IC MA:** _____
5.					**NR IR IC MA:** _____
6.					**NR IR IC MA:** _____
7.					**NR IR IC MA:** _____
8.					**NR IR IC MA:** _____
9.					**NR IR IC MA:** _____
10.					**NR IR IC MA:** _____
Total Correct					

Appendix B.3. Sample Compliance Training Data Collection Form. This data sheet was used to collect compliance data during two compliance training sessions for both participants. 10 instructions were delivered per session. Similar data sheets were used for the compliance reversal sessions.

Appendix C: Sample Session Instructions

Early Learning Measure Baseline & Probe Session Instructions

1. **Gather all materials.** You will need the following items for both ELM baseline and probe sessions:
    a. Two chairs (preferably a child-sized chair)
    b. Table
    c. Reinforcement activities or toys
    d. Current ELM session data sheet
    e. Writing instrument for data collection
    f. iPod and stand
    g. 3D & 2D stimuli for testing (see ELM data sheet for test items).

2. **Prepare the testing area.**
    a. **Arrange the table and chairs according to Diagram 1.** Chairs should be facing each other and placed beside the table. Avoid placing the chairs in front of a window or source of bright light which will diminish the quality of the video.
    b. Arrange the iPod and stand according to Diagram 1. Place the iPod in the stand so that the camera will film horizontally or in landscape mode. Verify under the "usage" settings that you have sufficient storage space on the Ipod to complete the video. Position the camera to face the testing area, with the screen facing away from the chairs (to avoid distractions from the video).
    c. Prepare the data sheet. Write the date of testing, the child's initials, and the start time of the assessment on the top of the data sheet.
    d. Place any stimuli needed for the first test condition on the table. Start with whichever section seems likely to be most successful for the child.

3. **ELM Administration**
    a. **Turn on the iPod recording.** Open the camera app. Select video. Push the red button to begin recording.
    b. **Begin the ELM away from the chair by reinforcer sampling to determine an effective reinforcer and engage the child.** After successfully engaging the child with a reinforcer, or failing to engage the child with five possible reinforcers, take the child to the chair with minimal prompting, sit down and immediately give the first instruction.
    c. **Give the S^D listed on the data sheet and observe the response.** The child has 5 seconds to respond regardless of child's level of attention or compliance. Do not wait for eye contact, or for the child to be silent before giving the S^D. Make sure to only state the S^D once.
    d. **All feedback is noncontingent.** Whether or not the child responds, or responds correctly, the examiner's voice is a neutral, "OK." On every third trial, give a neutral, "OK," and then reinforce with the child's preferred reinforcement: tickles, toys, food, or any primary reinforcer.
    e. **Correct Response.** If the child responds correctly within 5 seconds, it is considered a plus (+) (correct), but again the examiner's voice remains a neutral, "OK," and immediately move on to the next item.
    f. **Incorrect Response:** If the child responds incorrectly within 5 seconds, does not respond within 5 seconds, or refuses, tantrums, aggresses, bolts, or disrupts the environment without giving the

correct response within 5 seconds, give a neutral, "OK," and score a minus (-) (incorrect), and immediately move on to the next item. Next to the - , circle the error occurred for the instruction.

g. **Never prompt the correct response in any manner.** Respond and redirect as minimally to any challenging or off-task behavior as is necessary.

h. **If the child has bolted, go to the child and return him to the table with the minimal prompting necessary.** If the child fails to come to the table with your prompting within 10 seconds, return to the table to record the trial on the data sheet, counting the trial as a failure. If the child fails to come to the table on three consecutive trials within 10 seconds each, or continues verbally refusing, tantrumming, aggressing, or disrupting on three consecutive trials, count the rest of the items in the section as a failure. Take a normal break and, after the break, and with a new section, start again attempting to bring the child to the table for each trial, if necessary.

i. **Items should be administered in the order presented on the data sheet, and then repeated to complete the section.** During baseline, continue until 10 failed items occur in each section. During probe sessions, simply test the items on the data sheet in the order listed.

j. **After you have reached the end of the first section, take a small break from the chairs.** Breaks should not be longer than 3 minutes and should not include the contracted reinforcement. The child may request to continue the assessment in order to return to the reinforcement activity.

k. **After the break, move onto the other three sections.** Give a break at least between every section. Follow the procedures as above**.**

l. After the end of the testing concludes, stop the video recording. Record the end time of the administration for the ELM on the data sheet.

4. ELM Scoring

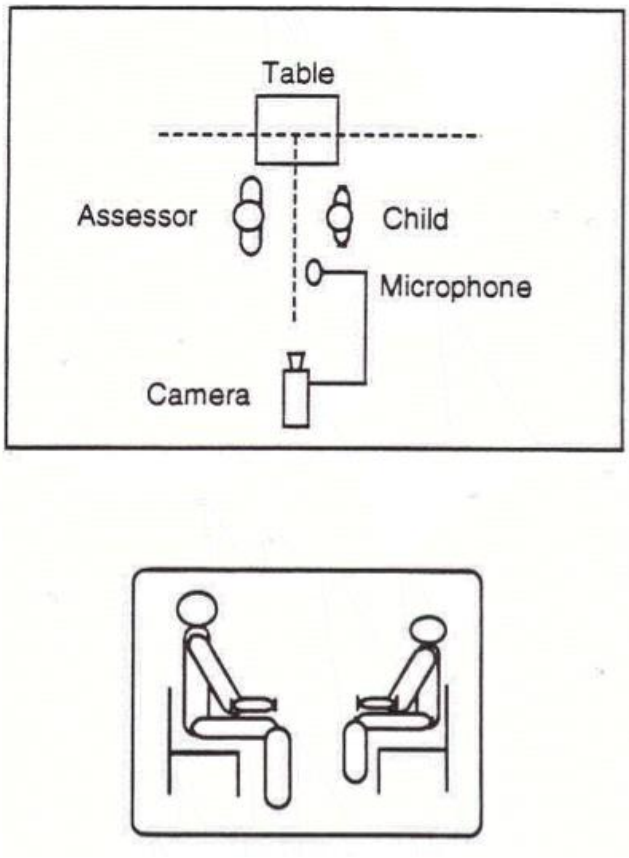
a. **Mastery requires correctly responding to the item for both trials on the same day.** If one trial on the item was correct or a (+), but the other trial had no response or a (-), the item as a whole is considered incorrect (-) or a failure. See these samples:

1. Arms out	+	-	=	- (incorrect)
2. Clap twice	+	+	=	+ (correct)
3. Touch head	-	___	=	- (incorrect)

1. Remember that if the child does not respond correctly within 5 seconds, it is considered incorrect (-) or a failure. Disruptive behavior or failure to get the child to the table within 10 seconds is also a failure.

2. **Baseline ELM Scores**: The resulting score of both baseline ELM's should be 0/10 in every section.

3. Probe Session ELM Scores: Scores on subsequent ELM's should show the cumulative success to date for each section, adding in any previously discontinued mastered items. So, for example, on ELM #2, on the Motor Imitation section, the child got 4/10 correct. On ELM #3 on the Motor Imitation section, only the 6 remaining were administered, and the child got two more correct. So his cumulative score for the ELM #3 was 6/10.



Appendix C.1. Sample ELM session instructions. These session instructions were used by the assessor for fidelity training and for conducting ELM Probes. Similar instructions were provided to assessors for compliance training and compliance reversal sessions.

Appendix D: Sample Assessor Fidelity Checklist

Date:
Session/Video Code:
Assessor:
Observer:

Baseline Fidelity Procedure: Observer should record accuracy of assessors performance for all responses in steps 1-3 & 11. For all other steps, observer should record fidelity data on every 5th instruction administered by the observer (minimum of 2 per each ELM test set).
In order to receive a score of Y for the step, the assessor must complete with 90% accuracy. **Target is a minimum of 11 of the 12 fidelity steps scored as a Y per each assessment administration.**

ELM -Baseline Session Summary Sheet			
Steps	**Description**	**Score**	**Notes**
1	**Did the assessor prepare the testing area as outlined? Must have 3/3:** - Are the table and chairs arranged according to the diagram? - Is the proper data sheet present? - Are the stimuli for the ELM test section readily available?	**Y** **N**	
2	**Did the assessor verify the iPod function? Must have 3/3:** - Is the iPod positioned arranged according to the diagram? - Did the assessor confirm sufficient storage on the Ipod? - Did the assessor open the camera app and begin recording at the onset of the testing?	**Y** **N**	
3	**Did the assessor conduct reinforcement sampling prior to engaging the child in the ELM? Must have 1/1:** - Did the assessor identify at least 1 possible reinforcer before beginning a test item or did the assessor sample a maximum of five possible reinforcers before beginning?	**Y** **N**	
4	**Did the assessor give the SD listed on the data sheet with 90% accuracy?** - Possible SD's (Motor Imitation: "Do This" followed by model of target; Vocal Imitation: "Say" followed by model of target; Expressive Labels: "What's this?" paired with the presentation of the item; Receptive Commands: Delivery of Instruction)	**Y** **N**	
5	**Did the assessor give the SD only 1 time regardless of child's compliance or attention with 90% accuracy?**	**Y** **N**	
6	**Did the assessor deliver non-contingent "OK" feedback and access to 1-2 min of reinforcement after every 3rd instruction with 90% accuracy?**	**Y** **N**	

7	**Did the assessor respond to correct responses according to the procedure with 90% accuracy ?** - Did the assessor identify correct responses as correct during the assessment? - Did the assessor deliver a neutral "OK" and move on to the next item? - Did the assessor record a + on the data sheet? - Did the assessor test each correct response a second time before scoring as mastered?	**Y** **N**	
8	**Did the assessor respond to incorrect responses according to the procedure with 90% accuracy?** - Did the assessor identify all incorrect responses as incorrect during the assessment? - Did the assessor deliver a neutral "OK" and move on to the next item? - Did the assessor record a - on the data sheet and the corresponding error? - Did the assessor avoid prompting the correct response?	**Y** **N**	
9	**Did the assessor respond to challenging behavior appropriately with 90% accuracy?** - Did the assessor provide minimal attention to challenging behavior? - If the child leaves the testing area did the assessor count the item as an error and attempt to bring the child back to the table? - If the child refuses to respond to 3 consecutive trials, did the assessor discontinue testing the section and provide a break?	**Y** **N**	
10	**Did the assessor continue testing items until 10 failures in the section were identified or until 120 items were tested with 90% accuracy?** - Did the assessor test 10 items in a row, then re-test the 10 items again? - Did the assessor add additional items of increasing difficulty? - Did the assessor discontinue testing after 120 items?	**Y** **N**	
11	**Did the assessor deliver a break after each section with 90% accuracy?** - Did the assessor withhold reinforcement during the break? - Did the assessor begin testing after a maximum of 3 minutes?	**Y** **N**	
12	**At the end of the testing session, did the assessor stop the video and record the end time of testing on the data sheet?**	**Y** **N**	

Individual Instruction Fidelity Sheet - Record data on every 5th instruction delivered during the ELM baseline condition.

Instruction (copy items from the child's ELM data sheet)	**Correct SD**	**Deliver SD 1x**	**"OK"**	**1-2 min Sr+ Delivered (every third trial)**	**If correct was scored as correct**	**If incorrect was scored as incorrect**	**No prompts**	**Respond to Challenging Bx according to procedure?**	**Correctly Continued or Correctly Stopped Testing?**

Appendix D.1. Sample ELM Assessor Fidelity Checklist. These fidelity checklists were used by the investigator for fidelity training with each assessor conducting ELM Probes. Similar fidelity checklists were implemented for compliance training and compliance reversal sessions.

Appendix E: Institutional Revie w Board Approval

ST. CLOUD STATE UNIVERSITY
EDUCATION FOR LIFE.

Institutional Review Board (IRB)

720 4th Avenue South AS 210, St. Cloud, MN 56301-4498

Name: Amy Sippl

Address

, USA

Email: asippl@stcloudstate.edu

IRB PROTOCOL DETERMINATION:
Exempt Review

Project Title: The role of compliance in Behavioral Assessment

Advisor Dr. Benjamin Witts

The Institutional Review Board has reviewed your protocol to conduct research involving human subjects. Your project has been: **APPROVED**

Please note the following important information concerning IRB projects:

- The principal investigator assumes the responsibilities for the protection of participants in this project. Any adverse events must be reported to the IRB as soon as possible (ex. research related injuries, harmful outcomes, significant withdrawal of subject population, etc.).

- For expedited or full board review, the principal investigator must submit a Continuing Review/Final Report form in advance of the expiration date indicated on this letter to report conclusion of the research or request an extension.

-Exempt review only requires the submission of a Continuing Review/Final Report form in advance of the expiration date indicated in this letter if an extension of time is needed.

- Approved consent forms display the official IRB stamp which documents approval and expiration dates. If a renewal is requested and approved, new consent forms will be officially stamped and reflect the new approval and expiration dates.

- The principal investigator must seek approval for any changes to the study (ex. research design, consent process, survey/interview instruments, funding source, etc.). The IRB reserves the right to review the research at any time.

If we can be of further assistance, feel free to contact the IRB at 320-308-3290 or email ri@stcloudstate.edu and please reference the SCSU IRB number when corresponding.

IRB Institutional Official:

Latha Ramakrishnan

Dr. Latha Ramakrishnan
Interim Associate Provost for Research
Dean of Graduate Studies

OFFICE USE ONLY

SCSU IRB# 1670 - 2086	**Type:** Exempt Review	**Today's Date:** 1/27/2017
1st Year Approval Date: 1/18/2017	**2nd Year Approval Date:**	**3rd Year Approval Date:**
1st Year Expiration Date:	**2nd Year Expiration Date:**	**3rd Year Expiration Date:**