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An Evaluation of Mand and Tact Assessment Procedures

Brittany Ann LeBlanc
University of Wisconsin-Milwaukee

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by

Brittany A. LeBlanc

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Brittany A. LeBlanc

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There are many empirically validated interventions to establish vocal mands and tacts for children (e.g., Miguel, Carr, & Michael, 2002; Wallace, Iwata, & Hanley, 2006); however, the method for determining the most appropriate intervention for each individual is unclear. An assessment is one way to identify an effective intervention for a given individual. The purpose of the current study was to replicate and extend Bourret, Vollmer, & Rapp (2004) who evaluated an assessment to inform effective mand interventions for three boys with vocal mand deficits. In the first study, we replicated the full mand assessment as described by Bourret et al. and compared the full assessment to a brief mand assessment with similar procedures. Results showed that the full mand assessment and the brief mand assessment identified similar patterns of responding for all three participants. In addition, there was increased efficiency of the brief mand assessment when compared to the full mand assessment. In the second study, we extended the brief assessment from the mand to the tact to evaluate the identification of training strategies for the tact. Results of the brief tact assessment identified similar patterns of responding to the brief mand assessment for two of the three participants and a dissimilar outcome for one participant, suggesting that vocal verbal deficits may differ across verbal operants.

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Language delays are prevalent for individuals with autism spectrum disorder (ASD) and other developmental disabilities (American Psychiatric Association, 2013). As such, treatment goals for the acquisition of language and communicative behavior are common for these individuals. There are several approaches to teaching language to children with language delays including a more traditional approach and a behavioral approach.

In a more traditional approach to language, words produced by the speaker are the fundamental unit of language (Baldwin, 1993; Benedict, 1979; Bowerman, 1996). To understand language from this approach is to be able to answer questions such as "What is the meaning of the word?" and "What is the speaker tying to communicate?" The meaning of the word is thought to be formulated in the speaker's mind and then communicated or transmitted from the speaker to the listener through words that link back to the non-verbal stimulus in the environment (Moore, 2000). That is, the word is a symbolic representation of the stimulus in the environment that is used to communicate. Therefore, when teaching language within the framework of a traditional approach, the emphasis is on the production of words and the sounds that produce that word, as well as developing the connection between the word and the nonverbal stimulus it represents (Bloom, 1996).

Alternatively, in a behavioral approach to language or verbal behavior, emphasis is placed on the identification and manipulation of relevant environmental variables for verbal behavior (Skinner, 1957). The functional relation between the speaker's behavior and the listener's response identifies the response unit (Moore, 2000). Using this approach, based on Skinner's conceptual analysis of verbal behavior (1957), the words we say are less relevant. Instead, the emphasis is on the effect the verbal behavior has on the listener or verbal community. Verbal behavior is occasioned by antecedent variables and reinforced by

consequences mediated by a verbal community. Verbal behavior is shaped by the verbal community; it increases in likelihood when reinforced and ceases when the verbal community no longer provides a consequence for the behavior. Skinner categorized the verbal behavior of individuals into several elementary units of analysis called verbal operants (e.g., mand, tact, intraverbal, echoic).

The mand is a verbal operant which is evoked by a motivation operation, such as deprivation, and is maintained by access to the specified consequence (Skinner, 1957). In other words, the mand is under the control of relevant establishing operations (EO) for a specific reinforcer, and the response is maintained by access to this reinforcer that is provided by the listener. The consequence provided may in turn reinforce the response. For example, if there is a relevant EO for water and a child says, "Water please" to his mother, this behavior is likely to result in water, the identified reinforcer. Repeated opportunities to obtain water under similar conditions will strengthen the child's mand.

The tact is a verbal operant occasioned by a nonverbal stimulus in the environment and is maintained by generalized social reinforcement. This verbal operant is central to many social interactions within a verbal community and allows the speaker to label or describe features in the environment. For example, given the antecedent stimulus of a picture of a cat, a child might say "cat" follow by a generalized reinforcer provided by the listener such as "That's right!" A traditional approach to language emphasizes tact training, and characterizes this operant as specifying a reference to a stimulus property. That is, the response refers to or names a stimulus. Skinner (1957) cautions against a traditional interpretation of the tact, because it is often assumed that individuals who acquire a tact (e.g., saying "cat" in the presence of a cat) are able to use the response in a variety of ways. Research in the field of behavior analysis provides

evidence that verbal operants are functionally independent, meaning that individuals who acquire "cat" as a tact will not emit the response as a mand or as other verbal operants without training (e.g., Kelly, Shillingsburg, Castro, Addison, & LaRue, 2007).

Although there are many empirically validated interventions to establish vocal mands and tacts (i.e., Kelley, et al., 2007; Miguel, Carr, & Michael, 2002; Wallace, Iwata, & Hanley, 2006), the method for determining the most appropriate intervention for each individual is unclear. Studies infrequently describe pre-requisite skills for successful mand and tact training or if the intervention would be successful for individual with vocal-verbal deficits (Bourret, Vollmer, & Rapp, 2004). One strategy for identifying an appropriate intervention for a given individual is to administer an assessment, because the assessment may help to identify the most effective intervention. Results from previous studies have demonstrated that interventions based on assessments are more likely to be effective than interventions that are arbitrarily chosen (e.g., Kodak, Fisher, Clements, Paden, & Dickes, 2010; McGhan & Lerman, 2013).

Assessment-based instruction is a burgeoning area of behavior analysis that is based on the premise that function-based interventions improve treatment outcomes (e.g., Carroll; Jaoquim, St. Peter, & Robinson, 2015; Iwata, Pace, Cowdery, & Miltenberger, 1994; Johnson, Vladescu, Kodak, & Sidener, 2017; Kodak et al., 2010). Although studies support the use of assessment-based intervention for skill acquisition, there is a paucity of research that identifies the most effective intervention to establish verbal operants for a given individual. A two-part study conducted by Bourret et al. (2004) is a notable exception. The authors evaluated an assessment to inform effective mand interventions for three boys with vocal mand deficits. More specifically, they identified the participant's patterns of responding during the assessment and used the patterns to identify the conditions under which vocal mands did not occur. In the second

experiment, intervention procedures were identified and implemented based on those patterns of responding. For example, during the assessment, one participant only emitted mands following a prompt to vocalize; therefore, the intervention included fading of this prompt. Another participant only emitted mands following a prompt to vocalize; however, that participant emitted phonemes to mand rather than the full response. For example, he said "t" instead of "tunes" for access to the radio. His intervention included shaping of the mand to gradually add individual sounds to the existing phoneme until the full response was acquired.

The results of Bourret et al. (2004) suggest that all three participants were able to acquire mands following intervention, and this study presents a methodology for assessing mands that could be useful for practitioners. Nevertheless, the internal validity of the assessment was not established by conducting within-participant replications of the assessment. Replications of the assessment developed by Bourret et al. are warranted before recommending its use in practice. Furthermore the clinical utility and feasibility of this assessment is unknown. The assessment administration required six to eleven 10-min sessions. For an individual with many skill deficits, an assessment that measures a single response and requires one to two hours to complete may not be efficient enough to warrant use of the assessment in clinical practice. In addition, Bourret et al. assessed and trained one verbal operant, and it is unknown if verbal behavior deficits are consistent across verbal operants and whether the procedures used for the mand assessment would produce similar outcomes for other verbal operants. It would be beneficial to assess if the assessment can be adapted to inform an appropriate intervention for other verbal operants such as the tact.

The purpose of the current study was to replicate and extend Bourret et al. (2004). In the first study, we replicated the full mand assessment as described by Bourret et al. and compared

the full assessment to a brief mand assessment with similar procedures. In the second study, we extended the brief assessment from the mand to the tact and evaluated the identification of training strategies for the tact.

GENERAL METHOD

Participants, Setting, and Materials

Three school-aged children recruited through a local applied behavior analysis (ABA) service provider participated in this study. Each participant had a documented deficit in their vocal-verbal repertoires that was identified by the participant's individualized education plan (IEP) or a prior assessment report provided by their family. All three participants could emit at least six different sounds that were identified with the Early Echoic Skills Assessment (EESA; Esch, 2008) within the Verbal Behavior Milestone Assessment and Placement Program (VB-MAPP; Sundberg, 2008).

Flynn was a six-year-old boy with moderate cognitive impairments and a diagnosis of global developmental delay. He had reported vocal-verbal and social skill deficits and used one-to-two words to communicate with others, although his vocalizations were typically comprised of initial phonemes for words. Flynn had an age-equivalent score of 2:5 on the *Peabody Picture Vocabulary Test,* Fourth Edition (PPVT-4; Dunn & Dunn, 2007) and less than 2:0 on the *Expressive Vocabulary Test,* Second Edition (EVT-2; Williams, 1997).

Caleb was a four-year-old boy with mild cognitive impairments with reported vocal-verbal deficits and an ASD diagnosis. He used one-to-three words to mand for preferred items and tact stimuli in his environment. Caleb had an age-equivalent score of 4:1 on the PPVT-4 and 3:1 on the EVT-2.

Brent was a 15-year-old boy with moderate cognitive impairments with reported vocal-verbal deficits and an ASD diagnosis. He used short phrases to mand for preferred items and tact stimuli in his environment. Brent had an age-equivalent score of 3:4 on the PPVT-4 and 3:2 on the EVT-2.

All sessions were conducted in the participant's home at the family kitchen table. Materials included a set of printed stimulus cards with images for the tact assessment, each participant's highly preferred toys and foods identified by a preference assessment, and materials for data collection (e.g., data sheets, timers). For data collection purposes, all sessions were recorded using a video camera on a tripod to capture participant vocalizations and the experimenter's procedural fidelity.

Response Measurement, Interobserver Agreement, and Procedural Fidelity

The dependent variables included (a) independent full utterances, defined as predetermined vocalizations of the full response (e.g., "cookie") that occur prior to the first adult prompt in the trial and can be heard from a distance of at least 1 m, (b) prompted full utterances, defined as predetermined vocalizations of the full response (e.g., "cookie") that occur during the remaining response interval following an adult's prompt and can be heard from a distance of at least 1 m, (c) prompted partial utterances, defined as predetermined vocalizations of a portion of the full utterance response (e.g., "ee" for cookie) that occur during the remaining response interval following an adult's prompt and can be heard from a distance of at least 1 m, (d) errors, defined as any other vocalizations discrepant from the targeted full and partial utterance, (e) attending, defined as the participant looking at the stimulus for at least 1 s, and (f) inappropriate behavior, defined as disruption (e.g., projecting an object into the air a distance of 7.62 cm or greater, swiping material off the table or desk, or putting materials into the mouth), negative

vocalizations (e.g. any non-targeted vocal behavior above conversational level that can be heard from a distance of at least 1 m including crying, growling, and screaming), and vocal noncompliance (e.g., refusal behavior, such as "no" and other statements indicating vocal refusal to comply). Each dependent variable was converted to a percentage by dividing the number of trials with an occurrence of the behavior by the total number of trials in a session, multiplied by 100.

One or two independent observers collected data on all dependent variables during the session and from video recordings following each session. We calculated trial-by-trial interobserver agreement for at least 40% of sessions for each assessment by dividing the number of trials in which both observers agree on the occurrence and nonoccurrence of all dependent variables by the total number of trials in the session, and convert the ratio to a percentage. Mean IOA for Flynn was 96.6% (range, 70% to 100%) for the full mand assessment, 97.3% (range, 50% to 100%) for the brief mand assessment, and 93.1% (range, 60% to 100%) for the brief tact assessment. Mean IOA for Caleb was 98.7% (range, 90% to 100%) for the full mand assessment, 98.0% (range, 70% to 100%) for the brief mand assessment, and 98.2% (range, 70% to 100%) for the brief tact assessment. Mean IOA for Brent was 99.7% (range, 90% to 100%) for the full mand assessment, 99.4% (range, 80% to 100%) for the brief mand assessment, and 99.1% (range, 80% to 100%) for the brief tact assessment.

In addition, a second observer collected data on procedural fidelity during at least 40% of sessions for each assessment. Each trial within a session was scored as an instance of procedural fidelity if the experimenter correctly implemented all steps in the written protocol, including (a) presenting the target stimulus, (b) verifying the EO for the target item, (c) providing a non-specific vocal prompt, if relevant, (d) providing a full utterance echoic prompt, if relevant, (e)

providing a partial utterance echoic prompt, if relevant, (f) providing the relevant reinforcer following a correct full utterance, (g) providing the relevant reinforcer following a prompted partial utterance, and (h) ending the trial when 1 min has elapsed (full mand assessment) or when 30 s has elapsed (brief mand and tact assessments).We calculated procedural fidelity by dividing the total number of trials in which the experimenter performed the protocol correctly by the total number of trials in the session, and converted the ratio to a percentage. Mean procedural fidelity was 98.6% (range, 70% to 100%) for Flynn, 99.2% (range, 90% to 100%) for Caleb, and 99.6% (range, 90% to 100%) for Brent.

Pre-Assessments

Echoic assessment. The experimenter administered the EESA to all participants prior to the start of the study to provide a measure of the participant's echoic behavior and sounds that the participant could emit. The EESA results were then reviewed by a speech therapist who assisted in identifying the most appropriate full and partial utterance to be modeled and accepted as a target response for each target during the full and brief mand and brief tact assessments (described below).

During the ESSA (Esch, 2008), Flynn vocally echoed several different sounds from Group 1: Single and reduplicated syllables (e.g., knee, bee, mama, no no, papa, oh, we) and one sound from Group 2: Two-syllable combinations (uh-oh). Although he vocalized frequently following the echoic prompts from Group 2, often the response only contained one syllable (e.g., "buh" following the echoic prompt "bunny"). Thus, the speech therapist identified two-syllable combinations (full utterance) and sounds blends (partial utterance) to include in the mand and tact assessments.

Caleb was able to vocally echo most of the sounds from Group 1: Single and reduplicated syllables (e.g., knee, bee, mama, no no, papa, oh, we) and Group 2: Two-syllable combinations (e.g., baby, go eat, bunny, nightmare, yucky, uh-oh, puppy). Also, he vocally echoed some sounds from Group 3: Three-Syllable Combinations (e.g., tubby toy, potato, go bye bye, teddy bear). Therefore, short sentences containing one-to-three syllables words (full utterance) and single words (partial utterance) were identified as responses for the mand and tact assessments.

Brent vocally echoed all of the sounds from Group 1: Single and reduplicated syllables and Group 2: Two-syllable combinations. He was able to vocally echo most of the sounds from Group 3: Three-Syllable Combinations. Thus, complete sentences containing one-to-three syllables words (full utterance), and single words (partial utterance) were identified as responses for the mand and tact assessments.

Preference assessment. The experimenter conducted a paired-stimulus preference assessment with each participant based on procedures described by Fisher, Piazza, Bowman, Hagopian, Owens, and Slevin (1992). The participants' parents helped to nominate ten preferred toys, objects, or edibles for which the participant did not independently mand. The experimenter presented a pair of items to the participant, said, "Pick one", and waited up to 5 s for the participant to select an item. If the participant made a selection, the experimenter removed the remaining item and allowed the participant to play with the selected item for 30 s. Each of the 10 items were paired with every other item in the array once. If the participant did not select an item within 5 s, the experimenter prompted the participant to sample each of the items and then re-presented the same two items for another 5 s. If the participant still did not select one of the items, both items were removed and a new pair was presented. If the participant attempted to select both items simultaneously, the experimenter blocked the participant's selection and re-

presented the choice. The top four ranked items were included in the pre-test to assess if the participant acquired the mand for each of the preferred items and served as reinforcers during the mand and tact assessments.

Two multiple-stimulus-without-replacement preference assessments (Carr, Nicolson, & Higbee, 2000) with tangible items also were conducted with Caleb to determine a hierarchy of preference for a fifth tangible item. After selecting the top four preferred items from the paired-stimulus preference assessment, the remaining six preferred items were presented in an array. The experimenter then waited up to 5 s for Caleb to "Pick one." Following a selection, the experimenter removed the remaining items and allowed Caleb to play with the selected item for 30 s. The experimenter then presented the remaining five tangible items and waited up to 5 s for Caleb to "Pick one." These procedures were repeated until all items were selected. If Caleb attempted to select more than one item simultaneously, the experimenter blocked the selection and re-presented the array.

Reinforcer consumption assessment. The experimenter verified that the participant would not become satiated on each preferred item, and would continue to consume the item, throughout the full assessment session interval of 10 min and the brief assessment session interval of 5 min. The experimenter placed and activated (if relevant) the target item within reach of the participant. If the participant reached for the item or looked at the item (i.e., gaze is directed at the item for at least 3 s) within 10 s of the presentation of the target item during one of two opportunities, the experimenter provided access to the item for 5 or 10 min for the brief and full assessments, respectively. To verify that the participant would not become satiated on each edible item, the experimenter placed a piece of the item in front of the participant. Every time the item was consumed, the experimenter placed another piece of the edible item on the

table until the 5- or 10-min interval elapsed. If the participant did not consume the item during the entire interval, the item was not used for the subsequent assessments.

Pre-Test

A pre-test was conducted to identify stimuli to include in each mand and tact assessment. Two (Flynn and Brent) or three (Caleb) target stimuli were included in the full mand assessment, two target stimuli were included in the brief mand assessment, and two target stimuli were included in the brief tact assessment. The target stimuli for the mand assessments were the top ranked items from the preference assessment without reinforcer satiation for the assessment duration. Targets were assigned to one of the two assessments based on ranked preference, the number of syllables, and targets with similar phonemes or initial sound were assigned to different assessments (e.g., cracker and cookie). We attempted to equate these three variables across the two assessments. That is, one of the top two ranked items was assigned to the full mand assessment and the other was assigned to the brief mand assessment. One of the next two ranked items was assigned to the full mand assessment and the other was assigned to the brief mand assessment. The target stimuli for the tact assessment were identified based on each participant's individualized treatment goals and were equated with the full and brief mand assessment targets based on the number of syllables. Again, targets with similar phonemes or initial sound were assigned to different assessments.

The targets chosen for Flynn's full mand assessment were iPad® (full utterance approximation was ah-puh) and cookie (full utterance approximation was oo-ee). The targets for Flynn's brief mand assessment were cracker (full utterance approximation was kae-kah) and Kindle® (full utterance approximation was ih-oh). The brief tact assessment targets were monkey (full utterance approximation was mah-kee) and pasta (full utterance approximation was

pa-tah). Caleb's full mand assessment targets were a remote (to use with a remote control car), Emily (Thomas & Friends™ train), and Lightening (Thomas & Friends™ train). The brief mand assessment targets for Caleb were Salty (Thomas & Friends™ train) and dino car (Switch & Go Dino ™). Correct full utterances included the mand frame "I want" followed by the name of the item. Caleb's brief tact assessment targets were lobster and toaster oven. Correct full utterances included the tact frame "It's a" followed by the name of the item. Brent's full mand assessment targets were Starburst® and plain M&M's®, and the targets for his brief mand assessment were Airheads® and Reese's Pieces®. Correct full utterances included the mand frame "Can I have the (name of the target), please?" Brent's brief tact assessment targets were the king and the queen cards from a deck of playing cards. Correct full utterances included the tact frame "That is a (name of the target) card."

Access to targeted items were restricted outside of the assessment sessions, when possible. When it was not possible to restrict items, we ensured that the participant did not have access to the item prior to the sessions conducted that day.

The experimenter presented each target stimulus a total of three times across the pre-test sessions for the mand and tact targets. To accommodate the varying number of mand target stimuli assessed (i.e., four targets assessed for Flynn and Brent, and five targets assessed for Caleb), the mand pre-test sessions consisted of four to five, four-trial sessions with all target stimuli randomly presented a total of three times. The tact pre-test session consisted of six trials, with two stimuli presented three times. During each trial, the experimenter secured attending and presented an item for at least 10 s; independent full utterances resulted in access to the target tangible item for 30 s or one piece of the target edible item (mand pre-test) or access to a preferred item that varied across trials (tact pre-test). Incorrect response, or no response resulted

in the presentation of the next trial without feedback on performance. Trials of previously mastered tasks (e.g., gross motor movement following the vocal discriminative stimulus "Do this") were interspersed approximately every two pre-test trials, and correct responses to mastered tasks (e.g., imitating the correct gross motor movement within 5 s of the experimenter's model) resulted in praise and a highly preferred item for 30 s. Target stimuli to which an error or no response occurred during all three presentations were selected for inclusion in the assessment. The pre-test and reinforcer duration assessment required 40 min to complete for Flynn, 52 min to complete for Caleb, and 39 min to complete for Brent.

STUDY 1: FULL VS BRIEF MAND ASSESSMENT

METHOD

Baseline

The experimenter conducted at least three, 10-trial baseline sessions for each mand target to establish a baseline for the assessment. The trial began with the presentation of a target stimulus. Participants had either 5 s (brief mand assessment) or 10 s (full mand assessment) to emit a response, and no consequences were provided for correct or incorrect responses. As in the pre-test sessions, trials of mastered tasks were interspersed approximately every two baseline trials, and correct responses to mastered tasks resulted in praise and a highly preferred item for 30 s.

Full Mand Assessment

To verify that there was a relevant EO for the item to be included in sessions conducted for the day, the experimenter held up the item in front of the participant. If the participant did not look at (i.e., gaze is directed at the item for a total of at least 3 s) or reach for the item within 10 s (e.g., Fragale et al., 2012) the experimenter removed the item and then re-presented the item for

another 10 s. If the participant did not reach for or look at the item during either opportunity, the item was not used during the sessions conducted that day. If the participant looked at or reached for the item, the experimenter proceeded with the session.

The experimenter then conducted the full mand assessment based on procedures described by Bourret et al. (2004) for two (Flynn and Brent) or three (Caleb) of the mand target stimuli identified by the pre-test. Each session was comprised of ten, 1 min-trials with one stimulus presented repeatedly across all trials of the session. Each trial began when the experimenter secured attending to the stimulus and placed the target stimulus on the table out of reach of the participant. After 10 s elapsed, the experimenter provided the non-specific vocal prompt, "If you want this, ask me for it." After 20 s elapsed, the experimenter provided a full utterance echoic prompt (e.g., "If you want this, say iPad"). After 30 s elapsed, the experimenter provided a partial utterance echoic prompt (e.g., "If you want this, say /puh/"). If the participant emitted a full utterance (prompted or unprompted) at any point during the trial or a prompted partial utterance, the experimenter gave the participant access to the item for the remaining time in the trial. For example, if the participant said, "iPad" after 3 s, the participant had access to the iPad® for 57 s. If the target item was food (e.g., cracker) and the participant said, "cracker" after 3 s, the participant was given one piece of cracker at a time for 57 s (e.g., we continued to give one piece of cracker at a time for the rest of the interval). If the participant engaged in an error during the trial, the response was recorded; however, no feedback was provided and the experimenter waited at least 1 s before a new response was accepted. The trial ended once 1 min elapsed. Refer to Appendix A for a flowchart of the full mand assessment procedures.

Brief Mand Assessment

The experimenter conducted a brief mand assessment for the two remaining mand target stimuli identified by the pre-test. The procedures in this assessment were identical to the full mand assessment with the exception of the trial duration and the timing of the delivery of the prompt. Each session was comprised of ten, 30-s trials with one stimulus presented repeatedly across all trials of the session. Each trial began when the experimenter secured attending to the stimulus and placed the target stimulus on the table out of reach of the participant. The experimenter provided the non-specific vocal prompt after 5 s elapsed, a full utterance echoic prompt after 10 s elapsed, and a partial utterance echoic prompt after 15 s elapsed. If the participant emitted a full utterance at any point during the trial or a prompted partial utterance, the experimenter gave the participant access to the item for the remaining time in the trial. If the participant engaged in an error during the trial, the response was recorded; however, no feedback was provided and the experimenter waited at least 1 s before a new response was accepted. The trial ended once 30 s elapsed. Refer to Appendix B for a flowchart of the brief mand assessment procedure.

Experimental Design

Four to ten, 10-trial sessions were conducted two to five days per week with at least 5 min in-between each session to control for satiation effects. Responding during each assessment was evaluated in a concurrent multiple baseline design across the two to three targets. That is, the experimenter conducted a multiple baseline design across the two or three full mand targets and a second multiple baseline design across the two brief mand targets for each participant.

The assessment was discontinued (a) after at least ten sessions, with three consecutive sessions for which there was no increasing trend in independent full utterances, or (b) once the

participant's responding met the mastery criterion of two consecutive sessions with correct independent full utterances during at least 90% of the trials.

RESULTS AND DISCUSSION

Figure 1 shows Flynn's results for the full mand assessment (top) and brief mand assessment (bottom). During all baseline sessions, Flynn did not emit an independent full utterance for any of the targets. During both assessments, similar patterns of responding were observed. Flynn did not engage in independent or prompted full utterances following the non-specific vocal prompt or full utterance echoic prompt, and emitted only partial utterances. This pattern of responding suggests that Flynn had a full utterance skill deficit for mands.

Figure 2 shows the results for the full mand assessment (top) and brief mand assessments (bottom) for Caleb. During baseline, Caleb did not independently emit the full utterance for the five targets. During both assessments, similar patterns of responding were observed for four of the five targets. Caleb initially engaged in prompted full utterances for the remote, Lightening, Salty, and Dino Car during the full and brief mand assessments. Following one to three sessions, he began to emit independent full utterances. Responding for these four target mands met the mastery criterion following three to five sessions in the full and brief mand assessments. He initially engaged in prompted full utterances for the fifth target, Emily; however, this pattern continued until he met the discontinuation criterion. Caleb engaged in a consistent incorrect response throughout the full mand assessment for Emily; he said, "I want the Emily" instead of the target response "I want Emily." Although Caleb did not master this target, the incorrect response did emerge in a similar pattern to the other four targets. Overall, his pattern of responding across assessments suggests that Caleb did not have any of the target mands in his

repertoire, and both the full and brief mand assessments were successful in training four of the five targets.

Figure 3 shows Brent's results for the full mand assessment (top) and brief mand assessment (bottom). During baseline, Brent did not independently emit the full utterance for any of the targets. Initially, during both assessments, Brent primarily produced the full utterance following the non-specific vocal prompt, "If you want this, ask me for it" for all four targets. This prompt did not specify or model the target response, suggesting that these mands were already in his repertoire and that Brent was waiting for a prompt to emit the response (i.e., prompt dependence). He also occasionally produced the full utterances following the full utterance echoic prompt, "If you want this, say (target)." Following one to three assessment sessions, Brent began to emit independent full utterances for all four of the target mands in the full and brief mand assessments. This resulted in mastery for three (Starburst®, plain M&M's®, and AirHead®) of the four mands following seven to 10 assessment sessions. These results suggest that Brent's mands were dependent on prompts, and the assessment procedures may have served as an intervention for Brent's prompt dependence. Also, it is important to note that the target that did not meet mastery during the assessment (Reese's Pieces®) was ranked fourth in the paired-stimulus preference assessment.

Figure 4 shows the average full and brief mand assessment duration for Flynn, Caleb, and Brent. The brief mand assessment was more efficient in terms of average assessment duration when compared to the full mand assessment for all three participants. Flynn's average assessment duration for the full mand procedure was 117.5 min (range, 116 to 118 min), while his average assessment duration for the brief mand procedure was 67 min (range, 66 to 68 min). Caleb's average assessment duration was 70.7 min (range, 35 to 119 min) for the full mand

procedure, and his average assessment duration for the brief mand procedure was 28.5 min (range, 26 to 31 min). Finally, Brent's average assessment duration for the full mand procedure was 115.5 min (range, 115 to 116 min), and his average assessment duration for the brief mand procedure was 58.5 min (range, 53 to 64 min).

Due to the similar patterns of responding across the full and brief assessments for all three participants and the increased efficiency of the brief mand assessment when compared to the full mand assessment, we extended the brief assessment to identify potential interventions for training tacts. Like mands, a vocal-verbal deficit within a tact repertoire may be a results of (1) a full-utterance skill deficit (i.e., the participant does not engage in an independent or prompted full utterance and emits only partial utterances), (2) an untrained tact, or (3) prompt dependence (i.e., the participant only produces a full utterance following a prompt). Although there are overlapping characteristics of mand training and tact training based on the type of deficit identified, it is unknown if verbal behavior deficits are consistent across verbal operants. Thus the purpose of Study 2 was to evaluate if the results of the brief mand assessment procedures show similar outcomes to a brief assessment of tacts. It is possible that the assessments will identify different outcomes for mands and tacts, given the functional independence of these verbal operants in early language development (e.g., Kelly, Shillingsburg, Castro, Addison, & LaRue, 2007). That is, the mand assessment could identify prompt dependence and the tact assessment could identify a full-utterance skill deficit. Nevertheless, it is beneficial to extend the assessment procedures to the identification of training strategies for the tact.

STUDY 2: BRIEF TACT ASSESSMENT

METHOD

Baseline

The experimenter conducted at least three, 10-trial baseline sessions for each tact target to establish a baseline for the assessment. The trial began with the presentation of a target stimulus. Participants had 5 s to emit a response, and no consequences were provided for correct or incorrect responses. Trials of mastered tasks were interspersed approximately every two baseline trials, and correct responses to mastered tasks resulted in praise and a highly preferred item for 30 s.

Brief Tact Assessment

The experimenter conducted a brief tact assessment (Appendix C) for each of the two tact target stimuli identified by the pre-test. Similar to the brief mand assessment, each session was comprised of ten, 30 s-trials with one target stimulus presented repeatedly across trials. The trial began when the experimenter held up and secured attending to the target stimulus card. The card remained present throughout the trial until the participant responded correctly or the trial ended. After 5 s elapsed, the experimenter provided the non-specific vocal prompt, "What is it?" After 10 s elapsed, the experimenter provided a full utterance echoic prompt (e.g., "What is it, say sock."). After 15 s elapsed, the experimenter provided a partial utterance echoic prompt (e.g., "What is it, say /so/."). Following a full utterance or a prompted partial utterance, the experimenter provided praise and gave the participant access to a preferred item identified by the preference assessment for the remaining time in the trial (e.g., if the participant said "sock" after 3 s, the participant had access to an iPad® or one piece of candy at a time for 27 s). If the participant engaged in an error during the trial, it was recorded; however, no feedback was provided and the experimenter waited at least 1 s before a new response was accepted. The trial ended after 30 s elapsed.

Experimental Design

Four to ten, 10-trial sessions were conducted two to five days per week with at least 5 min in-between each session to control for satiation effects. Responding during each assessment was evaluated in a concurrent multiple baseline design across two targets. The assessment was discontinued (a) after at least ten sessions, with three consecutive sessions for which there was no increasing trend in independent full utterances, or (b) once the participant's responding met the mastery criterion of two consecutive sessions with correct independent full utterances during at least 90% of the trials.

RESULTS AND DISCUSSION

Figure 5 shows the results of the brief tact assessment for Flynn. During all baseline sessions, Flynn did not emit the independent full utterance for the two targets. During the brief tact assessments, Flynn did not emit independent or prompted full utterances following the non-specific vocal prompt or full utterance echoic prompt, and emitted only partial utterances. This pattern of responding matched the outcome of both mand assessments and suggests that Flynn had a full utterance skill deficit for tacts.

Figure 6 shows the results of the brief tact assessment for Caleb. During all baseline sessions, Caleb did not independently emit the full utterance for the two targets. During the brief tact assessment, Caleb initially engaged in prompted full utterances for both tact targets. Following two assessment sessions, he began to emit independent full utterances, resulting in the mastery of these tact targets. This pattern of responding shows that Caleb did not have the tact targets in his repertoire and matched four of the mand assessment outcomes.

Figure 7 shows the results of the brief tact assessment for Brent. During all baseline sessions, Brent did not independently emit the full utterances for the two targets. During the brief tact assessment, Brent initially engaged in prompted full utterances for both tact targets

following the full utterance echoic prompt. Following seven to 10 assessment sessions, he began to emit independent full utterances, resulting in the mastery of these tact targets. This pattern of responding in the brief tact assessment did not match the full and brief mand assessment outcomes of prompt dependence and suggests that Brent did not have the tact targets in his repertoire.

GENERAL DISCUSSION

The present studies sought to improve the clinical utility of assessments (brief vs. full) to identify interventions to teach mands and tacts to children with vocal-verbal deficits. In the first study, we replicated the full mand assessment as described by Bourret et al. (2004) and compared the full mand assessment to a brief mand assessment with similar procedures. Flynn's assessment results suggest that his vocal-verbal deficits were a result of a skill deficit to produce the mand target full utterance and did not result in the mastery of the target mands. Caleb's assessment results suggest that his vocal-verbal deficits were a result of untrained mand targets, and the assessment resulted in mastery of four of the five target mands. Finally, Brent's assessment results suggest that his vocal-verbal deficits were a result of prompt dependence, and the assessment reduced prompt dependence and resulted in the mastery of three of the four target mands.

Although the mand assessment results (full and brief) showed different vocal-verbal deficits for each participant, this outcome is consistent with Bourret et al. (2004). That is, assessment outcomes differed across participants and suggest the need for individualized intervention. Overall, the present studies demonstrate that it may be beneficial to conduct an assessment of mands or tacts to identify appropriate interventions for a given individual, rather than arbitrarily selecting a standard training procedure to implement. Individualized

interventions are the hallmark of ABA, and by identifying the variables affecting an individual's performance through assessment, we can apply the results to better inform instruction. Furthermore, research on assessment-based instruction shows that the efficacy and efficiency of a given intervention may differ across children (e.g., Carroll et al., 2015; McGhan & Lerman 2013), highlighting the necessity of individualized interventions based on assessment results.

In the absence of an assessment, clinicians may apply similar or standard mand-training procedures to children with vocal-verbal deficits. Given the results of the mand assessment in the current study, it remains unclear whether standard training procedures (e.g., use of a prompt delay within naturalistic teaching opportunities; Hall & Sundberg, 1987) would be successful for at least two of the three participants. Flynn and Caleb's mand assessment results indicate that the targeted mands were unlikely to be trained with the continuation of full utterance prompts. As shown by Bourret et al. (2004), specialized interventions are needed to treat these types of deficient mand repertoires. Thus, although an initial assessment of several mands may slightly delay the onset of mand training, the benefits of obtaining information regarding the function of the deficient repertoire outweigh this delay to intervention and may ultimately increase both the efficacy of subsequent instruction and overall efficiency of mand training. However, additional research is needed to verify the results of the mand assessment with a treatment comparison. Future researchers could compare the efficacy and efficiency of mand interventions that are and are not based on the results of the mand assessment.

The current study also extends the previous literature through the demonstration of within-subject replication for each assessment and replication across the full and brief mand assessments, thus strengthening the internal validity. Furthermore, the brief mand assessment required 42 to 57 fewer min to conduct when compared to the full mand assessment. This

suggests that the brief mand assessment may be a more efficient alternative with greater clinical utility when compared to the full mand assessment described by Bourret et al. (2004). Due to the benefits of conducting a mand assessment to identify individualized interventions to implement with clients, identification of more efficient assessment methods may increase the likelihood that these assessments are used by practitioners. Additional research on the clinical use of the brief mand and tact assessments by practitioners could provide further evidence regarding the external and social validity of these assessments in clinical practice.

Brent's mand assessment results extend the literature on the assessment and treatment of prompt dependence. Prompt dependence occurs when the environment inhibits the transfer stimulus of control from a controlling prompt to a relevant discriminative stimulus so that correct responding occurs only when controlling prompts are presented (Clark & Green, 2004). To our knowledge, only Bourret et al. (2004) developed an assessment that captures data on prompt dependence. In addition, the full and brief mand assessment procedures may have served as an intervention for Brent's prompt dependence. That is, both assessments provided differential reinforcement of duration of access to the reinforcer. When Brent emitted an independent full utterance, he received a longer duration of reinforcement (up to 1 min for the full mand assessment or up to 30 s for the brief mand assessment) when compared to responses emitted following the full utterance echoic prompt (up to 40 s for the full mand assessment or up to 20 s for the brief mand assessment). Although, the type of differential reinforcement provided to treat prompt dependence differs from the previous studies, differential reinforcement has been shown to be an effective strategy for individuals with a history of prompt dependency (e.g., Cividini-Motta & Ahearn, 2013).

In the second study, we evaluated the results of the brief mand assessment procedures when compared to a brief assessment of tacts. It is unknown if vocal-verbal deficits are consistent across verbal operants. By comparing the patterns of responding observed for the two brief assessments (mand vs. tact), we were able to further evaluate participants' vocal-verbal deficits across verbal operants. Flynn's brief tact assessment results suggest that his vocal-verbal deficits were a result of a skill deficit to produce the full utterance tact, and Caleb's brief tact assessment results suggest that his vocal-verbal deficits were a result of untrained tact targets. Although the brief tact assessment matched the brief mand assessment for Flynn and Caleb, different patterns of responding were observed for Brent. That is, the brief mand assessment outcomes showed that Brent's vocal-verbal deficits for were a result of prompt dependence, and the brief tact assessment outcomes showed that his vocal-verbal deficits were a result of untrained targets. Together these results suggest that vocal-verbal deficits may differ across verbal operants for some individuals, thus warranting the separate assessment of different verbal operants when evaluating an appropriate intervention for individuals with vocal-verbal deficits. Future studies evaluating effective interventions for other verbal operants, such as the tact or intraverbal, for a given individual could evaluate the clinical utility of an assessment-informed intervention.

A potential limitation that is important to note is that Caleb's pattern of responding for one of the five target mands was inconsistent with the pattern of responding for the other targets. That is, the emergence of the independent full utterance was not observed for one target, and Caleb met the assessment discontinuation criterion without mastery. This target (Emily) was assigned to the full mand assessment, and although Caleb did not receive access to the Emily train following the incorrect response, he continued to emit the error until provided with the full

utterance echoic prompt, “If you want this say, I want Emily”. Furthermore, the error pattern that Caleb did emit (“I want *the* Emily”) followed a similar pattern to the full utterance response emitted for the other target mands. For example, this error pattern was initially observed for two of the other targets (Salty and Dino Car, which were included in the brief mand assessment); however, additional exposure to prompts resolved these errors. It is important to note that Caleb frequently responded correctly to the full utterance echoic prompt, which resulted in access to the Emily train for the remaining trial duration of about 40 s. This duration of reinforcement was more than double the reinforcement duration for a prompted full utterance response in the brief mand assessment (i.e., a 10-s reinforcement interval for Salty and Dino Car). Therefore, it is possible that a reinforcement interval more than twice as long as Caleb’s reinforcement interval during the brief mand assessment was sufficient to maintain this prompted response in the full mand assessment and prevent the transfer of control over the response from the prompt to the initial discriminative stimulus at the onset of the trial.

Another potential limitation is that only two targets were included in each of the brief assessments. Although the brief and full mand assessment results demonstrated similar patterns of responding when compared to Bourret et al. (2004), further within- and across-participant replication of the brief (mand and tact) assessment results with validated assessment-based interventions is warranted to better understand the identified vocal-verbal deficits. In addition, the mand assessment results were inconsistent with the brief tact assessment results for one of the three participants. Given the functional independence of these verbal operants in early language development, this disagreement is likely to be a result of a different function of the deficient mand repertoire when compared to deficient tact repertoire. Nevertheless, it is beneficial to replicate this differentiated outcome.

The results of these studies provide a methodology for conducting brief assessments to inform mand and tact training for children with vocal-verbal deficits. Furthermore, the results of the brief tact assessment suggest that the environmental variables related to observed vocal-verbal deficits may differ across verbal operants for some individuals. Continued research on assessment-informed intervention can help to provide more effective and efficient assessment and interventions methods to use when teaching individuals with vocal-verbal deficits.

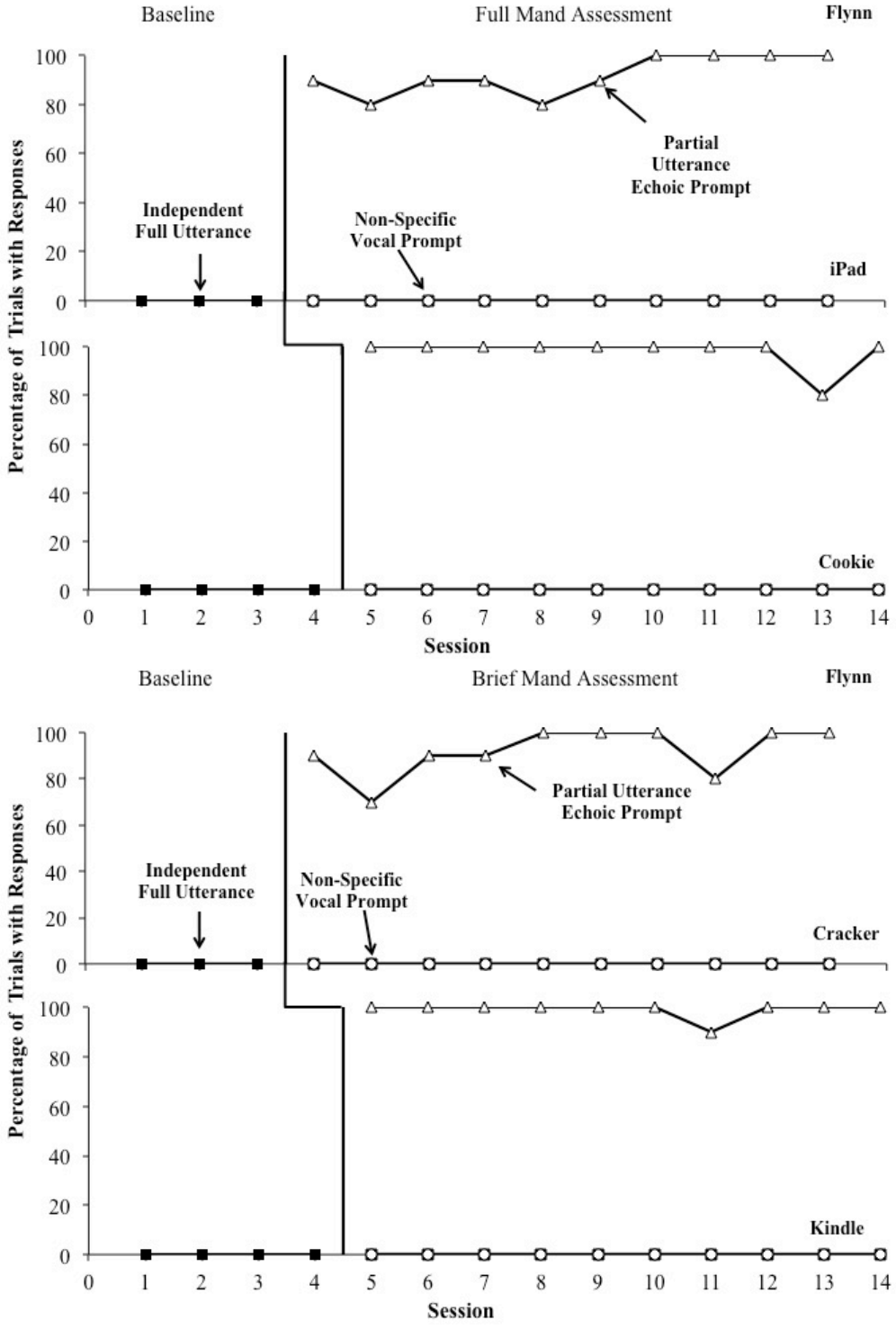

Figure 1. Flynn's percentage of mand assessment trials with independent full utterances, prompted full utterances following a non-specific vocal prompt or the full utterance echoic prompt, and prompted partial utterances across the full mand assessment targets (top) and the brief mand assessment targets (bottom) during sessions.

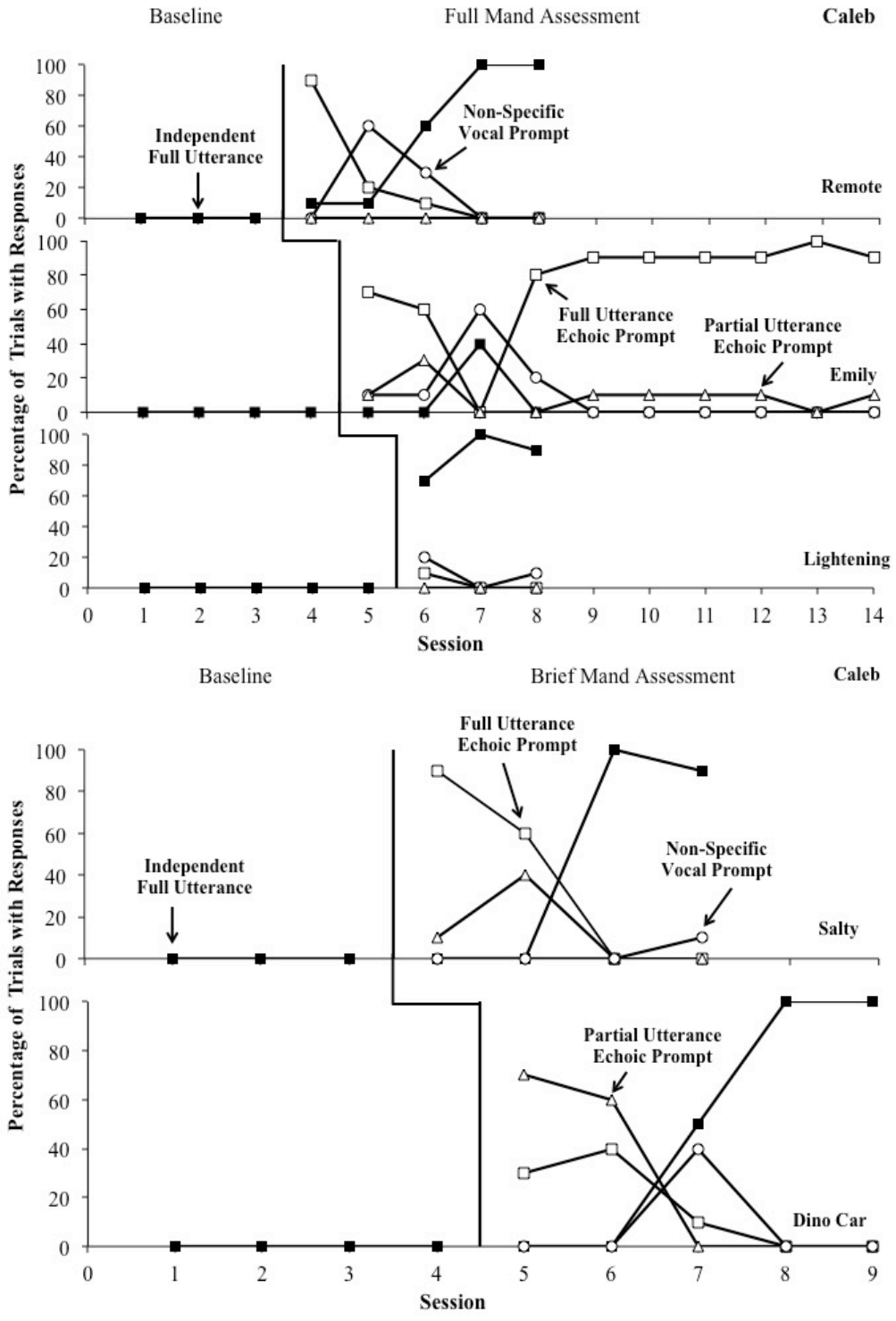

Figure 2. Caleb's percentage of mand assessment trials with independent full utterances, prompted full utterances following a non-specific vocal prompt or the full utterance echoic prompt, and prompted partial utterances across the full mand assessment targets (top) and the brief mand assessment targets (bottom) during sessions.

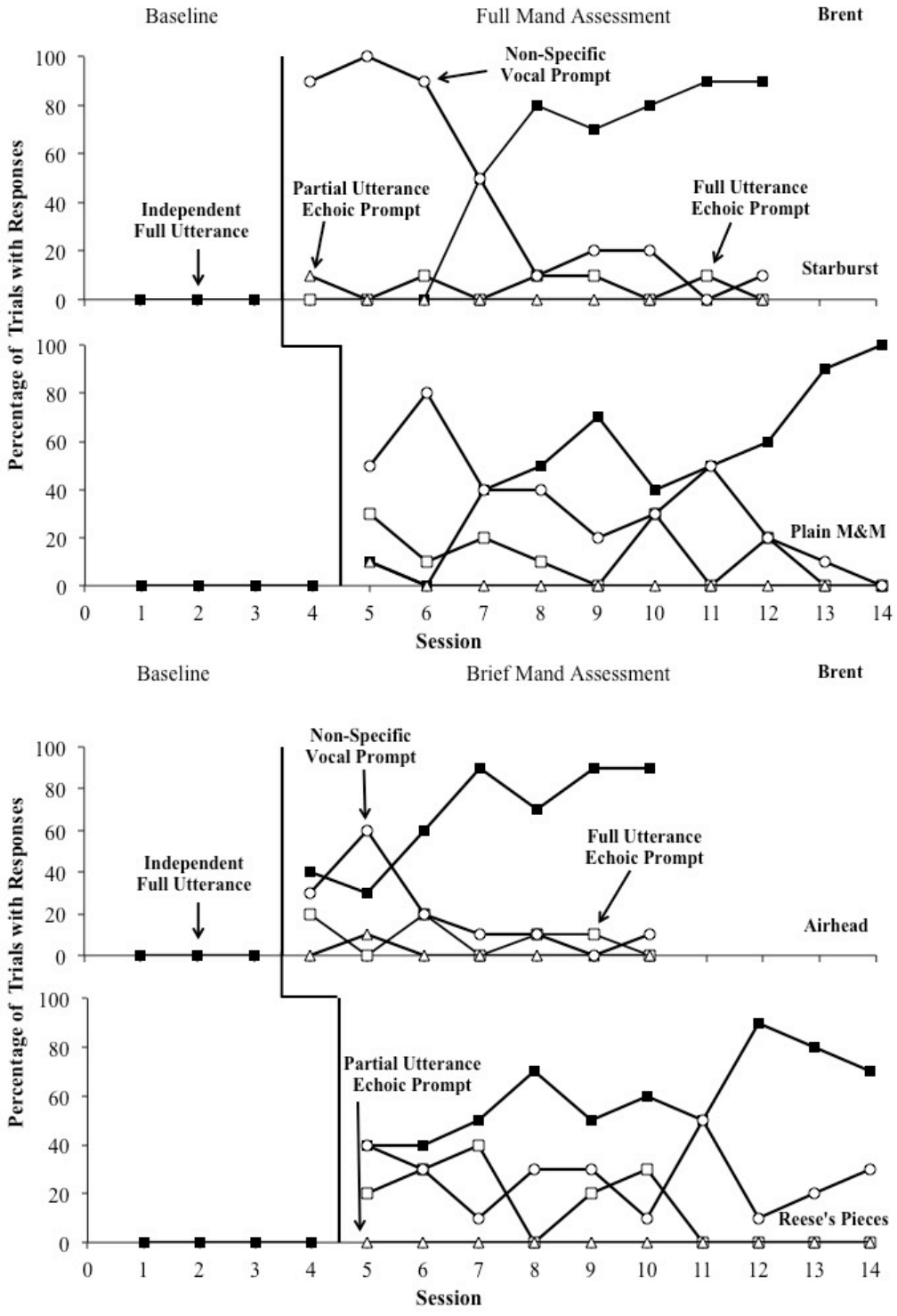

Figure 3. Brent's percentage of mand assessment trials with independent full utterances, prompted full utterances following a non-specific vocal prompt or the full utterance echoic prompt, and prompted partial utterances across the full mand assessment targets (top) and the brief mand assessment targets (bottom) during sessions.

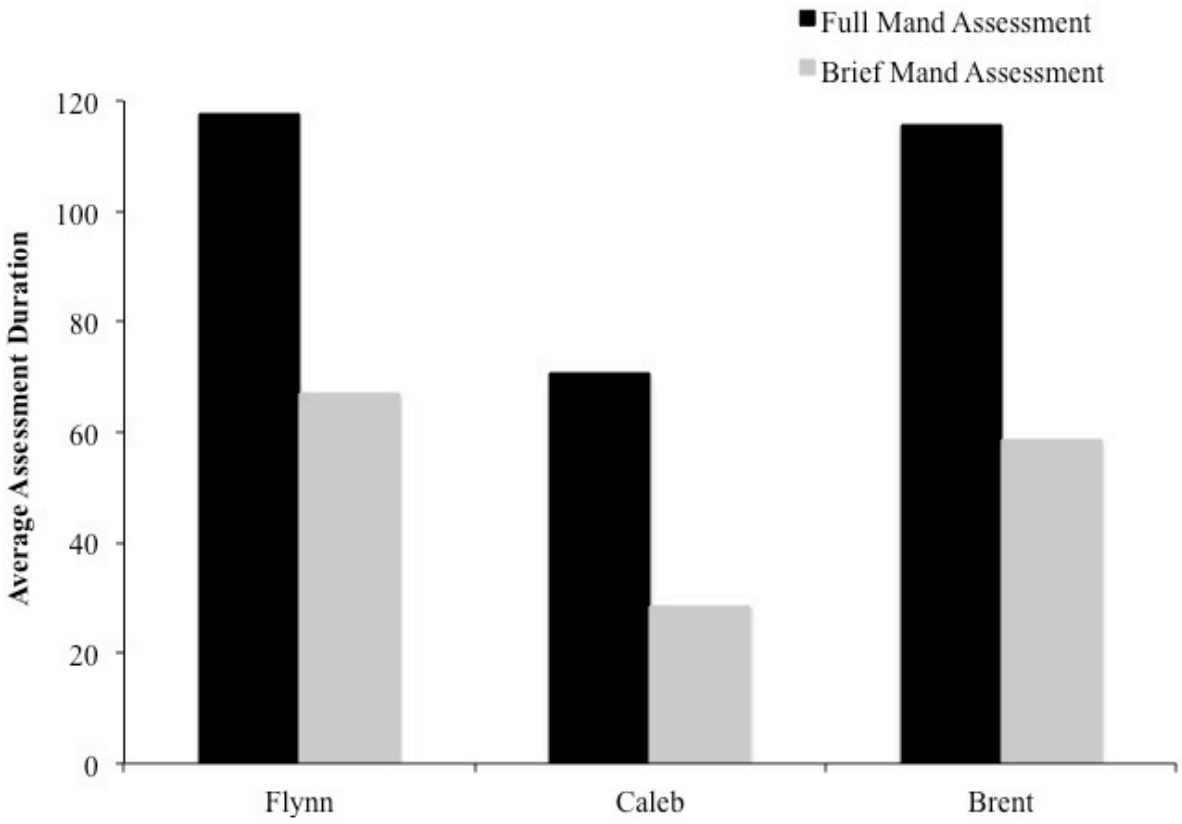

Figure 4. Average full and brief mand assessment durations for Flynn, Caleb, and Brent.

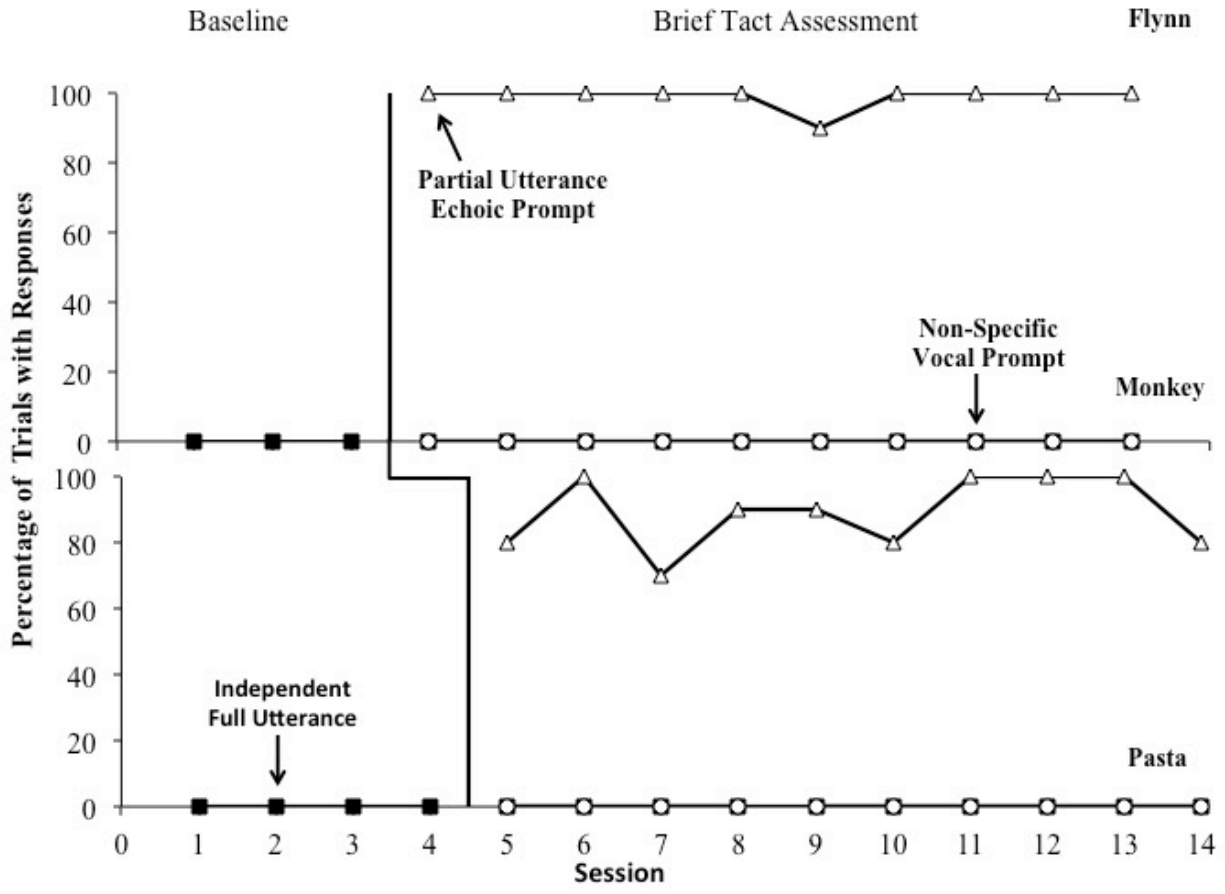

Figure 5. Flynn's percentage of tact assessment trials with independent full utterances, prompted full utterances following a non-specific vocal prompt or the full utterance echoic prompt, and prompted partial utterances across brief tact targets during sessions.

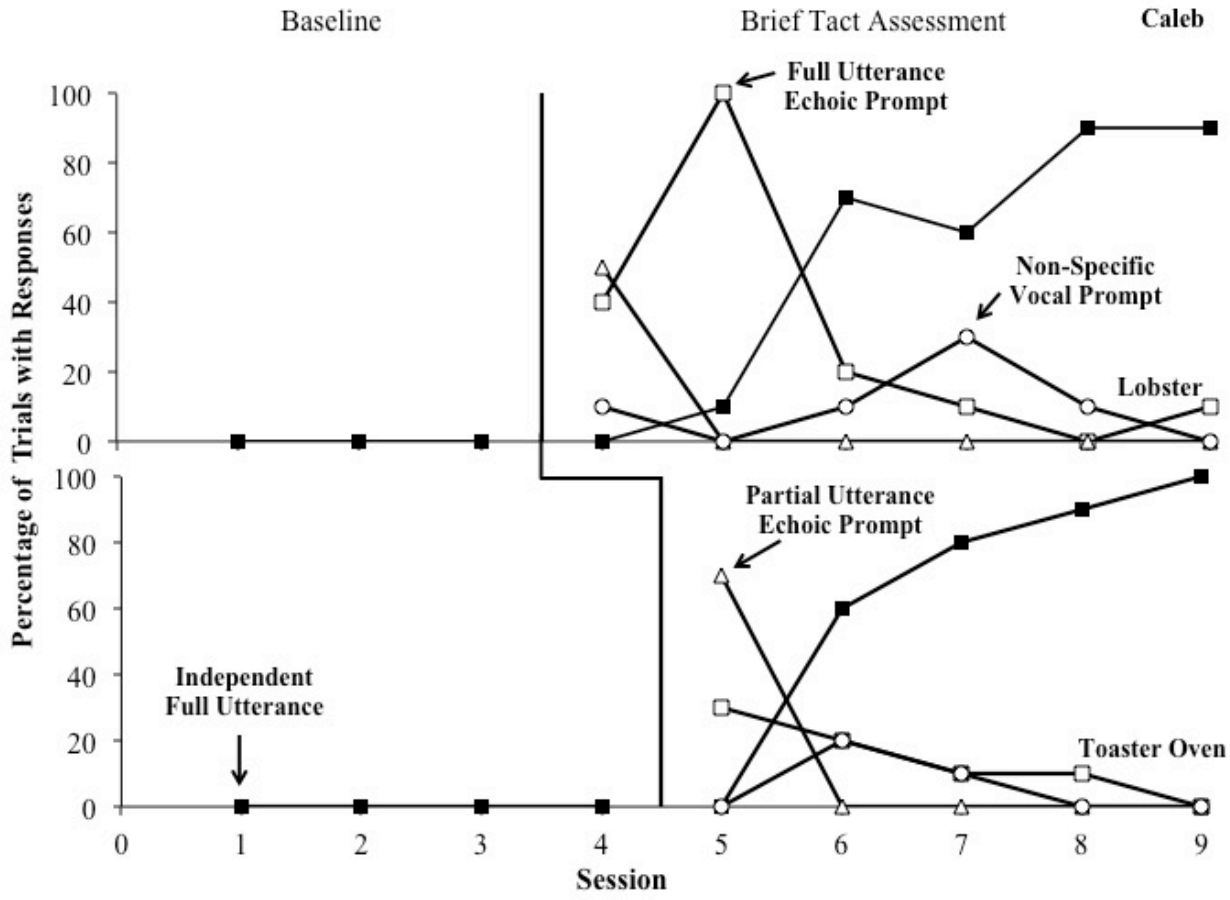

Figure 6. Caleb's percentage of tact assessment trials with independent full utterances, prompted full utterances following a non-specific vocal prompt or the full utterance echoic prompt, and prompted partial utterances across brief tact targets during sessions.

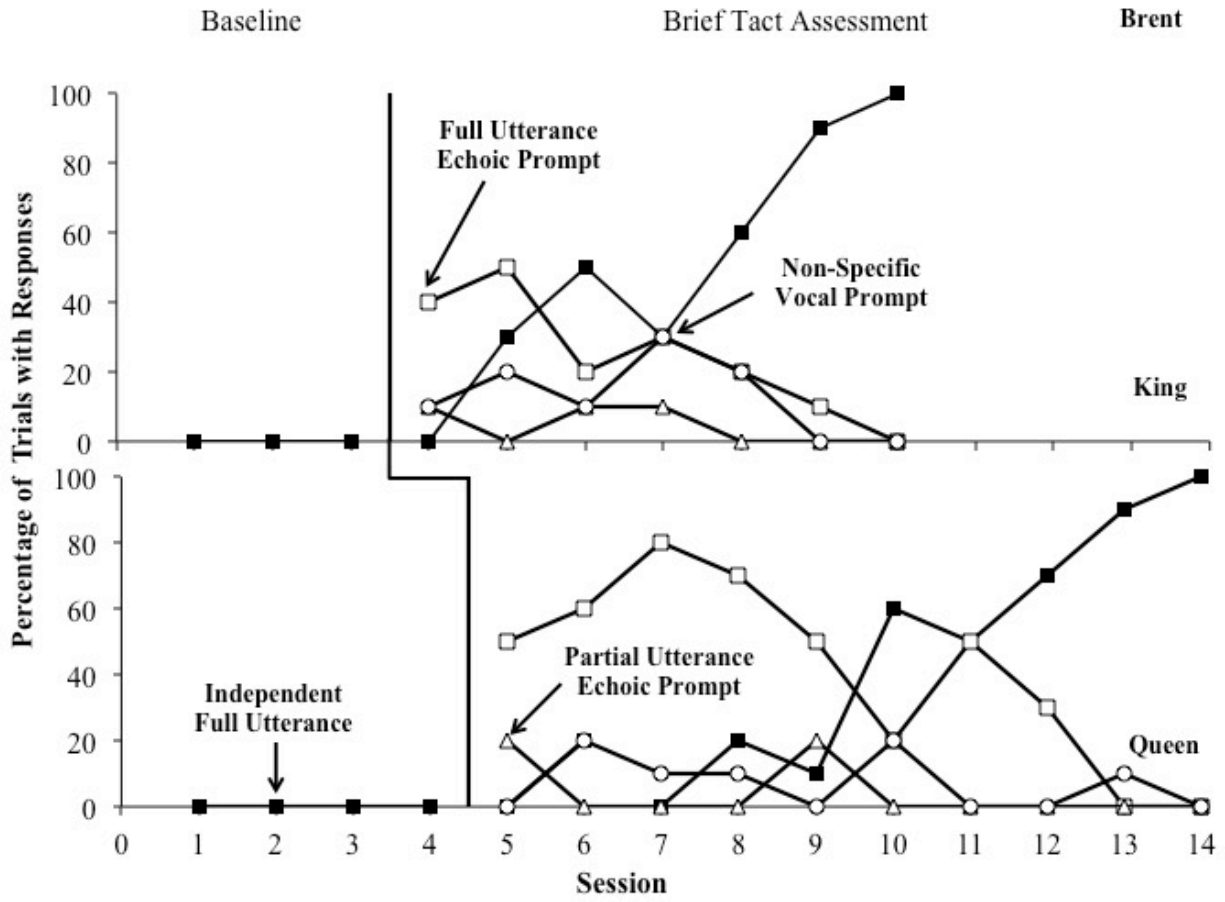

Figure 7. Brent's percentage of tact assessment trials with independent full utterances, prompted full utterances following a non-specific vocal prompt or the full utterance echoic prompt, and prompted partial utterances across brief tact targets during sessions.

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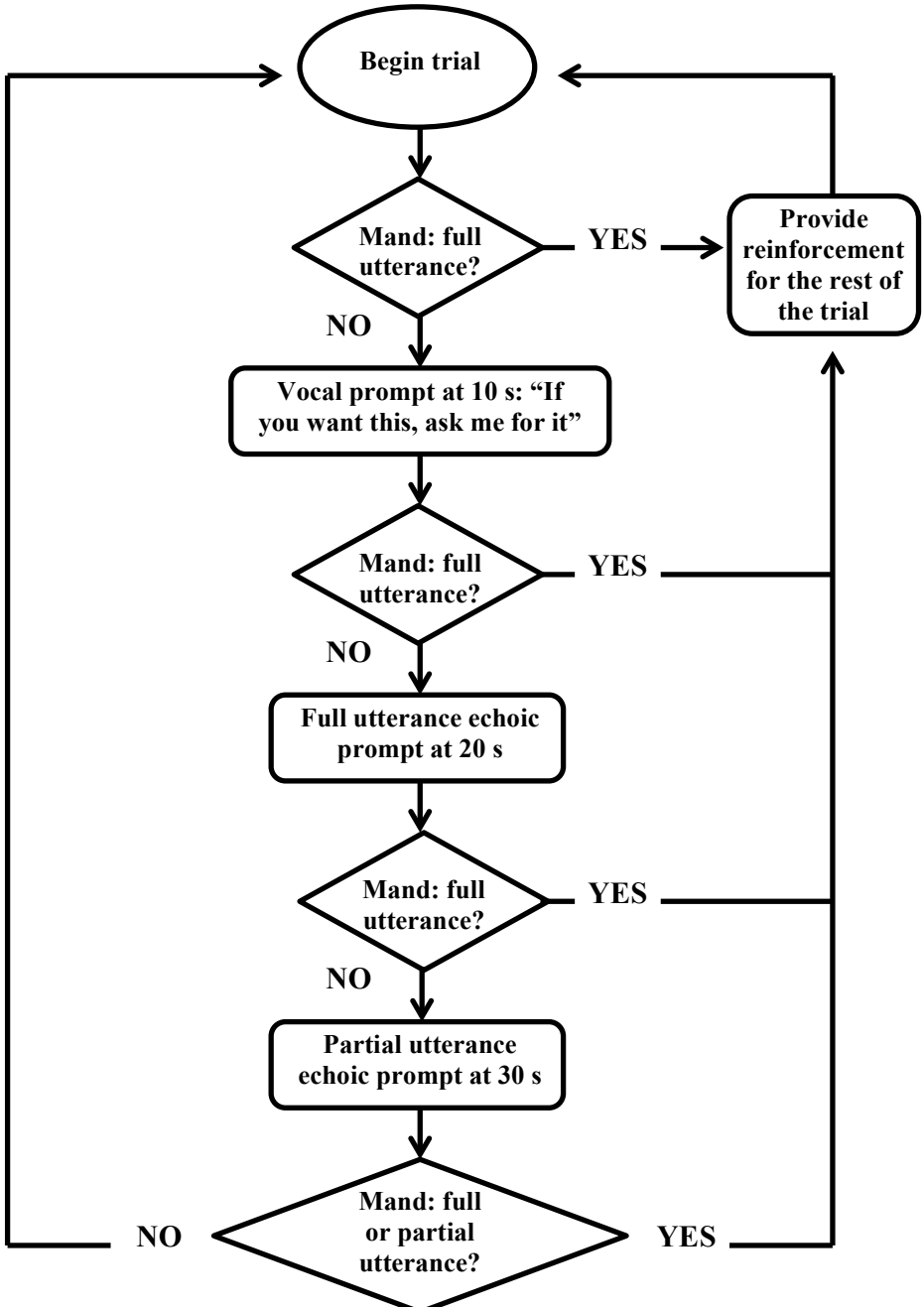
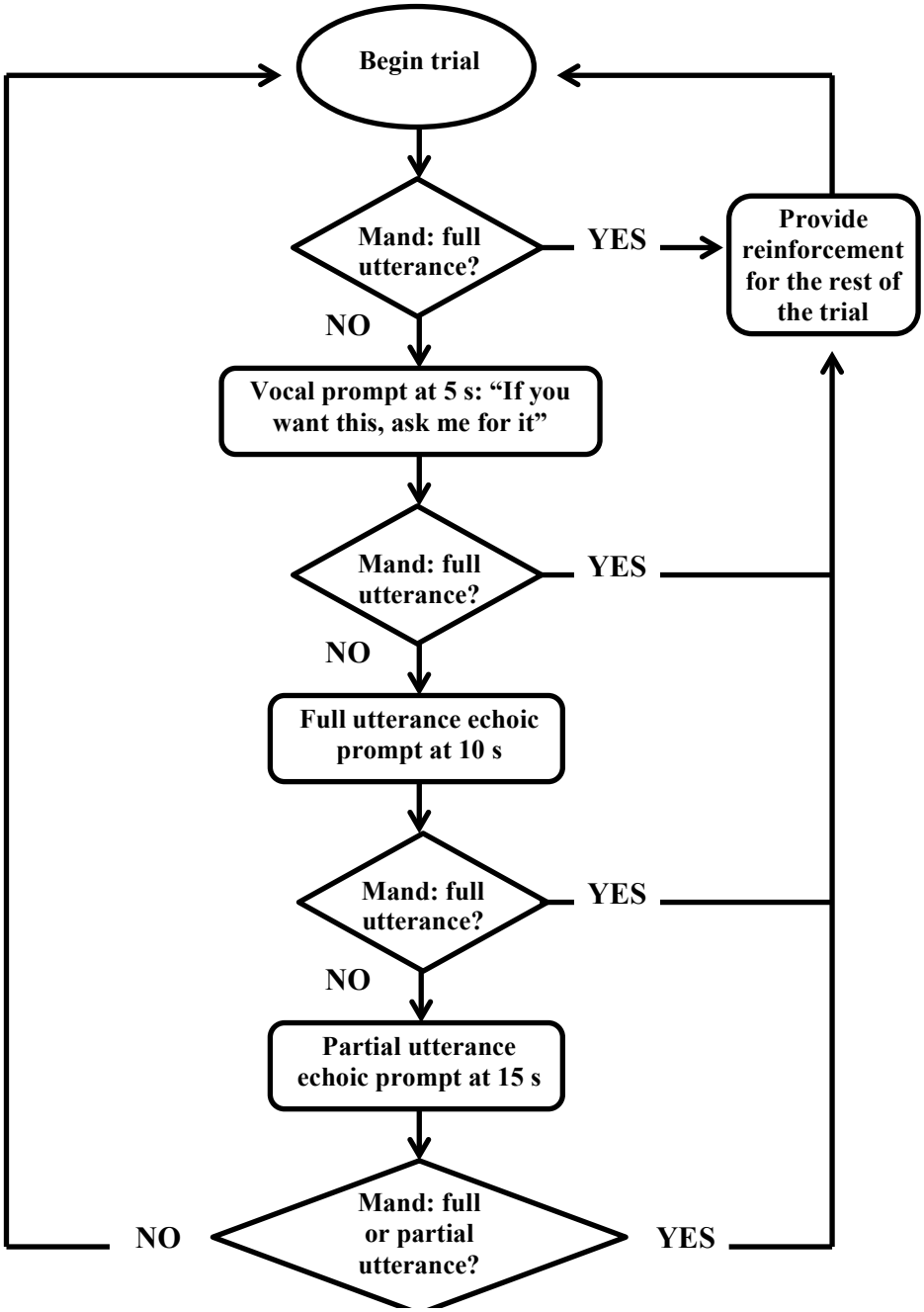
Appendix A

Full Mand Assessment Flow Chart



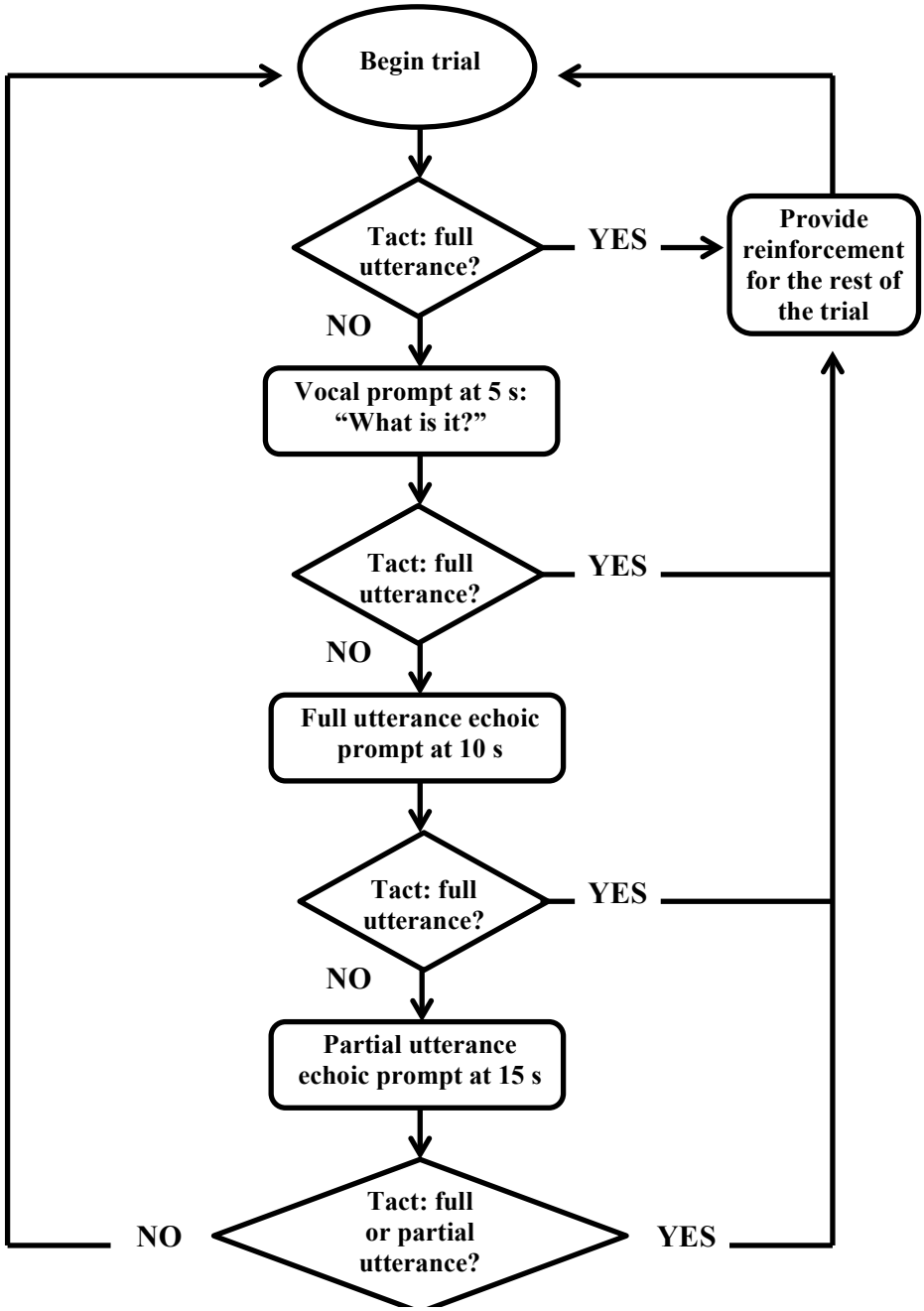
Appendix B

Brief Mand Assessment Flow Chart



Appendix C

Brief Tact Assessment Flow Chart



Appendix D

Assessment Data Sheet

Date_____ Condition: _____Stimulus: _____Session # _____ Initials_____

Trial	Independent	Non-Specific Prompt	Full Utterance Prompt	Partial Utterance Prompt	PB	Attend.	Integrity
1	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
2	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
3	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
4	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
5	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
6	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
7	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
8	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
9	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
10	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -

Session duration: _____

Date_____ Condition: _____Stimulus: _____Session # _____ Initials_____

Trial	Independent	Non-Specific Prompt	Full Utterance Prompt	Partial Utterance Prompt	PB	Attend.	Integrity
1	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
2	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
3	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
4	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
5	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
6	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
7	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
8	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
9	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -
10	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	F P - NR **V:**	+ -	+ -	+ -

Session duration: _____

CURRICULUM VITAE

Brittany LeBlanc

Place of birth: Springfield, MA

Education

B.A., University of Massachusetts-Amherst, May 2008
Major: Psychology

M.S., University of Wisconsin-Milwaukee, December 2015
Major: Psychology, Behavior Analysis

Ph.D., University of Wisconsin-Milwaukee, May 2017
Major: Psychology, Behavior Analysis
Minor: Psychopathology

Dissertation Title: An Evaluation of Mand and Tact Assessment Procedures

ASSOCIATION MEMBERSHIPS

Association for Behavior Analysis International: *2012-present*
Heartland for Behavior Analysis: *2015-2016*
Mid-American Association for Behavior Analysis: *2015-2016*
Minnesota Northland Association for Behavior Analysis: *2015-2016*
American Psychological Association: *2012-2014*
National Association for School Psychologist: *2012-2014*
Psi Chi, University of Massachusetts, Amherst: *2006-2008*

HONORS AND AWARDS

John & Lynn Schiek Award in Behavior Analysis, University of Wisconsin Milwaukee, *Sep. 2016*
John & Lynn Schiek Award in Behavior Analysis, University of Wisconsin Milwaukee, *Sep. 2015*
Student Poster Contest First Place, MN Northland Assoc. for Behavior Analysis Conference, *Sep. 2015*
John and Lynn Schiek Stipend, University of Wisconsin Milwaukee, *May 2015*
Summer Research Fellowship, **Dept. of Psychology,** University of Wisconsin Milwaukee, *May 2015*
Student Poster Contest First Place, Hartland Association for Behavior Analysis Conference, *Mar. 2015*
John & Lynn Schiek Award in Behavior Analysis, University of Wisconsin Milwaukee, *Oct. 2014*
Graduate Student Travel Award – Conferences, BABAT, *Oct. 2016,* MABA, *Oct. 2015,* ABAI , *May 2015,* APBA, *Mar. 2015,* ABAI, *Mar. 2014,* and ABAI on Autism, *Jan. 2013*

CLINICAL EXPERIENCE

09/2015-present

Behavioral Treatment Therapist, CLASS Interventions, Milwaukee, WI

Delivery of one to one therapy based upon ABA service delivery models in the home setting. Provide supervision to behavioral technicians and conducted parent training. Administer VB-MAPP to children with reported developmental delays and conduct functional analyses.

Supervisor: Tiffany Kodak, Ph.D.

06/2014-7/2014

ABA Instructor, Building Bridges, Portland, OR

Delivered one to one therapy based upon ABA service delivery models in a clinic setting. Developed proficiency in discrete trial and embedded teaching models.

Supervisor: Elizabeth Mishler

11/2011-06/2012

Lead ABA Instructor, REACH Behavioral Consulting, Seattle, WA

Delivered home-based one to one therapy based upon ABA service delivery models. Assisted students with functional living, socialization, recreational, and leisure skills. Administered ABLS, planned intervention based on students' Individual Education Plan goals. Trained new staff on client programs and ABA instruction.

Supervisor: Elizabeth Stoughton

10/2009 -11/2011

ABA Instructor, Advantage Learning Group/Boston ABA, Seattle, WA.

Delivered home-based and school-based one to one therapy based upon ABA service delivery models. Developed proficiency in discrete trial and embedded teaching models.

Supervisor: Nicole Vitkauskas

09/2008-10/2009

Mental Health Specialist and Shift Supervisor, Kennedy Hope Academy, Franciscan Hospital for Children, Brighton, MA

Residential program that served children and adolescents who were diagnosed with an intellectual disability and/or autism spectrum disorders with severe psychiatric and severe behavior. Led a team of mental health specialists to provide services to the residents in a home and school hospital-based environment. Promoted independence and taught functional living, social, leisure, and recreational skills.

Supervisor: Rui Carreiro

RESEARCH EXPERIENCE

09/2014-present

Research Assistant, Kodak Early Intervention Research Laboratory, University of Wisconsin-Milwaukee, Milwaukee, WI

Responsible for data collection and running interventions for children with autism spectrum disorders. Provide supervision for undergraduate research assistants. Current projects include developing verbal behavior in children, staff- training procedures, and early literacy skills.
Supervisor: Tiffany Kodak, Ph.D.

09/2012-06/2014

Research Assistant, Early Intervention Research Laboratory, University of Oregon, Eugene, OR
Assisted in the development and data collection for studies with a focus on developing verbal behavior in children who are currently non-vocal, evaluating the efficiency of and preference for computer-assisted instruction, and evaluating common treatment integrity errors.
Supervisor: Tiffany Kodak, Ph.D.

10/2010-06/2013

Research Assistant, Center on Human Development and Disability, University of Washington, Seattle, WA
Scored the Communication Symbolic Behavior Scales for children ranging 12-24 months of age. Coded communication spontaneity in infants at risk for autism spectrum disorders. Assisted in scoring a battery of developmental assessments, including the Mullen and Vineland. Trained new research volunteers. Managed organizational systems to track coding progress, inter-rater reliability, and data entry.
Supervisor: Shanna Alvarez

09/2009-08/2010

Research Intern, Cerebellar Psychiatric Research Lab, Mass. General Hospital, Charlestown, MA
Recruited and interviewed participants for a study examining the cerebellar structure and function in adults diagnosed with ADHD. Assisted in development and administration of a computerized working memory task.
Supervisor: Eve Valera, Ph.D.

12/2008-06/2009

Research Intern, Cerebellar Psychiatric Research Lab, Mass. General Hospital, Charlestown, MA
Study focusing on the neuroimaging of battered women with brain injury. Scored and organized data for neuropsychology tasks. Assisted with fMRI scans of participants.
Supervisor: Eve Valera, Ph.D.

02/2008-05/2008

Research Assistant, Psychology Department, University of Massachusetts, Amherst, MA
Recruited and interviewed participants for a study examining motor skill memory in older adults. Administered computer tasks.
Supervisor: Rebecca Spencer, Ph.D.

12/2007-05/2008

Research Assistant, Psychology Department, University of Massachusetts, Amherst, MA
Interviewed participants for a study examining the relationship between depressive symptoms and circulating cortisol levels in early adulthood. Collected saliva samples, administered questionnaires, and conducted semantic and affective priming tasks.
Supervisors: Donna Kreher, M.S., and Sally Powers, Ph.D.

TEACHING, SUPERVISION, AND MENTORING EXPERIENCE

Spring 2015, Spring 2016, Spring 2017

Teacher's Assistant and Lab Leader, Applied Behavior Analysis, University of Wisconsin-Milwaukee, WI
Lead lab sections for undergraduate class and assist with class presentations and activities. Help read and grade, quizzes, tests, and final papers. Maintained and submit grading records and provided constructive and evaluative feedback for graded assignments. Provided academic assistance and supports to students.
Supervisor: Tiffany Kodak, Ph.D.

Fall 2016

Teacher's Assistant and Lab Leader, Conditioning and Learning, University of Wisconsin-Milwaukee, WI
Lead lab sections for undergraduate class and assist with class presentations and activities. Help read and grade, quizzes, tests, and final papers. Maintained and submit grading records and provided constructive and evaluative feedback for graded assignments. Provided academic assistance and supports to students.
Supervisor: Jeffery Tiger, Ph.D.

Fall 2015

Teacher's Assistant and Lab Leader, Applied Behavior Analysis, University of Wisconsin-Milwaukee, WI
Lead lab sections for an online undergraduate class and assist with class activities and facilitated online discussion posts. Help read and grade weekly lab assignments and final papers. Maintained and submit grading records and provided constructive and evaluative feedback for graded assignments. Provided academic assistance and supports to students.
Supervisor: Jeffery Tiger, Ph.D.

Fall 2014

Teacher's Assistant, Introduction to Psychology, University of Wisconsin-Milwaukee, WI
Assist with online correspondence and assistance in an online U-Pace undergraduate class. Maintained and submit grading records and provided positive, evaluative, weekly feedback to each student regarding their progress in the course.
Supervisor: Raymond Fleming, Ph. D.

Fall 2013, Spring 2014

Teacher's Assistant and Discussion Leader, Educational Issues and Problems, University of Oregon, Eugene, OR

Lead discussion sections for an introductory undergraduate class and assist with class presentations and activities. Help read and grade, papers and exams. Maintained and submit grading records and provided constructive and evaluative feedback for graded assignments. Provided academic assistance and supports to students.

Supervisor: CHiXapkaid Pavel, Ph.D.

Spring 2007, Fall 2007

Teacher's Assistant, Psychology Statistic Course, University of Massachusetts, Amherst, MA

Assisted in teaching a weekly computer lab class and provided additional tutoring to students in need of help outside of class. Corrected homework assignments, weekly quizzes, learning portfolios, and exams.

Supervisor: Marian L MacDonald, Ph.D.

PEER REVIEWED PUBLICATIONS

LeBlanc, B., Kodak, T., Cariveau, T., & Campbell, V. A comparison of computer-assisted and therapist-led instruction for children with autism spectrum disorders. Accepted for publication in *Behavioral Interventions*.

Kodak, T., Cariveau, T., **LeBlanc, B.,** Mahon, J., & Carroll, R. Selection and implementation of skill acquisition programs by special education teachers and staff for students with autism spectrum disorder. Accepted for publication in *Behavior Modification.*

Bergmann, S., Kodak, T., & **LeBlanc, B**. Effects of programmed errors of omission and commission during auditory-visual conditional discrimination with typically developing children. Accepted for publication in *The Psychological Record.*

Haq, S., Zemantic, P., Kodak, T., **LeBlanc, B**., & Ruppert, T. Examination of variables impacting the efficacy of instructive feedback. Accepted for publication in *Behavioral Interventions*.

Kodak, T., Campbell, V., Bergmann, S., **LeBlanc, B.**, Kurtz-Nelson, E., Cariveau, T., Haq, S., Zemantic, P., & Mahon, J. (2016). Examination of efficacious, efficient, and socially valid error-correction procedures to teach sight words and prepositions for children with autism spectrum disorder. *Journal of Applied Behavior Analysis*, 49, 1-16. doi: 10.1002/jaba.310

Kodak, T., Clements, A., Paden, A. R., **LeBlanc, B.,** Mintz, J., & Toussaint, K. A. (2014). Examination of the relation between an assessment of skills and performance on auditory–visual conditional discriminations for children with autism spectrum disorder. *Journal of Applied Behavior Analysis*, 48, 1-19. doi: 10.1002/jaba.160.

Kodak, T., Clements, A., & **LeBlanc, B**. (2013). A rapid assessment of instructional strategies to teach auditory-visual conditional discriminations to children with autism. *Research in Autism Spectrum Disorders*, *7*(6), 801-807.

BOOK CHAPTERS

Kodak, T., & **LeBlanc, B.** (in press). Early childhood interventions. In K, Allison, J. Binder, L. Feliciano, E. Flannery-Schroeder, D. Friedman-Wheeler, D. Haaga, R. Heimberg, E. Jeglic, & N. Stolar (Eds). *The SAGE Encyclopedia of Abnormal and Child Psychology*. SAGE publishing.

PROFESSIONAL PRESENTATIONS

LeBlanc, B., Kodak, T., Bergmann, S., Zettel, S., Benitez, B., Knutson, S., & Shannon-Jackson, A. *Using Video Modeling to Teach Patents to use the Natural Language Paradigm.* Symposium conducted at the meeting of the Association for Behavior Analysis International, Chicago, IL (2016, May), and at the Berkshire Association of Behavior Analysis and Therapy conference, Amherst, MA (2016, October).

LeBlanc, B., Kodak, K., Bergmann, S., Zettel, S., & Benitez, B. (2015, October). *Teaching Parents to use the Natural Language Paradigm with Video Modeling.* Poster presented at the meeting of the Mid-American Association of Behavior Analysis.

LeBlanc, B., Kodak, T., Moberg, S., Kammer, J., Haq, S., & Zemantic, P. (2015, May). *Comparing the Effects of Errors of Commission and Omission on Skill Acquisition.* Symposium conducted at the meeting of the Association for Behavior Analysis International, San Antonio, TX.

LeBlanc, B., Campbell, V., Kodak, T., Cariveau, T., & Kurtz-Nelson, E. *Comparing the Efficiency of Error Correction Procedures and Children's Preference for a Particular Procedure.* Poster presented at the meeting of the Heartland Association of Behavior Analysis, Omaha, NE (2015, Mar.), the meeting of the Associate of Professional Behavior Analysts, Seattle, WA (2015, Mar.), and the meeting of the Minnesota Northland Association for Behavior Analysis (2015, Sep.).

LeBlanc, B., & Kodak, T. (2014, October). *Using Video Modeling to Teach Parents to Use the Natural Language Paradigm.* Presentation conducted at the Behavior Analysis Colloquium Series at the University of Wisconsin-Milwaukee.

LeBlanc, B., Kodak, T., Campbell, V., Cariveau, T., Schultz, S., & Bailey, A. (2014, May). *A Comparison of Computer-assisted and Person-based Tact Training for Children with Autism*. Symposium conducted at the meeting of the Association for Behavior Analysis International, Chicago, IL.

LeBlanc, B., Kodak, T., Campbell, V., Cariveau, T., Schultz, S., & Bailey, A. *Computer Assisted Instruction for Children Diagnosed with Autism*. Poster session presented at the University of Oregon 2013 Graduate Student Research Forum, Eugene, OR (2013, May). Also presented at the meeting of the Autism Association for Behavior Analysis International, Portland, OR (2013, Jan.).

SERVICE ACTIVITIES AND OFFICER POSITIONS

Treasurer, UWM, Association of Students in Behavior Analysis, *April 2016-May 2017*

Secretary, UWM, Association of Graduate Students in Psychology, *September 2015-May 2016*
Student Representative, ABAI Verbal Behavior Special Interest Group, *May 2013-May 2016*

Candidate's Day, UWM, Experimental Psychology Behavior Analysis, Student coordinator of interview day, *February 2015, February 2016*

Undergraduate Outreach Liaison, UO, School Psychology Program, *September 2013-June 2014*
Cohort Representative, UO, School Psychology Program, *September 2012-June 2013*