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Evaluating the Effects of Multiple Exemplar Training on Mand-to-Tact Transfer in Children with Autism

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Evaluating the Effects of Multiple Exemplar Training on Mand-to-Tact Transfer in Children with Autism

by

Santiira Michelle Williams

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

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Abstract

Children with an Autism Spectrum Disorder (ASD) often require direct instruction to acquire communication skills and such skills are targeted in intensive communication training programs using the principles of applied behavior analysis (e.g., Peters-Scheffer et al., 2010). Because such intensive training programs can be costly and time consuming (National Conference of State Legislatures, 2017), any research on collateral effects of communication training can be beneficial. Mands and tacts are among the verbal operants targeted in communication training and research surrounding the functional independence of mands and tacts has yielded mixed results (e.g., Twyman, 1996; Petursdottir et al., 2005). The current study evaluated whether multiple exemplar training could assist in independent transfer from mands to tacts in children with an ASD, and the number of exemplars needed for independent transfer to occur was also examined. This study included two participants. For one participant, transfer from mand-to-tact occurred after two mands and tacts were directly trained. For the second participant, transfer from mand-to-tact occurred after two mands and one tact were directly trained.
Evaluating the effects of Multiple Exemplar training on Mand-to-Tact transfer in children with Autism

Children with an Autism Spectrum Disorder (ASD) display deficits in social and communication skills (American Psychiatric Association, 2013). To address such deficits, an emphasis on teaching communication skills using the principles of applied behavior analysis is recommended (Eldevik et al., 2009; Peters-Scheffer et al., 2011). When using applied behavior analysis to teach communication skills, communication training is usually based on Skinner’s 1957 analysis of verbal behavior and consists of teaching tacting (labeling), intraverbal (conversation), echoic (vocal imitation), listener behavior (receptive), and manding (requesting) skills. Although all of these verbal operants are acquired with ease by typically developing children, children with an ASD often require intensive training to acquire these repertoires (Fenske et al., 1985; Harris & Handleman, 2000). Intensive interventions may be time consuming and costly as the rate of skill acquisition can vary by learners (Centers for Disease Control and Prevention, date). Thus, research on interventions that maximize skill acquisition is warranted.

Two of the verbal operants that are often the focus of intensive language training programs are the mand and tact. The mand, according to Skinner (1957), is defined as a verbal operant in which the response is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation or aversive stimulation. The
tact, on the other hand, is a verbal operant in which a response of given form is evoked by a particular object or event, or property of an object or event (Skinner, 1957). In other words, mands are responses controlled by what is wanted at the present time, and tacts are responses controlled by nonverbal stimuli and results in conditioned generalized reinforcement such as “that’s right”, or “good job”.

Programs focusing on the acquisition of communication skills usually teach mands first as they are the only verbal operant that is said to directly benefit the learner and allows the learner to have some control over their environment (Sundberg & Michael, 2001). Another potential benefit of teaching mands is a potential reduction of problem behavior that has a communicative purpose (i.e., functional communication training; Carr & Durand, 1985). Effective instructional procedures for teaching mands include incidental teaching and choice making (Shafer, 1994), discrete trial instruction (DTI; Jennett et al., 2008), video modeling and in-vivo training (Plavnick & Vitale, 2016), and/or the interrupted behavior chain procedure (Albert et al., 2012). In addition, children with an ASD have learned to mand using various modes of communication such as the picture exchange communication system (PECS; Charlop-Christy et al., 2002), manual signs (Carbone et al., 2010), speech generating devices (SGD; van der Meer et al., 2011), and vocal behavior or speech (Drash & High, 1999; Lee et al., 2014). In addition, a variety of assessments are currently available to help select a communication modality that is the most appropriate for each child (Ringdahl et al., 2009).

Tact training is also often incorporated into an intensive language training program as having a tact repertoire serves as the basis for acquisition of more complex communication skills (Sundberg & Partington, 1998). For example, a tact of an item in the environment (i.e., a dog), may lead to a verbal interaction between the child and another person, and this interaction could
expose the child to additional verbal behavior, as well as to generalized reinforcement, which in turn will make verbal behavior more likely to occur again. Tact training may be completed using various instructional methods such as transfer procedures (e.g., Barbera & Kubina, 2005), massed trial instruction (e.g., Majdalany et al., 2014), and task interspersal (e.g., Majdalany et al., 2014) and these methods have been used within discrete trial training (DTT; Smith, 2001) and natural environment teaching (NET; e.g., Salmon et al., 1986). In addition, tacts may be taught in a variety of communication modalities, such as vocals (Marchese et al., 2012), signs (e.g., Valentino & Shillingsburg, 2011), or speech generating devices (e.g., Kagohara et al., 2012), and instruction may be completed with various stimulus modes including picture cards (Salmon et al., 1986), 3D objects (Salmon et al., 1986), and videos (Cuvo & Klatt, 1992).

Although mands and tacts can be similar in response form, Skinner proposed that all verbal operants are functionally independent regardless of their similarities (Skinner, 1957). Thus, if a child learns to mand for chips there is no guarantee that the child will tact chips, and vice versa, without additional instruction. Some studies have investigated the functional independence of mands and tacts (e.g., Lamarre & Holland, 1985; Hall & Sundberg, 1987; Sigafoos et al., 1989; Twyman, 1996), and their results support Skinner’s analysis. For instance, in Lamarre and Holland (1985) half of the participants, who were children with no known developmental delays, were first taught to mand for experimenters to place small objects in preferred placements using prepositional phrases (i.e., on the left or the right) while the other half of the participants were first taught to tact the preferred placements using the same prepositional phrases. In a similar study, Hall and Sundberg (1987) taught two individuals to tact items needed to complete behavior chains that lead to access to reinforcers. Then the authors assessed whether the participants could mand for these missing items. Sigafoos et al. (1989) taught three adults...
with Down syndrome to tact utensils using corresponding tact symbols, and spontaneous mand emergence was tested. Finally, Twyman (1996) taught two preschoolers to mand for an item needed to complete a preferred task and two other preschoolers to tact items needed to complete a preferred task. In addition, all participants were required to specify the item’s abstract property. In all of these studies, acquisition of one operant did not result in emergence (i.e., transfer) of the untrained operant for any of the participants.

Although the previously cited studies supported Skinner’s claims that all verbal operants are functionally independent, some research examining mand-to-tact and tact-to-mand transfer suggest that operants may emerge without additional training (e.g., Sigafoos et al., 1990; Petursdottir et al., 2005). For instance, Sigafoos et al. (1990), taught two adults with a diagnosis of Down syndrome and severe mental retardation to tact utensils by pointing to a corresponding line drawing. In this study two of the three mands emerged without direct training of those mands for both learners. Petursdottir et al. (2005) replicated the procedures employed by Lamarre and Holland (1985) with five children with no known developmental delays. Four of the five children were taught to first tact the pieces necessary to assembly one task, while transfer to mand was later tested, and then to mand for the pieces necessary to assembly a second task, while transfer to tact was later tested, and the fifth participant received only tact training for the pieces of only one task, and transfer to mand was then tested. They found that all four of the participants who received both tact and mand training were able to tact missing pieces reliably after mand training, but emergence of mands after tact training was less consistent as two of the four participants failed to emit any mands after tact training, and the fifth participant also didn’t acquire mands after tact training. Results from these studies combined suggest that verbal operants may, at least in some cases, be acquired without direct training.
Previous studies have also been conducted investigating variables that might impact transfer across operants (e.g., Wallace et al., 2006; Pino et al., 2010; Kooistra et al., 2012). Wallace et al., (2006) taught three adults with mental retardation to tact high and low preferred items, as identified in a preference assessment. In this study, following tact training, all participants manded for the highly preferred item without direct mand training but did not consistently mand for the non-preferred items. In a similar study, Pino et al. (2010) taught six typically developing children to either mand or tact preferred and non-preferred items. In addition, this study investigated whether the sequence of training (i.e., tact first, mand first) had an impact on the emergence of the untrained operants. Results of this study showed that all participants learned to mand for both highly preferred and low preferred items in a rapid manner but acquired tacts in a slower fashion and that the mand-first training sequence was the most effective in facilitating transfer between the operants. More recently, Kooistra et al., (2012) examined the effects of motivating operations on tact-to-mand transfer. They taught two children with an ASD to first tact a high preferred edible and tested emergence of mands under both periods of deprivation (i.e., at least 24 hrs without access to the edible), and satiation (i.e., pre-session exposure to the high preferred edible. They found that both children only manded for the highly preferred edible when access to that item was restricted. Results of these studies combined suggest that the strength of a reinforcer, preference, and motivating operations can all impact mand-to-tact and tact-to-mand transfer. Finally, in a review of the literature on tact-to-mand and mand-to-tact transfer, Gamba et al. (2015) investigated the conditions under which these have been demonstrated. They reviewed 17 studies, and although some of the studies had problems with construct validity (e.g., overly strict definitions of correct response definitions, the use of blocked-response procedures, and/or the inclusion of vocal prompts such as “what do you
want?” and “what is it?” during probes), and results were mixed, the authors concluded that tact-to-mand transfer is more likely to occur when the item to be manded for is present during mand probes, and that mand-to-tact transfer is also most likely to occur when the item to be manded for is present during mand training and if an EO for the item to be tacted is present during tact probes.

One procedure that has been recommended for promoting generalization is multiple exemplar training (Stokes & Baer, 1977). It involves teaching skills (i.e., to tact “cat”) using multiple stimuli of the target response (i.e., pictures of various types of cats), in different settings, and across different people. Various skills (i.e., sharing; Marzullo-Kerth et al., 2011; and empathy skills; Sivaraman, 2017) have been taught to individuals with an ASD using multiple exemplar training and in each of these studies, mastered skills generalized to untrained stimuli. Although most of the studies that have examined mand-to-tact transfer have trained multiple mands before testing for tact emergence (e.g., Petursdottir et al., 2005; Pino et al., 2010), to date limited research has examined the effects of multiple exemplar training on mand-to-tact-transfer and the number of exemplars needed for tacts to emerge without direct training. One exception is a thesis completed by Shea (2013, unpublished thesis). She taught three children with speech, language and receptive and expressive skills delays to tact preferred edibles and then tested whether the children could mand for these items without direct training. To determine the number of exemplars required, test for emergence of mands was completed after each tact met mastery criterion. If mands were not acquired, then mand training was completed, and the sequence was repeated. In this study, all participants acquired mands, without direct training, after only one tact was trained and mastered. That is, only one exemplar was necessary.
In summary, teaching children with an ASD to mand and tact is imperative as having strong mand and tact repertoires will allow them to better control their environments. That is, they will be able to express their wants and needs, acquire more complete verbal skills, participate in verbal interactions, and thus contact reinforcement. Although beneficial, such training may be costly and time consuming. With regards to mand-to-tact transfer, previous research suggests that tacts may be acquired without direct training, which can reduce the time and resources needed during intensive training. To further explore interventions that maximize skill acquisition by possibly reducing resources necessary when teaching communication skills to children with an ASD, and to extend literature on mand-to-tact transfer as a result of multiple exemplar training, the purpose of this study was to examine the number of trained exemplars needed for mands to transfer to tacts for individuals with an ASD.
Method

Participants and Settings

Two children with ASD participated in this study. Participants were recruited via flyers that were posted at an ABA therapy clinic. Katie was 7 years old and attended ABA therapy at a local ABA clinic for approximately 10 hr a week. Prior to this study Katie had recently transitioned from using a picture exchange communication system (PECS; Bondy, & Frost, 1994) to communicating using vocalizations that consisted of single words or an approximation to a word (e.g., saying “poh-e” for potty). Samantha was 6 years old and attended ABA therapy at a local ABA clinic for approximately 15 hr per week. Samantha also communicated using single words or approximations of words. Although both participants communicated using vocalizations, they often required prompts to make requests. Both participants’ skills repertoires were assessed using the Verbal Behavior Milestone Assessment and Placement Program (VB-MAPP; Sundberg, 2008), subsection of mands and tacts of Level 1. Both participants scored 1 point in both the mand and tact subsections indicating that they emitted at least two mands and tacts with echoic prompts. Participants’ skills were also assessed using the Early Echoic Skills Assessment (EESA; Esch, 2008). Katie scored 64 out of 100 points on this assessment whereas Samantha scored 73 points. Their scores on the EESA indicate that they can echo at least 60 1-2 syllable words and phrases. All sessions were conducted in a room at the clinic where the participants received ABA therapy services.
Materials

Preferred edibles, as determined by a preference assessment, were used during mand probes and mand training, and picture cards displaying pictures of the preferred edibles, and a token board with tokens were used during tact probes and tact training. Picture cards were used during tact probes and tact training to decrease the possibility of any correct responses being a result of directly trained mands (e.g., if establishing operations for the edibles were present during tact probes and tact training, the sight of the 3D edible may have evoked a correct response). For Katie, 6.5 cm by 8 cm cards were used and they displayed pictures of the actual preferred edibles (e.g., a picture of a gummy); for Samantha, 7 cm by 8 cm cards were used and they displayed pictures of the preferred edibles in their packaging (e.g., a picture of a bag of bugles was used versus a picture of an actual bugle). This was done to minimize the likelihood of Samantha tacting the shape of the target stimuli (e.g., Samantha saying “cone” when asked to tact bugle). Data sheets and writing utensils were used to collect data, and a video camera was used to record sessions to collect interobserver agreement (IOA) data and to assess procedural integrity (PI).

Target Responses and Data Collection

During the EESA, the dependent measure was *echoic* behavior and was defined as the participant emitting a response that has point-to-point correspondence to the modeled sound emitted by the PI within 5 s of the presentation of the model sound. During the EESA, one point was given if the emitted response had point-to-point correspondence to the modeled sound, a half point was given if the emitted response had partial point-to-point correspondence with the modeled sound, and 0 points were given if no response was emitted or if a response with no point-to-point correspondence was emitted. Results of the EESA was summarized by calculating
the total number of points received in the assessment (see Appendix B). During all preference assessments, item selection was the dependent measure and was defined as any instance in which the participant points to, touches, or grabs an item presented in the array within 5 s of the onset of the trial. The percentage of trials in which each item is selected was calculated by dividing the number of trials in which the item was selected by the number of trials in which the item was presented and then multiplying by 100 (see Appendix C).

The primary dependent measures for mand and tact selection, mand and tact probes, and mand and tact training sessions was independent mands and independent tacts. A mand was defined as the participant emitting a vocal response for a preferred edible when an establishing operation (EO) for that edible was present. Establishing operations were assessed by observing the behavior of the participant. If the participant attempted to retrieve the edible by extending her arm towards the PI, it was assumed that the participant had an EO for that edible. Caregivers of the participants were also encouraged to withhold the edibles selected for training outside of research sessions so that the participants were more likely to be motivated for the edibles during sessions. When conducting mand selection sessions, mand probes and mand training, a response was counted as independent if the participant requested the edible without requiring a prompt from the PI within 5 s of an EO being present. A response was counted as prompted if a vocal prompt was required, and errors were counted if the participant emitted a response, with or without prompts, that did not correspond to the target mand.

A tact was defined as the participant emitting a vocal response that corresponded to the stimulus displayed in the picture card shown. During mand and tact baseline sessions, tact training and tact probes, a vocal discriminative stimulus’ (SDs) was presented concurrently with the picture card of the target stimulus. Vocal discriminative stimulus’ (SDs) were varied during
sessions and included “What is it?”, “tell me what you see,” or “what is this?” A response was scored as independent if the participant emitted a vocal response without requiring a prompt from the PI within 5 s of the presentation of the SD, whereas a response was scored as prompted if the participant emitted the response after the PI delivered a prompt. Errors were scored if the participant emitted a response, with or without prompts that did not correspond to the target tact.

During mand and tact selection sessions, mand and tact baseline sessions, mand and tact training sessions, and mand and tact probe sessions, data were collected on a trial-by-trial basis. Mand and tact selection sessions consisted of nine trials, mand and tact baseline sessions consisted of 20 trials, and mand and tact training sessions consisted of 10 trials. However, during mand and tact training sessions fewer trials were completed if the participant met criterion to move back to a more restricted prompt. Finally, mand probe sessions consisted of three trials, and tact probe sessions consisted of 10 trials. Fewer trials were completed during mand probes because these probes were meant to efficiently assess for maintenance of mands following acquisition of tacts. These data were summarized as the percentage of independent responses (mands or tacts) during each session. This was calculated by dividing the number of independent responses (mands or tacts) by the number of trials, multiplied by 100 (see appendices E, F, G, H, I, J, and K). A research assistant assisted the PI with data collection. They received training on dependent measures and procedures for data collection from the PI and practiced scoring sample videos. Training was completed when they achieved 90% agreement with the PI on two consecutive sample videos.
Interobserver Agreement (IOA) and Procedural Integrity (PI)

To collect data for calculating IOA and measuring PI, a researcher assistant independently scored video recordings of at least 33% of sessions across participants and all assessments and phases including preference assessments, token assessment, token training, mand and tact selection sessions, mand and tact baseline sessions, mand and tact training sessions, and mand and tact probes. IOA scores for the preference assessments, mand and tact selection sessions, mand and tact baseline sessions, mand and tact training sessions, and mand and tact probes were calculated using trial-by-trial agreement. That is, we divided the number of trials with agreement by the number of trials in that session and multiplied by 100. For token assessment and token training sessions IOA the smaller count in a session was divided by the larger count and multiplied by 100. TI was assessed and IOA was calculated for 50% of preference assessment sessions, 42% of token assessment and token training sessions, 50% of mand and tact selection sessions, 48% of mand and tact baseline sessions, 37% of mand training sessions, 41% of tact training sessions, 45% of mand maintenance probe sessions, and 40% of tact generalization probe sessions. The mean IOA for both participants was 100% for the preference assessments, 86% for token assessment and token training (range, 0-100%), 96% for mand and tact selection sessions (range, 50-100%), 97% for mand training sessions (range, 75-100%), 97% for tact training sessions (range, 80-100%), and 100% for both mand maintenance probe sessions and tact generalization probe sessions.

Treatment integrity was assessed using a task analysis that described the procedures for each of the assessments and phases (see Appendices C, D, E, F, G, H, I, J, and K). Treatment integrity scores were calculated by dividing the number of steps completed correctly by the
number of steps in the task analysis and then multiplied by 100. Mean TI for both participants was 100% for preference assessments, 99% for token assessments and token training (range, 96-100%), 100% for mand and tact selection sessions, 98% for mand and tact baseline sessions (range 90-100%), 100% for mand training sessions, 100% for tact training sessions, 100% for mand maintenance probes, and 100% for tact generalization probes.

**Experimental Design**

A concurrent multiple probe design across behavior was used to assess the number of exemplars needed for tacts to emerge after mand training was completed with each participant. Preferred edibles were identified for each participant, and target mands and tacts were selected based on the participants’ repertoires. Baseline on the participant’s manding and tacting repertoires for those preferred items were assessed. Then mand training was completed and once mastery was met, the PI assessed for acquisition of tacts. If tacts were not acquired as a result of mand training, then tact training was completed.
**General Procedure**

To identify appropriate participants and preferred items to be used during mand training this study included a caregiver questionnaire (see below), an echoic assessment (EESA; Esch, 2008), an assessment of the mand and tact domains of the VB-MAPP (Sundberg, 2008), preference assessments, and token training. Appropriate target responses for each participant during the mand and tact target selection sessions were identified. Finally, mand training sessions, tact training sessions (if necessary), and mand and tact probes were completed to determine the number of mand training exemplars required for tacts to emerge without direct training.

**Participant Screening and Caregiver Questionnaire**

To determine participants’ eligibility to participate in this study, caregivers completed a participant screening and caregiver questionnaire. Parental consent was attained, and caregivers were interviewed using a subset of the Reinforcer Assessment for Individuals with Severe Disability (RAISD; Fisher et al., 1996) to identify a list of potentially preferred edibles to be included in the preference assessments (see Appendix A, parts 1 and 2). Assent from each participant was waived due to the limited verbal repertoire of the participants.

**Early Echoic Skills Assessment (EESA; Esch, 2008)**

The EESA was conducted with each participant. During the EESA, the participant was seated a table and was asked by the PI to repeat each item on the EESA (See Appendix B). The
participants had three opportunities to emit a correct response for each item, and the best response was scored. Participants that scored at least 20 points on the EESA were eligible for inclusion in this study.

**VB-MAPP Assessment (Sundberg, 2008)**

An assessment of the mand and tact domains of level 1 of the VB-MAPP was completed with each participant. Only participants that could emit at least two mands and two tacts with echoic prompts but had not yet mastered the level 1 mand and tacts domains of the VB-MAPP were eligible for inclusion in this study.

**Preference Assessments**

Preference assessments were conducted with each participant to identify preferred edibles for mand training and continued until 3-5 preferred items were identified. Two preference assessments were conducted for each participant. Items selected on at least 75% of trials were considered preferred and were used during mand training. The type of preference assessment conducted for both participants was a paired-stimulus preference assessment (PS, Fisher et al., 1992).

During the PS preference assessments, two edibles were presented in front of the participant and the participant was asked to choose one. Once the participant selected an edible, the other edible was removed immediately. The participant was allowed to consume the selected edible. Each edible was presented until it had been paired with every other edible twice, with the edible placement being counterbalanced each trial (See Appendix C).

**Token Assessment and Token Training**

For both participants, we first assessed if tokens functioned as conditioned reinforcers. To do this we compared participants’ responding during two conditions, one in which responding
resulted in access to tokens (token sessions) and another in which responding resulted in no consequences (baseline sessions). During the token assessment both baseline and token sessions were 3 min. However, if 1 min elapsed without responding, the session was discontinued. In addition, at least three sessions of each condition were completed. The target response for both participants during token assessment sessions was target touching (e.g., touching/tapping a circle taped to a table). An alternating treatments design was used during the token assessments. For Katie, responding during the token assessment indicated that tokens functioned as conditioned reinforcers, as responding during the token sessions was higher than in baseline sessions (see Figure 2). For Samantha, responding during the token assessment indicated that tokens did not function as conditioned reinforcers as responding during the token sessions was lower than in baseline sessions (see Figure 2). Therefore, Samantha participated in token training to condition tokens as reinforcers (see Figure 2).

Token training consisted of several pairings of tokens with preferred items. During token training the token production schedule (i.e., responses required to receive a token) and token exchange schedules (i.e., number of tokens required to access back reinforcer) was successively increased. For Samantha the target free operant response during token training was target touching (e.g., touching/tapping a circle taped to a table) and the tokens consisted of stars that were placed on a small board (i.e., star chart). During the first phase of token training, each response resulted in access to a token (FR1 production). The token was placed on a token board and immediately exchanged for a backup reinforcer (FR1 exchange). During token training backup reinforcers included a small piece of a veggie straw and access to an iPad (10-15 sec). During phases 2-5, responses continued to be reinforced on a FR1 schedule but tokens were exchanged on a FR2, FR3, FR4, or FR5 schedule. Each session of token training was 3 min and
as least three sessions were completed per phase. Token training continued until Samantha was emitting single responses (i.e., FR1) prior to receiving a token and earning multiple tokens (i.e., FR5) prior to trading them in for a back-up reinforcer (See Appendix D).

**Selection of Appropriate Target Vocalizations**

Given that both participants often used approximations to words when communicating, prior to beginning mand and tact training we completed an additional echoic assessment to identify appropriate vocal responses for each participant and to ensure that we equated the target vocalizations across stimuli. During this assessment participants were instructed to imitate the tact of each potential target (e.g., “Say gummy”), and various approximations to or partial tacts for potential target (e.g., “Say gum,” for gummy). Each tact or approximation was presented to the participant three times and their verbatim response was recorded. Vocalizations that the participant imitated on 100% (3/3) of trials were selected as the target vocalizations for training. For Katie, “kuh” (for cheez-it), “gum” (for gummy), and “mihk” (for peppermint), were the vocalizations selected for mand and tact training. Thus, for Katie all target vocalizations consisted of 1-syllable words. For Samantha, “cheez-uh” (for cheez-it), ‘bugle” (for bugle), and “teh-e” (for teddy graham) were the vocalizations selected for mand and tact training. Thus, for Samantha all target vocalizations consisted of 2-syllable words.

**Mand and Tact Selection**

Once an array of preferred edibles and appropriate target vocal responses (mands and tacts for each of the preferred items) was identified for each participant, mand and tact selection sessions were conducted to assess the participants’ current mand and tacting repertoire for those items. Two mand and tact selection sessions were completed for both Katie and Samantha. For Katie, the items included in these assessments were peppermints, gummies, and cheez-its; for
Samantha the assessments were completed with bugles, cheez-its, and teddy grahams. During each of these sessions, each target response was assessed across three trials and each session consisted of three stimuli, presented in a random order, for a total of nine trials per session. During these sessions, no prompts were provided for the participant’s response, however, preferred items (other than the target items) were delivered for appropriate session behavior every 2-3 trials to minimize the likelihood of problem behavior. If the participant did not emit an independent mand or tact for the item during any trials, that item was selected for mand and tact training. Neither Katie nor Samantha emitted any independent mands or tacts during these sessions (see Table 1); therefore, all items used in these sessions were selected for training.

**Mand Selection Trials**

During mand selection trials the participants were seated at a table across from or next to the PI. The PI gave the participant a small piece of an edible to consume. If the participant emitted an independent mand within 5 s of an EO being present (i.e., reaching towards the item) the PI gave the participant access to a small amount of the requested edible. If the participant did not emit an independent mand or emitted an incorrect mand within 5 s of an EO being present, no consequences were provided and another trial with a different edible commenced. This process was continued until at least three edibles were selected for mand training. If the participant failed to emit any responses, whether they were correct or incorrect, during the mand selection trials without a vocal SD, a vocal SD such as “what do you want?” was included to assess if a vocal SD was necessary to evoke a correct response. The SD “What do you want?” did not occasion a correct response for either participant and therefore was not used during the study.

**Tact Selection Trials**
During tact selection sessions, the participants were seated at a table across from or next to the PI. Prior to presenting any picture cards or SDs, the PI ensured that the participants were attending by having the participants do a ready response such as touching or pointing to the picture or folding hands. Once the participants were attending, the PI held up a picture card with an image of the edible in front of the participants and presented a vocal SD (“What is it?”, “tell me what you see?”, or “what is this?”). The experimenter alternated between various vocal SDs to attempt to foster generalization as caregivers and others in participant’s environment are likely to use various vocal stimuli. If the participant emitted an independent response, praise (e.g., good job) was delivered. If the participant did not emit an independent response or emitted an incorrect response within 5s of the SD being presented, the picture card was removed, no prompts were provided, no feedback was given, and another trial for a different picture commenced. This process continued until at least three items were selected for tact training.

**Mand and Tact Baseline Probes**

At least three mand and tact probes for each target edible were conducted during the baseline phase prior to beginning mand training. The order in which mand training for each of the selected edibles were completed was determined in a random manner. In addition, mand and tact probes during the baseline phase for each target edible were alternated so that consecutive baseline sessions for the same verbal operant weren’t conducted. Procedures for mand and tact probes during the baseline phase were similar to those described for the mand and tact selection sessions except that each mand and tact probe during the baseline phase consisted of 10 trials of one target response (i.e., cookie), and no consequence was delivered for correct responding. If independent responding remained at 20% or less of the trials across the three consecutive
sessions, training began. If independent responding was above 20% of the trials, new mands/tacts were identified.

**Mand Training**

Mand training sessions were similar to mand selection trials and mand probes during the baseline phase, however mand training sessions included prompts as needed, access to the preferred item, and an error correction procedure when necessary. At the beginning of each trial, the target edible was shown to the participants. A four-step prompting procedure was used during mand training. During step one of mand training, a full vocal prompt was delivered immediately after the onset of the EO (i.e., reaching for the edible) for the target item. That is, after a 0 s delay. During step two, a full vocal prompt was delivered 2 s after the onset of the EO. During step three, a partial vocal prompt was delivered 2 s after the onset of the EO. During step four, no prompts were delivered. All independent and prompted mands resulted in praise (i.e., “that’s right”) and access to the specified items. Errors resulted in an error correction procedure consisting of the PI showing the target edible and presenting the instruction for the participant to repeat the target word/sound two consecutive times. Compliance with the error correction procedure resulted in neutral praise. Then the next trial of mand training commenced. The criterion to advance to the next prompting step was at least 80% correct responding (independent responses and prompted responses) and no more than two errors during the session. If the participant made three errors in a session, the session was discontinued and a new mand training session began at the previous, more intrusive, step. Mand training continued until mastery criterion was met. For Katie, the mastery criterion was at least 90% independent correct responding across three consecutive sessions. For Samantha, the mastery criterion was 100% independent correct responding across two consecutive sessions. This mastery criterion for
Samantha was chosen as Samantha would typically require a prompt on the initial trial of session and thus it appeared that she was not maintaining the skill between sessions.

**Tact Generalization Probes and Tact Training**

Once the target mand was mastered, at least two tact generalization probes were conducted, on the day that the target mand was mastered, to assess whether the participants could tact the edible that was included in mand training. Tact generalization probe procedures were similar to tact baseline sessions except they consisted of 10 trials. During the probes praise was delivered for independent responding, and access to preferred items (other than those selected for training) was delivered every two to three trials to decrease the likelihood of problem behavior occurring. If the participant did not independently tact on at least 90% of the trials of the tact generalization probe, then tact training commenced. The procedures for tact training were similar to tact baseline sessions, however consequences for correct responding, prompting and an error correction procedure were included. Contingent on independent and correct prompted responses, tokens were delivered on a fixed-ratio 1 schedule of reinforcement and were exchanged on a fixed-ratio 5 schedule for backup reinforcers (the same as in token training.) The prompting procedures and error correction procedures used in tact training were identical to those in the mand training sessions. Tact training sessions continued until the mastery criterion was met. The same mastery criterion used in mand training for both participants was used for tact training except that for Samantha, the mastery criterion for tact training was at least 90% independent responding for three consecutive sessions.

**Mand Maintenance Probes**

Mand maintenance probes were completed during tact training sessions to assess for maintenance of mands. Mand maintenance probes were similar to mand probes during baseline.
However, instead of 10 trials per session, only three trials per session were conducted to increase efficiency, and independent and prompted responses resulted in access to the specified edibles. The same error correction procedure used during mand training was used during mand maintenance probes, and the step 3 prompting procedure used during mand training was used during mand maintenance probes. Only Samantha required prompts and error correction during these mand generalization probes.

**Social Validity**

After the study was complete, a social validity questionnaire was given to the caregivers of each participant (See Appendix L) to assess their opinions about the procedures used in this study, and if they were satisfied with the outcomes of this study. Most of the questions in the questionnaire were answered using a 5-point Likert scale, but open-ended questions were also included in the questionnaire. The questionnaires were sent home with caregivers with a self-addressed and stamped envelope. Caregivers were instructed to complete the questionnaire, place the completed questionnaire without their names in the envelope, seal the envelope, and return the questionnaire to the PI either in person or via mail.
Results

Results for Katie and Samantha are presented in Figures 1-4 and tables 1-2. Results of the edible preference assessments are shown in Figure 1 and indicate that for Katie, peppermints, cheez-its, and gummies were highly preferred edibles and that for Samantha, cheez-its, bugles, and teddy graham were highly preferred edibles as they were chosen in at least 75% of trials. Results from the token assessment and token training are shown in Figure 2. Table 1 shows the percentage of independent mands and tacts during mand and tact selection sessions. Both Katie and Samantha did not emit any correct responses thus these items were selected for training.

Figure 3 shows the percentage of independent correct mands and tacts during baseline, mand training, tact probes, tact training, and mand maintenance probes for Katie. She did not emit any independent mands or tacts during baseline sessions for all three target edibles, and received mand training for cheez-its (“kuh”) first. Mand training for cheez-it resulted in mand acquisition after four mand training sessions. Although Katie learned to mand for cheez-its, she did not tact cheez-its during tact probes. Therefore, tact training was completed for cheez-its. Katie learned to tact cheez-its after seven tact training sessions and mands for cheez-its maintained as shown in the mand maintenance probes completed post-tact training. Mand training for gummy (“gum”) began after Katie mastered the mand and tact for cheez-it. Katie mastered the mand for gummy after 10 mand training sessions. After completing mand training for gummy, tact probes for gummy were conducted and Katie did not emit any independent tacts;
thus, tact training for gummy was conducted. Katie mastered the tact for gummy after seven tact training sessions and mands for gummy persisted. Mand training for peppermint (“mihk”) began after independent mands and tacts for gummy occurred. Katie required five mand training sessions to master this mand. During the two tact probes completed she emitted independent tacts on 100% of the trials. That is, she acquired the tact for peppermint without requiring direct tact training for this item. Finally, during the mand maintenance probes for peppermint, mands for peppermint persisted.

Figure 4 shows the results for Samantha. She did not emit any independent mands or tacts for target edibles during baseline sessions and received mand training for cheez-its (chez-uh) first. Mand training for cheez-its resulted in mand acquisition after 12 mand training sessions. Although Samantha learned to mand for cheez-its, Samantha only emitted independent tacts for cheez-its during tact probes on 20% of tact probe sessions and therefore received tact training for cheez-its. Samantha independently emitted tacts for cheez-its after 15 tact training sessions. During mand maintenance probes for cheez-its, Samantha did not reliably emit independent mands for cheez-its, and therefore received additional mand training sessions for cheez-its. Samantha independently requested cheez-its on 0% of opportunities during the first session, on 67% of opportunities during the second session, and on 100% of opportunities during the third session. Mand training for bugle (bugle) began after independent mands and tacts for cheez-its occurred. Samantha required 69 mand training sessions to master this mand. The large number of mand training sessions required to master this mand was likely due to an extended time without conducting sessions (due to issues with the participant and PI’s schedule) denoted by an arrow on the graph. During tact generalization probes for bugle, Samantha independently emitted tacts for bugle. Therefore, tact training for bugle wasn’t necessary. During mand
maintenance probes for bugle, Samantha independently requested bugle on 100% of opportunities during the first session, and on 67% of opportunities during the second session.

Results of the social validity assessment completed with Katie’s caregiver is on Table 2. The scores from this assessment suggested that Katie’s caregiver found the procedures employed in this study to be acceptable and that the procedures led to an increase in Katie’s mands and tacts, and indicated that they were likely to use the procedures to teach her to additional mands and tacts and that they would recommend the procedures to other caregivers and children. Samantha’s caregiver did not return the questionnaire to the PI.
Discussion

This study evaluated whether multiple exemplar training would facilitate mand-to-tact transfer with children with an ASD. More specifically, this study sought to determine the number of exemplars (i.e., tacts) that required direct teaching prior to transfers occurring from mands to tacts. In this study, for one of the participants, direct teaching of mand and tact for two preferred edibles was necessary before transfer from mand-to-tact occurred for a third edible, and for the other participant, one preferred edible needed to be trained as a mand and as a tact before transfer from mand-to-tact occurred for a second edible. In other words, for one participant two exemplars needed to be trained as a mand and tact before mand-to-tact transfer occurred. For the other participant transfer occurred after one exemplar was directly trained as a mand and a tact. Therefore, results of this study indicate that multiple exemplar training may facilitate transfer across operants after one-two exemplars are trained, which can in turn decrease the amount of time and resources necessary when using intensive training to teach skills to children with an ASD.

Although multiple exemplar training is likely to promote generalization (Stokes & Baer, 1997), few studies have evaluated whether multiple exemplar training can facilitate transfer across verbal operants. In a thesis completed by Shea (2013) multiple exemplar training was used to teach three children with speech, language, and receptive and expressive skill delays to tact preferred edibles, and then later tact-to-mand transfer was tested. In that study all
participants acquired mands after receiving tact training and mand training for one exemplar (i.e., preferred edibles and/or drinks) without additional mand training. Thus, results of the current study are similar to those of Shea (2013) that showed that multiple exemplar training assisted in tact-to-mand transfer in children with various delays.

The results of this study are also similar to those of other studies that show that transfer can occur between mands and tacts without additional training (e.g., Sigafoos et al., 1990; Petursdottir et al., 2005). For instance, in Sigafoos et al. (1990) mands emerged without direct training for two of the three tacts. In that study, participants were taught to tact utensils that were used to access preferred food and drink items, as determined by preference assessments. The emergence of independent mands without direct training may have occurred as a result of participants getting access to preferred food and drink items. Petursdottir et al., (2005) taught participants to tact and mand for certain items needed in assembly activities (e.g., puzzles) and then tested for the emergence of the un-trained operant (mand or tact depending on the verbal operant that was directly taught for that item. In this study transfer occurred from tact-to-mand and mand-to-tact, however, mand-to-tact transfer was more consistent (i.e., all participants in this study reliably emitted independent tacts after receiving mand training without receiving tact training for the target items).

Results of previous research has shown that preference (Wallace et al., 2006), sequence of training (i.e., tact training first, mand training first; Pino et al., 2010), motivating operations (Kooistra et al., 2012), and the presence or absence of preferred items during training (Gamba et al., 2015) are variables that might impact transfer across verbal operants. For instance, Wallace et al. (2006) taught three adults with mental retardation to tact highly preferred and low preferred leisure items and then tested for mand emergence. In that study, all participants learned to tact
mand for both high and low preferred leisure items, but during mand emergence tests, responding that resulted in low preferred leisure items decreased to near zero levels. In other words, mands that resulted in low preferred items did not maintain. Kooistra et al. (2012) also tested for tact-to-mand transfer in two children with autism and in this study both participants emitted mands for the highly preferred edibles when access to these items had been restricted for 24+ hours (deprivation) but not when they had access to the highly preferred items immediately prior to the sessions testing for mand emergence (no deprivation). Results of study suggest that tact-to-mand transfer may occur more readily under periods of deprivation.

In the current study, for Katie, mand-to-tact transfer occurred when she was taught the mand for the most preferred edible (peppermint; selected on 100% of trials of the preference assessment) which indicates that preference of items can impact mand-to-tact transfer. However, peppermint was also the last edible to be trained as a mand, therefore it is unclear if transfer occurred due to the preference of the edible or as a result of multiple exemplar training. Future research on multiple exemplar training should ensure that items are equally preferred, or not preferred, to be able to determine the impact of multiple exemplar training on mand-to-tact transfer. Another variable that may have impacted transfer across verbal operants in the current study is the availability of the preferred edibles during mand training trials. In this study, edibles were present during mand training sessions and mand generalization probes, which could have led participants to acquire both mands and tacts during mand training. Future research should further examine this possibility by comparing transfer when preferred items/edibles are present and absent during mand training sessions.

This study extends previous research on mand-to-tact transfer by recruiting children with an ASD that had limited mand and tact repertoires. Previous studies either used children with no
known developmental disabilities (e.g., Lamarre & Holland, 1985), adults with disabilities (Sigafoos et al., 1989), or did not report whether participants had disabilities (Twyman, 1996). In her study, Shea (2013) recruited participants with various delays and limited mand and tact repertoires, but none of which had an ASD diagnosis. It is unclear whether diagnoses or the skills repertoire of participants can impact transfer of verbal operants; therefore, future research should examine mand-to-tact and/or tact-to-mand transfer in children with an ASD that have stronger mand/tact repertoires.

There are several limitations to the current study. First, because participants were children with a limited verbal repertoire (i.e., 10 or fewer independent mands and tacts; limited echoics), approximations to the actual label of the target mand and tact were accepted. For example, cheez-its was a preferred item for both participants in this study but they couldn’t emit the word(s) “cheez-it” intelligibly. Therefore, Katie was taught to use “kuh” to mand for and tact cheez-it, and Samantha was taught to use “chez-uh” to mand for and tact cheez-its. Although both Katie and Samantha learned to a mand and a tact for cheez-its, it is unlikely that Katie’s response (i.e., “kuh”) will be reinforced by a novel audience, and it may be unlikely that Samantha’s response (i.e., “chez-uh”) will be recognized unless it is emitted in the presence of cheez-its. Another limitation of this study is the error correction procedure employed. Contingent on an error, the researcher modeled the target response (e.g., “kuh”) and waited for the participants to imitate the target response. The target response was modeled twice and correct responding during the error correction procedure resulted in praise (mand training) or tokens (tact training) but not access to the specified item in the case of mand training. The lack of access to the specified reinforcer evoked problem behavior during at least some of the mand training sessions completed with Samantha. Future research should examine an error correction
procedure that consists of the researcher modeling the target response once instead of twice and having participant(s) imitate the target response once to decrease the likelihood of problem behavior occurring.

The use of total count IOA to assess the reliability of the results of the token assessment and token training sessions is another limitation of this study. For instance, during one baseline session of a token assessment, the PI observed two instances of the target behavior while the research assistant counted 0 instances of the behavior. Therefore, the IOA score for that session was 0. However, if an alternative IOA calculation method had been employed (e.g., proportional agreement), the IOA score for this session would have been much higher because it would also consider unscored intervals as an agreement. Another limitation of this study is that the mand training mastery criterion differed among participants. For Katie, during mand training the mastery criterion was independent responding for at least 90% of trials across three consecutive sessions. For Samantha, the mastery criterion was independent responding on 100% of trials across two consecutive sessions. Differing mastery criteria were selected for Katie and Samantha based on visual inspection of the data for each of these participants. For Katie, visual inspection of the data indicated that Katie was acquiring mands, as once responding reached 90% independence, it remained at or above 90% independence for all target edibles. However, for Samantha, when training the second target edible (bugle), visual inspection of the data indicated that Samantha wasn’t truly acquiring the mand as responding would reach 90% independence and then drop to low levels during subsequent sessions. Because of this, the mastery criterion for Samantha was changed to 100% independent correct responding across two consecutive sessions. Another noteworthy limitation is an error in data analysis for the acquisition of the mand for bugle during mand training for Samantha. Per the mastery criterion, the mand for bugle
was mastered after session 48, and again after session 55, but mand training continued for this edible as there was an error in data analysis. A final limitation for this study would be the break in data collection for Samantha during mand training sessions for bugle. During mand training for bugle, Samantha’s data collection was halted due to winter break, holidays, etc., and was resumed about four weeks later (see arrow on graph). The break in data collection may have contributed to the delayed acquisition of a mand for bugle.

In summary, this study demonstrated that transfer across verbal operants can occur, at least in some cases, in children with an ASD who have limited mand and tact repertoires. Although variables other than multiple exemplar training may have facilitated transfer, knowing that transfer can occur when teaching operants can aid in program decisions. For instance, one may decide to focus on teaching multiple mands in place of tacts if they can be confident that transfer from mand-to-tact will occur. Mand-to-tact transfer can be beneficial if it occurs as such transfer across the operants can decrease the time and resources that are necessary in early intervention therapy. If you can teach a mand for an item and get a tact for that item without any additional training, it is likely that more skills can be taught in less time.
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https://doi.org/10.1007/BF03392819


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Appendix A: Participant Screening and Caregiver Questionnaire

Part 1:

Participant’s Name: ____________ Caregiver’s Name: ____________ Date: ____________

1. How old is your child?
2. Does your child have a developmental or intellectual disability? If so, what?
3. Does your child have a speech disorder?
   a. If so, what?
   b. If so, are you willing to share this information?
4. How does your child communicate his/her wants? Vocalizations, pictures, signs, gestures
5. Does your child vocally request preferred food items?
   If so, how many items does your child request independently?
   List the names of items your child requests independently:
6. Does your child vocally labels (names) items (i.e., pictures, objects) independently?
   If so, how many items does your child name independently?
   List the names of items your child names independently:

Part 2:

1. Some children really enjoy certain food or snacks such as cookies, chips, gummies, popcorn, pretzels, graham crackers, etc. What are some things you think ____________ most likes to eat?
2. Some children really enjoy certain toys or objects such as puzzles, toy cars, balloons, comic books, flashlights, bubbles, etc. What are ____________’s favorite toys or objects?
3. What are some other items or activities that ____________ really enjoys?
Appendix B: Early Echoic Skills Assessment

Scoring Group 1-3: For each item, score the best response of up to 3 trials
X = correct sounds and correct number of syllables (1 point)
/ = recognizable response, but incorrect or missing consonants or extra syllables (1/2 point)
Blank = no response, incorrect vowels, or missing syllables (0 points)

<table>
<thead>
<tr>
<th>Group 1: Simple and reduplicated Syllables</th>
<th>TOTAL RAW SCORE (Groups 1-5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target: vowels, diphthongs, consonants p, b, m, n, h, w</td>
<td></td>
</tr>
<tr>
<td>ah</td>
<td>bye bye</td>
</tr>
<tr>
<td>wow</td>
<td>hop</td>
</tr>
<tr>
<td>bee</td>
<td>mama</td>
</tr>
<tr>
<td>knee</td>
<td>papa</td>
</tr>
<tr>
<td>o</td>
<td>me</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 2: 2-syllable combination</th>
<th>Sub-total (Group 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target: Add consonants k, g, t, d, f, y, ng</td>
<td></td>
</tr>
<tr>
<td>baby</td>
<td>window</td>
</tr>
<tr>
<td>go eat</td>
<td>funny</td>
</tr>
<tr>
<td>nighttime</td>
<td>meow</td>
</tr>
<tr>
<td>bunny</td>
<td>kitty</td>
</tr>
<tr>
<td>my foot</td>
<td>bow wow</td>
</tr>
<tr>
<td>ucky</td>
<td>mommy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 3: 3-syllable combination</th>
<th>Sub-total (Group 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target: Potato, high five, tiny pan, how many, go bye bye, oh foo-ey, peek a boo, potty time, fee f foe, fat doggy, binky boo, teddy bear, giddy up, yummy food, goopy goat, one cookie, doggy bone, wet mitten, daddy up, hey me too, open up, funny king, teepee boat, in a boat, my big toe, peanut hat, a hiccups, puppet game</td>
<td></td>
</tr>
<tr>
<td>tubby toy</td>
<td>potato</td>
</tr>
<tr>
<td>banana</td>
<td>go bye bye</td>
</tr>
<tr>
<td>fee f foe</td>
<td>fat doggy</td>
</tr>
<tr>
<td>yummy food</td>
<td>goopy goat</td>
</tr>
<tr>
<td>daddy up</td>
<td>hey me too</td>
</tr>
<tr>
<td>in a boat</td>
<td>my big toe</td>
</tr>
</tbody>
</table>

The VB-MAPP Early Echoic Skills Assessment (ESSA)  Copyright © 2008 Barbara E. Esch
Group 4: Prosody: spoken phrases (Model: Emphasize syllables in **bold italic**)  
X = emphasis on correct syllables (1 point)  
/ = emphasis on non-target syllables (1/2 point)  
Blank = monotone response (no emphasis) (0 points)  

☐ no WAY  ☐ ONE bunny  ☐ in a MIN-ute  ☐ TAKE it  ☐ My MOM-my  
☐ bug-a BOO  ☐ UH-oh  ☐ MY mommy  ☐ Bow-WOW  ☐ BUG-a-boo

Sub-total (Group 4) ☐

Group 5: Prosody: other contexts  
X = response correct or nearly so (1 point)  
Blank = response does not closely match model (0 points)  

pitch  
☐ Echoes pitch variations in 1-2 lines of a familiar song  
☐ Echoes continuous warble (fire truck OO-oo- OO-oo- OO)

Loudness  
☐ Echoes whispering

☐ Echoes quiet/loud voice (bye-bye vs. BYE-BYE)

Duration  
☐ Sustains ahh dhh 3 seconds, echoically

Sub-total (Group 5) ☐
Appendix C: Paired Stimulus Preference Assessment Data Sheet/ Treatment integrity/ IOA

Observer: __________  Participant: __________  Date: __________
List item name and # of times selected next to each number (#)
Item 1:_______________________(#______)  Item 2:___________________ (#______)
Item 3:_______________________ (#______)  Item 4:___________________ (#______)
Item 5:_______________________ (#______)

<table>
<thead>
<tr>
<th>Therapist has data sheet</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapist has writing utensil</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist has edibles</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist is seated at table across from participant</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trial</th>
<th>Placement</th>
<th>Correct Placement</th>
<th>Vocal instruction (i.e. choose one presented)</th>
<th>Therapist allows 5 sec for participant to make a selection?</th>
<th>Chosen edible consumed?</th>
<th>Non selected edible removed from array?</th>
<th>Trial represented once if no selection is made?</th>
<th>Trial discontinued if no selection is made on second presentation?</th>
<th>5-10 seconds between trials?</th>
<th>Data recorded after trial?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>4</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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</tr>
<tr>
<td>3</td>
<td>3</td>
<td>1</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
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<tr>
<td>4</td>
<td>2</td>
<td>4</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

42
|   |   | 5 | 4 | 5 |   | Y | N | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
| 6 | 3 | 2 | Y | N | Y | N | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
| 7 | 1 | 5 | Y | N | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
| 8 | 3 | 4 | Y | N | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
| 9 | 5 | 1 | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
|10 | 1 | 4 | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
|11 | 2 | 3 | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
|12 | 3 | 5 | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
|13 | 4 | 2 | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
|14 | 5 | 2 | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
|15 | 4 | 3 | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
|16 | 2 | 5 | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
|17 | 3 | 5 | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
|18 | 4 | 1 | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
|19 | 5 | 3 | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |
|20 | 2 | 1 | Y | N | Y | N | Y | N | Y | N | N/A | Y | N | N/A | Y | N | N/A | Y | N | Y | N |

TI: 184 * 100 = ___ % 

IOA: 20 * 100 = ___%
Appendix D: Token Assessment/Training Data Sheet/ Treatment integrity/ IOA

Therapist Behavior

<table>
<thead>
<tr>
<th>Prior to and during session</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapist has data sheet(s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapist has writing utensil</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist has token board and tokens</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist is seated at table across from participant</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Materials required for target response available</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>Therapist delivers vocal instruction at beginning of session</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>Therapist delivers tokens per token production schedule</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once participants earns all necessary tokens, therapist removes materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once participants earns all necessary tokens, therapist prompt participant to exchange tokens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapist gives participant back up reinforcer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Following a token exchange, therapist returns materials to participant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Participant Behavior (target responses). Each interval is a 10-s interval

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3.</td>
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<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# of responses emitted by participant _________________________
# of tokens earned ___________________
# of tokens exchanges __________________________

TI: ___/64 * 100= ___ %
### Appendix E: Mand Selection Data Sheet/ Treatment Integrity/ IOA

**Mand Selection Data Sheet/Treatment Integrity/IOA**

**Response Key:**
- I= Independent
- N= No response
- E= Error

<table>
<thead>
<tr>
<th>Participant:</th>
<th>Observer:</th>
<th>Date:</th>
</tr>
</thead>
</table>

#### TI: ____/ 23= ____%                 IOA: _____/3=_____%  

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Y</td>
<td>N</td>
<td>Y N</td>
<td>I N E</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
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<tr>
<td>2</td>
<td>2</td>
<td>Y</td>
<td>N</td>
<td>Y N</td>
<td>I N E</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Y</td>
<td>N</td>
<td>Y N</td>
<td>I N E</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
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</tbody>
</table>

<table>
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<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>N</td>
<td>Y N</td>
<td>I N E</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>Y</td>
<td>N</td>
<td>Y N</td>
<td>I N E</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
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<table>
<thead>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Y</td>
<td>N</td>
<td>Y N</td>
<td>I N E</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
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<tr>
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<td>I N E</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
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<td>N</td>
<td>Y N</td>
<td>I N E</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
</tr>
</tbody>
</table>

Prior to and during session:
- Therapist has data sheet
- Therapist has writing utensil
- Therapist has stimuli prior to session
- Therapist is seated across from participant
- Therapist delivers preferred items (other than the target item) every 2-3 trials

TI: ____/ 23= ____%                 IOA: _____/3=_____%
## Appendix F: Tact Selection Data Sheet/ Treatment integrity/ IOA

**Tact Selection Data Sheet/Treatment Integrity/IOA**

**Participant:** _______________  
**Observer:** _______________  
**Date:** _______________

<table>
<thead>
<tr>
<th>Stimuli</th>
<th>Session</th>
<th>Trial</th>
<th>Tact</th>
<th>Participant emits ready response?</th>
<th>Both stimuli and SD presented?</th>
<th>Response?</th>
<th>Correct consequence for independent response?</th>
<th>Correct consequence for error or no response?</th>
<th>Data recorded after trial?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Y N</td>
<td>Y N</td>
<td>E: _____</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>Y N</td>
<td>Y N</td>
<td>E: _____</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>Y N</td>
<td>Y N</td>
<td>E: _____</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td>Y N</td>
<td>Y N</td>
<td>E: _____</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
</tr>
</tbody>
</table>

Prior to and during session:  
- Therapist has data sheet: Y N  
- Therapist has writing utensil: Y N  
- Therapist has stimuli prior to session: Y N  
- Therapist is seated across from participant: Y N  
- Therapist delivers preferred items (other than the target item) every 2-3 trials: Y N

**TI:** ____/23= ____%  
**IOA:** ____/3= ____%
Appendix G: Mand and Tact Baseline Data Sheet/ Treatment integrity/ IOA

Participant: __________ Observer: __________ Date: __________ Time: __________
Target Stimuli: __________

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td></td>
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<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
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<td>2</td>
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<td>Y</td>
<td>Y</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
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<td>Y</td>
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<td>N/A</td>
</tr>
<tr>
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<td>N/A</td>
</tr>
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<td>N/A</td>
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<tr>
<td></td>
<td>7</td>
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<td>Y</td>
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<tr>
<td></td>
<td>8</td>
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<td>N</td>
<td>Y</td>
<td>Y</td>
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<td>N/A</td>
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<tr>
<td></td>
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<td>Y</td>
<td>Y</td>
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<td>N/A</td>
</tr>
<tr>
<td></td>
<td>10</td>
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<td>N</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
|          |       |      |                  |              |                      |                                          | Percentage of correct responses: /
|          |       |      |                  |              |                      |                                          | 10= %                                         |

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
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<td>N/A</td>
</tr>
<tr>
<td></td>
<td>4</td>
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<td>N</td>
<td>Y</td>
<td>Y</td>
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<td>N/A</td>
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</tr>
<tr>
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<td>N/A</td>
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<td>N/A</td>
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<td>9</td>
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<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
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<td>---</td>
</tr>
<tr>
<td>10</td>
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<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
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</tr>
</tbody>
</table>

Percentage of correct responses: \( \frac{\_}{10} = \% \)
<table>
<thead>
<tr>
<th>Therapist has data sheet</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapist has writing utensil</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist has edibles</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist has picture cards</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist is seated at table across from participant</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist records data</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist delivers preferred items (other than the target items) every 2-3 trials</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

TI: ____/ 87* 100= ___ %

IOA: ____/ ____20* 100= ___ %
## Appendix H: Data Sheets for Mand Training

**Participant:** __________  **Observer:** __________  **Date:** __________  **Time:** __________

<table>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>P E</td>
<td>Y N</td>
<td>N/A</td>
<td>Y N</td>
<td>N/A</td>
</tr>
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<td>N</td>
<td>Y</td>
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<td>P E</td>
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<td>Y N</td>
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<td>P E</td>
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<td>P E</td>
<td>Y N</td>
<td>N/A</td>
<td>Y N</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Percentage of correct responses:** \[ \frac{ ___}{10} = \% \]

**Therapist is seated at table across from participant**  |  Y      |  N  |
<table>
<thead>
<tr>
<th>Therapist has edibles</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapist has writing utensil</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist records data</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist delivers preferred items (other than the target items) every 2-3 trials</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

TI: ___/ 75*100= ___ %

IOA: ____/ ____10* 100= ___ %
## Appendix I: Data Sheets for Tact Probes

Participant: __________  Observer: __________  Date: __________  Time: __________

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Y</td>
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<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>Y</td>
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<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>Y</td>
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<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
</tr>
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<td>5</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
</tr>
<tr>
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<td>Y</td>
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<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
</tr>
<tr>
<td>7</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
</tr>
<tr>
<td>8</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
</tr>
<tr>
<td>9</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
</tr>
<tr>
<td>10</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Percentage of correct responses: __/10 = %

<table>
<thead>
<tr>
<th>Therapist has data sheet</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapist has writing utensil</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist has picture cards</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Therapist is seated at table across from participant</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist records data</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist delivers preferred items (other than the target items) every 2-3 trials</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

TI: ___/ 46* 100 = ___ %

IOA: ____/ ____ 10* 100 = ___ %
### Appendix J: Data Sheets for Tact Training

**Participant: __________  Observer: __________  Date: __________  Time: __________**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td></td>
<td>Y      N</td>
<td>Y      N</td>
<td>Y      N      P      E</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td>Y      N</td>
<td>Y      N</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
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<td>Y      N      N/A</td>
</tr>
<tr>
<td></td>
<td>3</td>
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<td>Y      N</td>
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<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td>Y      N</td>
<td>Y      N</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
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<tr>
<td></td>
<td>5</td>
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<td>Y      N</td>
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<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>Y      N</td>
<td>Y      N</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
<td>Y      N</td>
<td>Y      N</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td>Y      N</td>
<td>Y      N</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td></td>
<td>Y      N</td>
<td>Y      N</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td></td>
<td>Y      N</td>
<td>Y      N</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
<td>Y      N      N/A</td>
</tr>
</tbody>
</table>

**Therapist has data sheet** | Y | N |
**Therapist has writing utensil** | Y | N |
**Therapist has picture cards** | Y | N |

Percentage of correct responses: __/10= %
| Therapist is seated at table across from participant | Y | N |
| Therapist records data | Y | N |
| Therapist delivers preferred items (other than the target items) every 2-3 trials | Y | N |

TI: ___/ 76* 100= ___ % 

IOA: ____/ ____10* 100= ___ %
## Appendix K: Data Sheets for Mand Probes

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
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<td>Y</td>
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<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
<td>Y</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
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<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
<td>Y</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
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<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
<td>Y</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Percentage of correct responses: \( \frac{}{10}= \% \)

<table>
<thead>
<tr>
<th>Therapist is seated at table across from participant</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapist has edibles</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist has writing utensil</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist records data</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Therapist delivers preferred items (other than the target items) every 2-3 trials</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

TI: \( \frac{}{26} \times 100= \% \)

IOA: \( \frac{}{3} \times 100= \% \)
Appendix L: Social Validity Questionnaire

1. I found the procedures used in this study to be acceptable

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

2. I would use these procedures with my child to teach him/her to make requests and label items

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

3. I would recommend the procedures used in this study to other parents and children

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

4. I feel that my child is making requests and labeling items more often

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

5. Please comment on any aspects of this study that you enjoyed/did not enjoy and explain why

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

58
## Appendix M: Tables

### Table 1

*Participant data from initial assessments*

<table>
<thead>
<tr>
<th>Participant</th>
<th>VB-MAPP Mand score</th>
<th>VB-MAPP Tact score</th>
<th>EESA Score</th>
<th>Mand selection sessions (% ind. Responses)</th>
<th>Tact Selection sessions (% ind. responses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Katie</td>
<td>1</td>
<td>1</td>
<td>64</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Samantha</td>
<td>1</td>
<td>1</td>
<td>73</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>
**Table 2**

*Data from caregiver questionnaire completed by Katie's caregiver*

<table>
<thead>
<tr>
<th>Questions</th>
<th>Caregiver 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>I found the procedures used in this study to be acceptable</td>
<td>5</td>
</tr>
<tr>
<td>I would use these procedures with my child to teach him/her to make requests and label items</td>
<td>5</td>
</tr>
<tr>
<td>I would recommend the procedures used in this study to other parents and children</td>
<td>5</td>
</tr>
<tr>
<td>I feel that my child is making requests and labeling items more often</td>
<td>5</td>
</tr>
<tr>
<td>Please comment on any aspects of this study that you enjoyed/did not enjoy and explain why</td>
<td>“Katie has grown so much and I’m quite pleased. Thank you so much”.</td>
</tr>
</tbody>
</table>
Appendix N: Figures

Figure 1

Preference Assessment Results
Figure 2

*Token Assessment and Token Training Results*
Figure 3
The percentage of Katie’s independent responses during the various phases and assessments responses.
Figure 4

The percentage of Samantha’s independent responses during the various phases and assessments

Note: The arrow denotes the session in which mand training for bugle was resumed after an extended break in data collection.
Appendix O: USF IRB Approval

November 5, 2018

Santiira Williams
CFBH-Child and Family Behavioral Health
11735 N. 58th Street
Tampa, FL 33617

RE: Expedited Approval for Initial Review
IRB#: Pro00037382
Title: Evaluating the Effects of Multiple Exemplar Training on Mand-to-Tact Transfer in Children with Autism

Study Approval Period: 11/5/2018 to 11/5/2019

Dear Ms. Williams:

On 11/5/2018, the Institutional Review Board (IRB) reviewed and APPROVED the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
IRB Protocol V1.docx

Consent/Assent Document(s)*:
Combined Parental and Permission with HIPAA V1.docx.pdf
Combined Parental and Permission without HIPAA V1.docx.pdf

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review...
research through the expedited review procedure authorized by 45CFR46.110. The research proposed in this study is categorized under the following expedited review category.

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

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

This research involving children as participants was approved under 45 CFR 46.404: Research not involving greater than minimal risk to children is presented.

Requirements for Assent and/or Permission by Parents or Guardians: 45 CFR 46.408 Permission of one parent is sufficient.

Assent is waived because it is not appropriate due to the age, maturity, and/or psychological state of the child.

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

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

Sincerely,

[Signature]

Kristen Salomon, Ph.D., Chairperson
USF Institutional Review Board