Effects of a Verbal Behavior Card Sort Implemented by Early Childhood Educators on the Verbal Behavior Skills of Children with Developmental Disabilities

By

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Abstract

Previous research has demonstrated the effectiveness of Verbal Behavior Intervention on the language development of children with developmental disabilities (DeSouza, Akers, & Fisher, 2017; Petursdottir & Devine, 2017). Despite its effectiveness, research thus far has focused mostly on teaching the mand and tact, and less on the intraverbal, which is the operant that makes up the majority of everyday verbal interactions and most complex verbal behavior. Research has also demonstrated that more complex intraverbals do not emerge spontaneously until prerequisite skills across the echoic, mand, tact, and listener response have developed, all of which are emitted hundreds of times a day by the time a child is between the ages of two and three years (Sundberg & Sundberg, 2011). Once a child reaches three they more consistently emit intraverbals during communicative interactions, however intraverbals can become rote and restricted in nature during Verbal Behavior Intervention if sufficient prerequisites across other operants are not taught (Sundberg & Michael, 2001). Currently, research on Verbal Behavior Intervention has focused mostly on the ways to teach single operants (e.g., the most effective and efficient ways to teach the tact), however additional research is needed on interventions that can both move children with developmental delays more quickly towards strong echoic, mand, tact, and listener response repertoires and teach intraverbals when appropriate. This dissertation examined whether an intervention called the verbal behavior card sort (Carbone, 2017; Miklos & Dipuglia, 2010) can support growth in verbal behavior skills across operants towards the development of intraverbal prerequisites. Three early childhood special educators in reverse mainstream classrooms (i.e. 50:50 ratio of typically developing peers to children receiving special education services) implemented the verbal behavior card sort for approximately five months with one child in their classroom with a developmental disability. Results indicated that

each child developed skills across multiple operants and was able to generalize these skills both to other classroom activities and contexts and to their home. Additionally, results of a questionnaire as completed by each educator indicated strong social validity for the use of the card sort in public ECSE classrooms. Implications for its use in public school classrooms in which intensive interventions based in applied behavior analysis are often not feasible are discussed.

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I would like to dedicate this dissertation to my family, and specifically my husband Frank, my parents Mary Ellen and Robert, and my children Elizabeth and James. Their encouragement, patience, and understanding led me through the past four years and helped see me through the final stretch of completing and defending my dissertation. I would also like to thank my advisor, Dr. Eva Horn, for her patience, support, and guidance during my doctoral program, and Dr. Richard Simpson for his mentorship.

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## Chapter 1: Background and Context

Language skills are arguably some of the most important a child will develop over the course of their life time, and language ability in early childhood is directly correlated with later vocabulary and cognitive abilities (Marchman & Fernald, 2008). Language has also been found to be a direct indicator of reading and math comprehension (Biemiller, 2006; Fuchs et al., 2006), which holds true for all children, including those with developmental disabilities. Indeed, research has demonstrated that children with more intact language demonstrate better cognitive, academic, and social outcomes than children who have more significant language delays (Rowe, Raudenbush, & Goldin-Meadow, 2012).

A number of interventions that have their basis in applied behavior analysis (ABA) have been developed to improve the language of children with developmental delays such as Milieu Teaching (e.g.,Warren, 1992), Pivotal Response Training (e.g., Koegel, Koegel, Harrower, & Carter, 1999), Discrete Trial Teaching as part of an early and intensive behavioral intervention (e.g., Remington et al., 2007; Smith, 2001) and Verbal Behavior Intervention (Partington & Sundberg, 1998). Central to ABA is the examination of antecedent and consequent stimuli that control behavior and the environmental factors such as motivation, discriminative stimuli, reinforcement, and punishment that control its occurrence (Catania, 2011). Within ABA, socially relevant behaviors are targeted and behavioral principles are applied to increase desired behavior (Fisher, Groff, & Roane, 2011). When applying the principles of ABA to language interventions for children with developmental delays, individualized and socially relevant communication and language skills are targeted for intervention and the antecedent and consequent stimuli that control them are manipulated so the child's communication might increase (Sundberg & Michael, 2001).

As noted above, one example of a language intervention based in ABA is Verbal Behavior Intervention, which has a strong base of research and has been demonstrated to be effective for improving the language of children with developmental delays (for reviews, see DeSouza, Akers, & Fisher, 2017; Petursdottir & Devine, 2017). This longstanding intervention is not only based in ABA but also in B.F. Skinner's (1957) conceptualization of language development, known as the analysis of verbal behavior. The analysis of verbal behavior emerged from the field of behavior analysis as a means of describing language development through the behavior analytic lens and views language as similar to any other observable behavior in that it is controlled by antecedents and consequences. The remaining sections of this chapter will provide the following: a brief description of Skinner's behavior analytic conceptualization of language, a description of how this conceptualization led to the development of interventions for improving the language of children with developmental delays, an overview of research on Verbal Behavior Interventions, and finally a discussion of important next steps in research on the use of Verbal Behavior Intervention with young children with developmental delays and disabilities.

## A Behavior Analytic Conceptualization of Language

In 1957, B.F. Skinner published *Verbal Behavior*, which outlined language as operant behavior possessing antecedents and consequences that control its use. Drawing from research on both applied and experimental analyses of behavior, Skinner analyzed language according to its functional relations and argued that language, like any other behavior, was functionally related to the antecedents that precede it and the consequences that follow it. Furthermore, the language in which we engage daily is made up of multiple simple operants that come together with increased complexity such that it can be multiply controlled by more than one antecedent and consequence.

The operant analysis by which language is conceptualized is unique in that the focus is singularly on the functional relationship between a verbal behavior and its antecedents and consequences. Specifically, while verbal operants may sound the same across the situations in which they are used, they can have differing functions and thus, can be used for different purposes. For example, the word 'hat' can be used as a mand to ask for a hat, as a tact to label or point out a hat, or as an intraverbal to someone's question, "what are you looking for" to which the answer is 'hat' (Sundberg & Michael, 2001). When analyzing verbal behavior, Skinner identified the following four verbal operants: the mand, tact, echoic, and intraverbal. The mand is a verbal behavior emitted in the presence of motivation, serves as a request for something (e.g., an object, activity, or information), and is followed by specific reinforcement (i.e. the person emitting the mand receives what was requested). The tact is a verbal behavior emitted in the presence of a sensory stimuli, serves as a label of something the speaker sees, hears, smells, touches, etc., and is followed by generalized reinforcement (e.g., the speaker is given praise or acknowledgement). An echoic occurs when the speaker echoes something someone else says, and an intraverbal occurs when someone verbally responds to the verbal behavior emitted by someone else (e.g., "Star" in response to someone else saying, "Twinkle twinkle little...", "Moo" in response to someone else saying, "What does a cow say?" or "I went to a movie" in response to, "What did you do this weekend?").

These four operants encompass speaker behavior only (i.e. the language emitted by the person speaking) but Skinner also discussed the role of the listener in the context of language (Tincani, Bondy, & Crozier, 2011). Indeed, according to Skinner, both speaker and listener behavior must be analyzed in order to understand an entire communicative interaction and the ways verbal behavior emitted by the speaker can control the listener's response. Operants related

to listener behavior that are also relevant for learning language are the listener response and motor imitation. A listener response occurs when a non-verbal response is emitted as the result of someone else's verbal behavior (e.g., going to retrieve a pencil from a drawer in response to someone saying, "Can you get me a pencil from the drawer?") and is followed by generalized reinforcement such as being told, "Thank you". Finally, motor imitation does not involve speaker behavior by either individual within the interaction and occurs when someone imitates the motor behavior of someone else. Teaching motor imitation to children who do not imitate others spontaneously is an important step towards developing generalized imitation, which, in turn, is an important tool for learning novel behaviors and skills.

## From Conceptualization to Intervention

While Skinner's analysis did not immediately give way to verbal behavior-based interventions for children with developmental disabilities, the initial study by Wolf, Risley and Mees (1964) that applied behavior analytic principles to the challenging behavior of a young child with autism, paved the way for a host of research and development in the field of ABA and its usability for supporting the education of children with developmental delays (e.g., Koegel et al., 1999; Koegel, O'Dell, & Koegel, 1987; Lovaas, 1977, 1987; Smith et al., 2000). This research has demonstrated that behavioral techniques are effective in teaching or remediating numerous skills and behaviors, and that language skills for children whose language is delayed can be a main focus of intervention using behavioral principles (Sundberg & Michael, 2001).

Behavior analytic interventions use strategies such as reinforcement, extinction, shaping, incidental teaching, prompting, prompt fading, chaining, and generalization techniques to increase or decrease skills and behaviors, but until the 1990s did not utilize Skinner's principles of verbal behavior when programming goals. While language development was generally a

major component of interventions, behavioral techniques were applied to what was considered communicative behavior encompassing skills such as labels, requests, nouns, verbs, prepositions, and answering 'WH' questions (Sundberg & Michael, 2001). It was not until Partington and Sundberg (1998) published The Assessment of Basic Language Learning Skills (the ABLLS), a curriculum guide and skills tracking system for children with autism and other developmental disabilities, that skills within verbal operants were more consistently considered when programming interventions (Sundberg & Michael, 2001). In 2005 Carr and Firth called for more research on Verbal Behavior Intervention and since then, there has been an increase in the number of articles examining how to teach verbal operants. Two recent reviews of literature (i.e. DeSouza et al., 2017; Petursdottir & Devine, 2017) have been published on this verbal behavior intervention research since the early 2000s, both of which are discussed in detail below.

## Verbal Behavior Intervention Research

Two comprehensive reviews examining efficacy research on Verbal Behavior Intervention between 2001 to 2016 and 2005 to 2016 have been published by DeSouza and colleagues (2017) and Petursdottir & Devine (2017) respectively. Specifically, DeSouza et al. (2017) analyzed single case research that included one of Skinner's (1957) verbal operants as a dependent variable and involved teaching one or more new verbal responses to individuals with autism. Across the 172 studies identified, there were 493 participants ages 12 years and younger, all of whom had a diagnosis of autism. Ninety one (53%) of the identified articles specifically targeted mands, 56 (33%) targeted tacts, one (0.6%) targeted echoics, and 40 (23%) targeted intraverbals. The authors concluded not only that a large portion of the research focused on the development of mands and tacts (86%) as compared to intraverbals (23%), but that the

complexity of intraverbals necessitated more research on how to effectively and efficiently teach this operant to children with autism.

Petursdottir and Devine (2017) identified 369 empirical studies in which a verbal operant was manipulated or measured. Human participants were used in all but one study including participants with autism (60%), intellectual disability (11%), unspecified developmental delays (2%), language delays (2%), sensory impairment (1%), and dementia (1%). Additionally, participants were children in 84% of the studies, adults in 12%, and both children and adults in 4% of studies. As in DeSouza et al. (2017) the most commonly studied operant was the mand (45%) followed by the tact (43%), intraverbal (26%) and echoic (10%).

**Current Status**

While both reviews confirmed a range of findings regarding the best methods for teaching various operants and the ways growth in some operants can lead to the spontaneous emergence of others, findings also indicate some holes in the verbal behavior literature that should be addressed with future research. Namely, while there appears to be a plethora of studies examining the mand and tact, there is a relatively small amount of research on the intraverbal. Additionally, echoics were the least targeted operant (i.e. less than 1% for DeSouza et al. [2017] and 10% for Petursdottir and Devine, [2017]) and in practice are generally only used as prompts for teaching other operants or are targeted for intervention only when a child's vocal responses are difficult to understand due to articulation errors. As such, their focus in Verbal Behavior Intervention is limited, and they are not targeted at all in the present study due to a lack of articulation errors in the speech of child participants.

In contrast, much of the language used in everyday interactions is made up of intraverbals, and research has examined the ways to best teach this skill, including the most

effective prompts and whether novel intraverbals emerge following training in other operants such as the tact and listener response (Sundberg & Sundberg, 2011). However, while preliminary research on the intraverbal demonstrates a strong foundation of methods for teaching them, considerations for teaching more complex intraverbals, along with research on thoroughly and effectively teaching intraverbal prerequisites, should be further explored. As such, some of the factors that should be considered for intervening on this complex set of behaviors will be discussed in the follow sections.

**Next Steps**

The emergence of intraverbals and the most efficient ways to teach them are of considerable importance given the role they play in language. Indeed, the intraverbal, which is essentially a verbal response to someone else's verbal behavior, comes in many forms from simple to complex, and makes up the majority of everyday interactions. For example, a simple greeting consists of a verbal exchange between two people in which one person says something and the other responds. Other examples of intraverbals are answering a question, engaging in back and forth conversation, and being able to describe events and tell stories (Skinner, 1957). When first developing language, toddlers form simple fill-in-the-blank intraverbals while singing songs or answering simple questions (e.g., "Twinkle twinkle little..." said by the adult, followed by "star" from the child, or "What does a cow say?" to which the child says, "Moo"). These simple verbalizations are already emerging when a child turns 1 ½, and by the time a child reaches two years they can generally provide their name, fill in various phrases ("peek-a…") or respond to simple questions and word associations (e.g., "Mommy and…" or "shoes and…"; Sundberg, 2008).

While these simple intraverbals are not sufficient for carrying on lengthy conversations, they do build the foundation for the more complex intraverbals that begin to increase in both rate and complexity between the ages of 2 and 3 years when children experience rapid verbal development (Bijou, 1976; Hart & Risley, 1995; Schlinger, 1995). This development of intraverbals is aided by strong echoic, mand, tact, and listener response repertoires that develop around various topics. While children may not be able to engage in intraverbal behavior and conversations around these topics initially, strong repertoires in other operants allow for intraverbals to emerge as a child approaches the age of three (Sundberg & Sundberg, 2011). For example, before a child is able to answer questions or talk about items or actions related to a farm (e.g., "What animals live on a farm?" or "Where do animals on a farm live?"), they must first be able to reliably identify as a listener and a speaker items that answer those questions such as pigs, horses, cows, chickens, barns, and the notion of the verb, live. Without these prerequisite verbal skills, any intraverbals that are taught are in danger of becoming rote answers with little meaning behind them for the child (Sundberg & Sundberg, 2011).

Indeed, Sundberg and Sundberg (2011) examined intraverbal development in 39 typically developing children and 71 children with autism and found that before children begin to emit intraverbals, they engage in thousands of echoics, mands, tacts, and listener responses per day and only begin to emit intraverbals when those others skills are strong. Likewise, DeSouza, Fisher, and Rodriguez (2019) examined the prerequisite skills necessary for children with autism to spontaneously emit more complex intraverbals, called convergent intraverbals, after these same prerequisite skills were met. A convergent intraverbal is an intraverbal response that is controlled by two or more antecedent variables. For example, one might ask the question, "What is a pink animal that lives on a farm?" the correct answer to which is evoked by the antecedents,

"pink", "animal", and "farm". They found that in order for children with autism to emit convergent intraverbals without specific training, they must first be able to tact a pig, tact its class (i.e. animal), where it is from (i.e. farm), be able to name "pig" when asked to name some animals and when asked which animals live on a farm, and be able to point to a picture of a pig when asked to "point to the pink animal that lives on a farm" in a field of pictures of other animals and objects that are farm-related.

## Conclusion

While we are coming to understand both the necessary prerequisite skills for intraverbals to reliably emerge without specific teaching and the most effective methods for teaching them when necessary and approrpriate, additional research is needed on interventions that can both move children with developmental delays more quickly towards strong echoic, tact, and listener response skills and teach intraverbals when the time comes. The intervention examined in this study, called the verbal behavior card sort (Carbone, 2017; Miklos & Dipuglia, 2010), has been proposed as a possible method for building a strong base of listener and speaker skills needed for the emergence and specific teaching of intraverbals, however research has not been conducted to examine its effectiveness. As such, the purpose of this study is to determine whether a verbal behavior card sort can increase skills across the echoic, tact, listener response, and intraverbal operants in three preschool-age children with developmental delays such that their verbal behavior skills increase and can be used in everyday classroom and home interactions. The following research questions will be addressed: 1) Does the implementation of a verbal behavior card sort result in an increase in skills across verbal and other relevant communicative operants? 2) Do verbal behavior skills learned via the card sort generalize to other classroom activities and

to the home setting? 3) Do the educators who were trained in implementing the verbal behavior card sort with fidelity feel it is a usable and effective intervention for classroom settings?

## Chapter 2: Theoretical Foundations and Description of Verbal Behavior Card Sort: A Verbal Behavior Intervention

The analysis of verbal behavior was first conceptualized by B.F. Skinner in 1957 when Skinner described participants in a communicative exchange as either the speaker or listener, and language as behavior made up of simple verbal operants, all of which are under the functional control of distinct antecedents and consequences that evoke and maintain their use. The analysis of verbal behavior has been used to guide the development of language goals in interventions based in applied behavior analysis (ABA) for children with autism and other developmental disabilities. This intervention is known as Verbal Behavior Intervention, and research examining its effectiveness has increased steadily in the past decade (Lechago, Jackson, & Oda, 2017). Verbal behavior interventions are supported by a large body of research that demonstrates the different ways to effectively teach the verbal operants as defined by Skinner and the ways growth in some operants can lead to the spontaneous acquisition of skills in other operants (see reviews by DeSouza et al., 2017 and Petursdottir and Devine, 2017).

Despite this large body of research, gaps remain in fully understanding the potential for Verbal Behavior Intervention to improve the language of children with developmental disabilities. This chapter will describe a specific Verbal Behavior Intervention strategy called the verbal behavior card sort, which may fill some gaps that currently exist in the Verbal Behavior Intervention literature. Specifically, recent reviews (i.e. DeSouza et al., 2017; Petursdottir & Devine, 2017) indicate that research on verbal behavior interventions is less robust with regard to methods of efficiently teaching skills across multiple operants at once towards the development of strong generalized language, teaching complex intraverbals, and the development of interventions with strong social validity or feasibility such that they can be accessed in school

settings where children with developmental delays receive special education services. The verbal behavior card sort discussed here may address these holes and serve as an alternative to verbal behavior interventions that are complex, difficult to implement, and are typically only delivered in clinic and home-based settings as part of early and intensive behavioral interventions (EIBI) by clinicians who possess a great deal of knowledge and training in ABA (Carr & Firth, 2005).

The following sections will provide an overview of Skinner's analysis of verbal behavior, a description of the ways the analysis was developed into an intervention, an overview of the current literature on Verbal Behavior Interventions and the ways a verbal behavior card sort can contribute to this literature, and finally, an in-depth description of the intervention and its high level of social validity such that it can be implemented in public school classrooms by educators.

## Skinner's Analysis of Verbal Behavior

The field of behavior analysis conceptualizes behavior in two ways: respondent and operant, the former being behavior that occurs as an automatic reflex to some type of stimuli (e.g., shivering when cold) and the latter being behavior that is learned and brought under stimulus control by repeated interactions with consequences in the environment (Cooper, Heron, & Heward, 2007). All operant behavior consists of the three-term contingency of antecedent-behavior-consequence, which is the basic unit of analysis in the examination of operant behavior. The analysis of verbal behavior, developed by Skinner in 1957, is no different, and conceptualizes language as operant behavior that can also be analyzed via this three-term contingency. Like any other operant behavior, Skinner's theory viewed language as behavior that was learned and controlled through repeated interactions with consequences in the environment. This view brought forth a new way of studying language development and was a departure from other views of language due to its singular focus on the functional relationships between verbal

behavior, and the environmental antecedents and consequences that control it. Instead of viewing language as either receptive or expressive and considering its form and structure, the analysis of verbal behavior only considers the reason, or function, for which we emit verbal behavior and considers varying verbal operants with distinct antecedents and consequences when describing language. From this functional standpoint, words emitted across operants may be topographically similar but serve different functions depending on the context in which they are emitted, the antecedents that precede them, and the consequences that follow them (e.g., "cookies" as a mand to ask for a cookie when motivation is present, or as an intraverbal to respond to someone else's verbal stimulus, "what are you baking?" to which the answer is "cookies").

Skinner (1957) discussed language in terms of the speaker and listener and identified four verbal operants that make up speaker behavior including the mand, tact, echoic, and intraverbal. Specifically, the mand occurs in the presence of motivation, is equivalent to a request, and is followed by direct reinforcement (i.e. delivery of what was requested). In contrast, the tact occurs in the presence of sensory stimuli, is equivalent to a verbal label of something seen, heard, smelled, tasted, etc., and is followed by indirect reinforcement such as someone making a comment in return, or praise for a correct answer. An echoic occurs when someone echoes something another person has said, and an intraverbal is a verbal behavior emitted in response to another person's verbal behavior and is followed by generalized reinforcement such as someone emitting another response in return. While the mand, tact, echoic, and intraverbal are the operants that compose speaker behavior, it is also necessary to consider the listener during communicative interactions and teach listener behaviors within verbal behavior interventions. As such, another relevant operant taught during the verbal behavior card sort is the listener response, which consists of following the speaker's directions after a verbal behavior is emitted. See

Tables 1 and 2 for a full description of the verbal and other relevant operants and the antecedents and consequences that control their use.

## Development of Verbal Behavior Interventions

The analysis of verbal behavior was not originally conceptualized as a means of teaching language to children with developmental delays, but rather as a response to a large theoretical hole in the field of behavior analysis. Prior to the publication of Skinner's *Verbal Behavior* (1957) there was no behavior analytic explanation for language, and definitions of language as operant behavior did not exist. Despite its development as an expansion of the behavior analytic view of human behavior, the analysis of verbal behavior would eventually become the primary means through which language goals for children with language delays would be developed within interventions based in ABA. Before language goals were programmed using the verbal operants, however, behavior analytic principles were used in interventions for children with developmental delays beginning with the initial study by Wolf, Risley and Mees (1964), which applied behavior analytic principles to the challenging behavior of a young child with autism. This study led to a host of research and development in the field of ABA and its usability for supporting the education of children with developmental delays (e.g., Koegel et al., 1999; Koegel, O'Dell, & Koegel, 1987; Lovaas, 1977, 1987; Smith et al., 2000), all of which has demonstrated behavioral techniques as effective for teaching or remediating numerous skills and behaviors while also highlighting language as a necessary component of these interventions (Sundberg & Michael, 2001).

While behavior analytic interventions use strategies such as reinforcement, extinction, shaping, incidental teaching, prompting, prompt fading, and generalization techniques to increase or decrease skills and behaviors, it was not until the 1990s that Skinner's principles of verbal

Table 1

*Verbal Operants*

| Operant | Definition | Examples |
|---|---|---|
| Mand | Asking for an object/action/information for which a child is motivated. | • "Apple" (child is given some apple)<br>• "Push" (Child is pushed on the swing)<br>• "Where my doll?" (child is given information regarding the whereabouts of his doll) |
| Tact | Label a sensory stimulation: anything you can see, hear, taste, feel, or smell | • "Plane" (child says as a reaction to seeing a plane)<br>• "Cookies!" (child says as a reaction to smelling cookies baking in the oven)<br>• "Red" (child says in response to seeing a red flower)<br>• "Sweet" (child says in response to tasting a lollypop).<br>• "Loud" (child says in response to hearing a siren). |
| Echoic | Echo part or all of what someone else has said | • "Row boat" in response to someone saying, "row, row, row your boat"<br>• "Wow!" in response to someone else saying, "wow" |
| Motor Imitation | Imitate the motor movements of another person. | • Clapping hands after seeing someone else clap hands<br>• Give a doll a bottle after seeing a playmate give a doll a bottle |
| Listener Response | Following directions | • Touching ball in response to someone saying, "touch the ball"<br>• Getting a pencil in response to a teacher saying, "Go grab a pencil from my desk" |
| Intraverbal | Give a verbal response to the verbalization of another person | • Saying "Boat" in response to someone saying, "Row, row, row your____"<br>• Saying "shoes" in response to someone saying, "Socks and___"<br>• Saying "Hat" in response to someone saying, "What do you wear on your head?"<br>• Saying, "Great! We went to a movie" in response to someone saying, "How was your weekend?" |

Table 2

*Antecedents and Consequences for Verbal and Other Relevant Operants*

| Verbal Operant | Antecedent | Behavior | Consequence |
|---|---|---|---|
| Mand | Motivation | Verbal Behavior | Specific Reinforcement (receive what was asked for) |
| Tact | Sensory Stimuli | Verbal Behavior | Generalized reinforcement |
| Intraverbal | Verbal Stimulus | Verbal behavior | Generalized reinforcement |
| Echoic | Verbal stimulus | Verbal behavior | Generalized reinforcement |
| Listener Response | Verbal Stimulus | Non-verbal behavior | Generalized reinforcement |
| Motor Imitation | Non-verbal stimulus | Non-verbal behavior with point to point correspondence | Generalized reinforcement |

behavior were used for programming language goals. Although language development was generally a major component of interventions, behavioral techniques were applied to what was considered communicative behavior encompassing skills such as labels, requests, nouns, verbs, prepositions, and answering 'WH' questions. It was not until Partington and Sundberg (1998) published The Assessment of Basic Language Learning Skills (the ABLLS), a curriculum guide and skills tracking system for children with autism and other developmental disabilities, that skills within verbal operants were more consistently considered when programming interventions (Sundberg & Michael, 2001). In 2005 Carr and Firth called for more research on verbal behavior interventions and since then, there has been an increase in the number of articles examining how to teach verbal operants. Two recent reviews of literature have been published on this verbal behavior intervention research since the early 2000s, both of which are discussed in detail below.

**Overview of Current Literature and Implications for the Intraverbal**

The analysis of verbal behavior is now typically used to guide the development of language goals in interventions based in applied behavior analysis (ABA) for children with autism and other developmental disabilities, and research examining verbal behavior-based interventions has increased steadily in the past decade. Indeed, in two recent reviews, DeSouza and colleagues (2017) and Petursdottir and Devine (2017) found that hundreds of studies on the verbal operants have been conducted since 2001, the majority of which examine ways to teach skills within verbal operants to children with developmental disabilities. Both reviews also found most of these studies examined ways to teach the mand and tact while a much smaller number (23% and 26% respectively) examined the intraverbal as the dependent variable. While preliminary research on the intraverbal demonstrates a strong foundation of methods for teaching

these skills, considerations for teaching more complex intraverbals along with research on thoroughly and effectively teaching intraverbal prerequisites, should be explored further.

**Importance of the Intraverbal.**

Much of the research conducted on the intraverbal has examined the best ways to teach it, including the most effective prompts to use and whether novel intraverbals emerge following training in other operants such as the tact and listener response. Information that sheds light on effective strategies such as these are important, particularly given the extensive role intraverbals play in everyday verbal interactions (Sundberg & Sundberg, 2011). Indeed, intraverbals first begin to emerge around the time a child turns 1 ½ or 2 years of age and consist largely of simple fill-ins such as "Row row row your…" or "Old McDonald had a farm, E-I-E-I…" (Sundberg & Sundberg, 2011). However, intraverbals that form later in childhood make up the majority of our verbal interactions and include simple greetings, back and forth conversations, problem-solving, answering questions, and telling stories (Sundberg & Sundberg, 2011). Not only do intraverbals grow in complexity as children get older, but their development also depends on a strong foundation of echoics, mands, tacts, and listener responses surrounding concepts about which intraverbals are later learned and emitted (DeSouza et al., 2019). For example, in order to engage in intraverbal behavior around the concept, 'farm' and answer questions such as, "Who lives on a farm?" or What grows on a farm?" one must first be able to tact nouns such as, pig, cow, sheep, horse, farmer, and corn, and must also be able to tact verbs such as 'grow'. The necessity of these prerequisite skills prior to the development of intraverbals has been demonstrated by DeSouza and colleagues (2019) who examined the development of more complex intraverbals in children with autism and found that complex intraverbals only emerged without specific training when the child was able to tact items and actions related to the intraverbal questions and

concepts being probed, could identify as a listener response those same concepts, and could identify the intraverbal as a listener skill first (e.g., "Find the mammal from the savannah" in a field of pictures containing mammals and non-mammals, some of which are from the savannah and some which are not, before being asked, "Name some mammals from the savannah"). Understanding both the progression of skills that are learned prior to intraverbals, as well as the progression of intraverbal complexity is an important consideration when programming language targets for children with developmental delays. Without this knowledge, educators are at risk of programming difficult skills too early such that rote responses are learned with little meaning to the child.

The notion of building a strong base of responses before more complex language develops seems intuitive, and Palmer (2012) discusses these simple verbal operants in terms of verbal atomic repertoires, saying that a strong base of simple operants makes up strong generalized language, and that gaps in individuals' complex responding may be the result of insufficient and underdeveloped atomic repertoires. As such, verbal behavior interventions should begin by teaching simple verbal behaviors across all relevant operants such that verbal atomic repertoires are established and lead to greater adaptive and generalized language in the future.

**Feasibility for Implementation in Classroom Settings.**

Not only is it important to develop programs that can build verbal atomic repertoires, it is also necessary to consider the usability of such an intensive intervention. Indeed, developing and implementing verbal behavior programs can be cumbersome, and interventions are often implemented differently across programs and with inconsistent teaching strategies (Love, Carr, Almason, & Petursdottir, 2009). This is understandable given the immense amount of research

on ways to prompt when teaching each operant and the range of teaching strategies found in the literature that can make consistent implementation difficult. As a result, while Verbal Behavior Intervention has become more common in clinic and home-based therapy programs (Carr & Firth, 2005), the approach may not be streamlined enough to implement in other settings such as public early childhood special education (i.e. Part B) programs, not only because of their complexity, but particularly given the limited training preservice educators receive in ABA in undergraduate and graduate educator preparation programs (Loiacono & Allen, 2008).

Despite some hurdles, ECSE programs located in public schools may be an ideal alternative to home and clinic settings for the implementation of Verbal Behavior Intervention. Not only do children with developmental disabilities typically receive special education services in public early childhood classrooms, but these classrooms can also be optimal settings for generalization of skills due to the presence of typically developing peers with whom skills can be practiced. Additionally, the Individuals with Disabilities Education Act (IDEA) mandates the use of practices that improve the social and communicative skills of children with developmental delays (IDEA, 2004), and public ECSE classrooms can provide opportunities for rigorous amounts of daily intervention because of the number of hours per week that children spend in school (Lawton, Hannigan, & Ellawadi, 2014). As such, a line of research on a streamlined Verbal Behavior Intervention that is both easy to learn and implement in classrooms by educators may be a prudent consideration for verbal behavior researchers as the field progresses.

## Verbal Behavior Card Sort

One intervention that may be both easily implemented in a preschool classroom and comprehensive such that skills across multiple operants can be taught concurrently towards the development of strong intraverbals, is a verbal behavior card sort program (Carbone, 2017;

Miklos & Dipuglia, 2010). The verbal behavior card sort is a comprehensive verbal behavior program used to teach multiple skills across verbal operants in a developmentally appropriate sequence with the specific goal of building strong verbal atomic repertoires. It can be implemented on its own, or as a component of a child's early and intensive behavior intervention (EIBI) program generally through the use discrete trial teaching methods.

Teaching procedures used in a verbal behavior card sort occur within the three-term contingency of stimulus-response-consequence (Tincani et al., 2011). Within this contingency, a direction (i.e. stimulus) is presented along with a prompt, the child emits a response, and a consequence, such as reinforcement for the correct behavior, is delivered. During a teaching session, both target skills (i.e. new skills being taught) and mastered skills (i.e. skills the child already knows but which are periodically probed for maintenance purposes) are presented via card or object sort systems. Specifically, different colored 3x5 index cards are used to prompt the instructor on the operant within which a skill is being taught, and picture cards or objects are used to teach new tacts (i.e. vocabulary). Refer to Figure 1 for examples of 3x5 index cards from each operant. In addition, four groups of these cards or objects are used to guide instruction: one group consists of pictures of items the child has already mastered, the second consists of 3x5 index cards on which skills the child has already mastered are written, the third group consists of 3x5 colored index cards on which skills the child is currently learning are written, and the fourth consists of picture cards of items the child is learning to tact. Figure 2 provides an example of how the card sort system is set up for teaching sessions, however picture cards can be substituted for objects depending on the child's learning needs and preferences. When pictures are substituted for objects, objects for which the tact has been mastered are stored in one container,

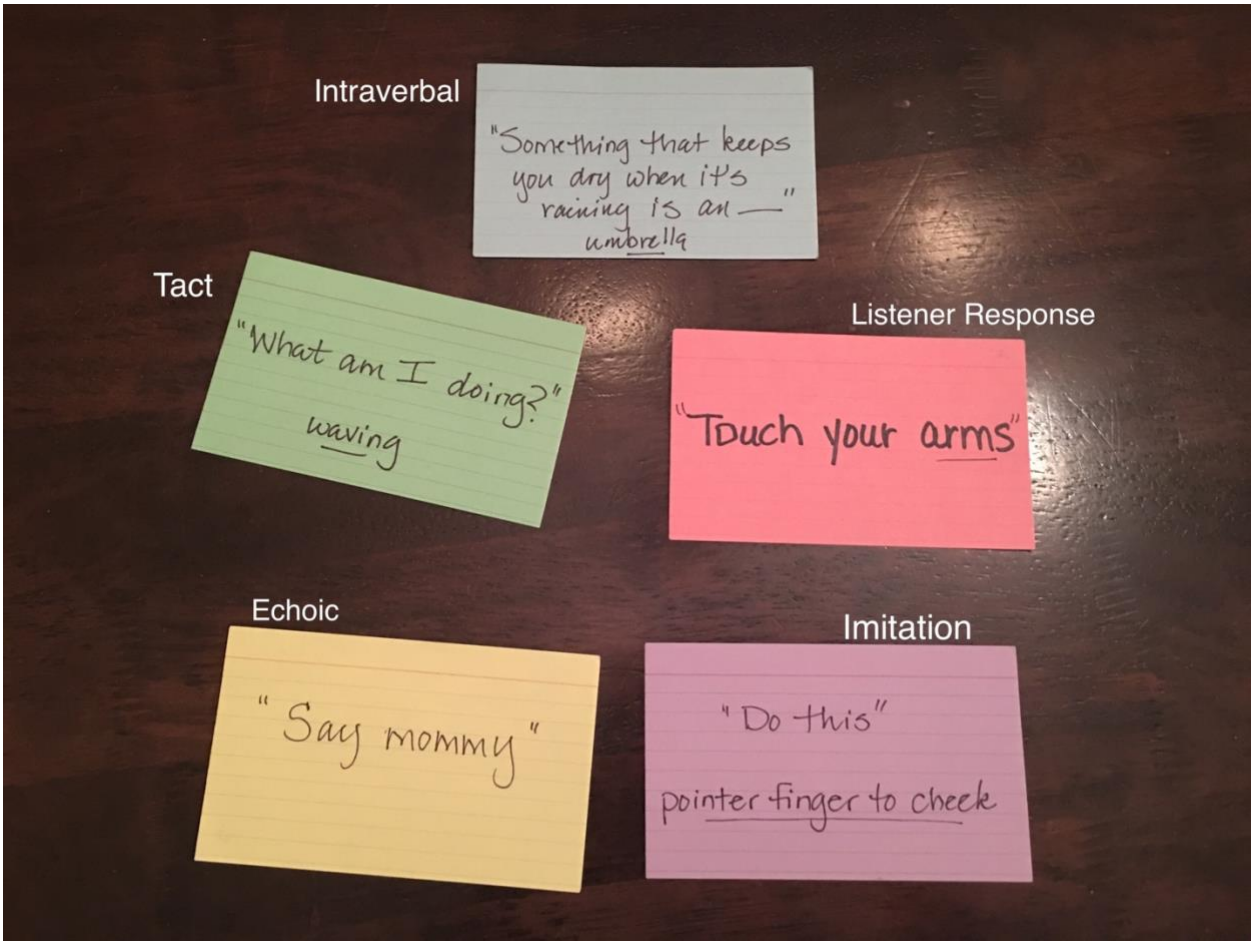


*Figure 1.* Sample 3x5 cards


*Figure 2.* Sample Card Sort System

and objects for which the child is learning the tact are stored in another (Miklos & Dipuglia, 2010).

The card sort is used specifically to drive instruction and is set up to allow for the following teaching considerations: a) delivery of both mastered and target items in an 80:20 ratio in which approximately 80% of trials are known items and 20% are target items, b) presentation of both target and known items from different operants presented in random order such that skill presentation is varied, and c) the use of a variable ratio schedule of reinforcement during which reinforcement can be delivered after an average number of trials during teaching sessions.

Additionally, two teaching procedures are used during the verbal behavior card sort: errorless teaching and error correction, both of which are described in detail below. Because an errorless teaching procedure is used during teaching sessions, there are no opportunities for unprompted responses from the child on target skills during teaching, and thus, no way to measure whether targets are being learned. Instead, all teaching sessions begin with a *cold probe* data collection session during which target skills are presented without a prompt and the child's response (i.e. correct or incorrect) is recorded. Once a child emits a skill's correct response during cold probe over three consecutive data days, the skill is considered mastered and is replaced with a new target. Once cold probe data has been taken and recorded, a new teaching session begins.

While there is of yet no research examining a comprehensive intervention that teaches skills across multiple operants, the specific teaching procedures used in this intervention have a strong evidence base and, when taken together, form the verbal behavior card sort. The remaining sections will provide the following: first, a detailed description of the teaching procedures used in the verbal behavior card sort and the evidence that supports them, and

second, the ways schools can support the delivery of verbal behavior programs in public preschool settings by educators.

## Teaching Procedures in a Verbal Behavior Card Sort

**Errorless teaching.** Errorless teaching procedures are instructional strategies designed to reduce the number of errors a child makes when learning new skills (Mueller, Palkovic, & Maynard, 2007). While the general purpose of an errorless teaching procedure is to transfer stimulus control from a prompt to the natural stimulus that controls the behavior, there are several benefits that can be gleaned by using such a procedure during teaching. Namely, errorless teaching strategies decrease the likelihood of errors being repeated and practiced, allow for more opportunities for reinforcement, decrease the likelihood that problem behaviors will occur due to the presence of excessive errors, can provide a more positive teaching experience for both the teacher and the learner, and increases the time available for instruction (Cooper, 1987).

There are several response prompt procedures supported by research that result in near errorless learning including most to least prompting, least to most prompting, graduated guidance, and time delay (Wolery & Gast, 1984). Most to least prompts involve the use of the most intrusive prompt needed to ensure a child emits a correct response, and then gradually fading that response over a number of teaching sessions until the skill is mastered. Likewise, least to most prompting involves allowing the student an opportunity to respond independently, and then providing a prompt that gradually increases in intensity as needed until a successful correct response is emitted. Graduated guidance requires extensive judgement on the part of the educator, who shadows the child's movements and provides physical prompting when needed. This level of prompting is then faded slowly over time as the child becomes more independent in their response. Finally, time delay involves transferring stimulus control from the response

prompt to the controlling stimulus via the use of a delay between the presentation of the discriminative stimulus and the controlling prompt.

Two types of time delay are identified in the literature and include constant time delay and progressive time delay (Cooper, Heron, & Heward, 2007). During progressive time delay, a systematically increased delay is placed between the discriminative stimulus and the controlling prompt until independent responses are given and the prompt is faded entirely. During a constant time delay, only two prompting procedures occur: a zero second delay during which there is no delay between the presentation of the discriminative stimulus and response prompt, and a three- or five-second delay during which a specified time delay is inserted to allow for an unprompted response.

***Simultaneous prompting.*** A fifth type of errorless teaching procedure called simultaneous prompting is used in the verbal behavior card sort and involves presenting the stimulus and the response prompt concurrently (Waugh, Alberto, & Fredrick, 2016). Simultaneous prompting resembles a zero-second time delay in that the presentation of the discriminative stimulus occurs concurrently with, or immediately before the presentation of the controlling prompt that ensures a correct response is emitted by the learner. By presenting the controlling prompt immediately, students are never given an opportunity to respond independently, and thus have no opportunity to make an error.

However, because there are no opportunities for independent responses during instructional sessions, simultaneous prompting also involves the use of daily probe trials that occur immediately prior to instructional sessions and which serve to assess whether control is being transferred from the response prompt to the natural stimulus. Daily probe trials involve presenting the learning task without a prompt to allow for an independent response from the

learner. Data is then collected on incorrect and correct responses and mastery criteria is set for a specified number of correct responses across daily probe sessions (i.e. a skill is considered mastered when the learner emits the correct response during three consecutive daily probe sessions).

Waugh and colleagues (2016) conducted a literature review that identified 35 studies examining the utility of simultaneous prompting for teaching a variety of skills. They found that 93% of the participants across studies reached criterion with the use of simultaneous prompting, and those who did not meet criterion still made gains in skill acquisition. While skills taught across studies varied, communication skills including expressive and receptive identification of items and the production of communicative manual signs were taught in seven, and results indicated that simultaneous prompting provides some advantages over other response prompting procedures. Namely, simultaneous prompting does not require changes in educator behavior as in other prompt procedures. Instead, the same type of prompt is used for every teaching trial involving the skills to which those prompts are matched, thus reducing the risk of procedural errors on the part of the educator (Waugh et al., 2016). Not only does it reduce educator errors, but simultaneous prompting also eliminates the need to keep direct data during instructional settings, which can be cumbersome during fast-past discrete trial instruction, and when teaching multiple students at one time.

***Transfer of stimulus control and use of distractor trials.*** While simultaneous prompting is the primary response prompt used in the verbal behavior card sort, the full errorless teaching procedure involves the following steps: *prompt, transfer, distract, check.* The *prompt* portion of the procedure consists of the simultaneous response prompt only, and the remaining three steps serve to both promote faster prompt fading and strengthen response generalization to

unprompted conditions. Specifically, the *transfer* trial, which occurs immediately after the simultaneous prompt, involves re-presenting the stimulus without a prompt as an initial attempt to transfer stimulus control from the simultaneous prompt to the discriminative stimulus. The same is true for the check trial, which is unprompted and serves as a further attempt at fading the response from the prompt to the natural stimulus (Miklos & Dipuglia, 2010).

The distractor trials, in which previously mastered items are presented without prompts, serve a number of functions including prompt fading, building skill fluency, and strengthening response differentiation (Miklos & Dipuglia, 2010). Indeed, the distractor trials serve an integral part of the prompt fading process during the errorless teaching procedure used in the verbal behavior card sort. Unlike other prompt fading procedures, there is no built-in method for fading the simultaneous prompt. Instead, time delays (Wolery, Gast, Kirk, & Schuster, 1988) are added to ensure faster prompt fading. However, because time delays involve wait time before another prompt is delivered, distractor trials are delivered as a way to reduce problem behavior during wait time and strengthen stimulus discrimination (Miklos & Dipuglia, 2010). Once distractor trials are delivered, the errorless teaching procedure ends with the check trial, which serves as the final attempt to fade the prompt to the unprompted discriminative stimulus.

**Error correction.** The error correction procedure used in the verbal behavior card sort is identical to the errorless teaching procedure, however an additional *end* step is added to the beginning that signals an incorrect response and the subsequent re-presentation of the discriminative stimulus and response prompt (Carroll, Joachim, St. Peter, & Robinson, 2015). During the *end* step, the instructor removes the stimulus and looks away for 1-2 seconds, effectively creating a time out from the availability or reinforcement.

This time out from reinforcement (Cooper et al., 2007) is an effective way of signaling that reinforcement is temporarily unavailable, particularly during a variable ratio schedule of reinforcement, which is the schedule of reinforcement used in the verbal behavior intervention program (described in further detail below). Because reinforcement is delivered after a set *average* number of trials (e.g., reinforcement is delivered after an average of five trials), responses become chained to this reinforcement schedule, and the *end* step, which signals a time out from reinforcement, serves as a brief punishment for an incorrect response.

The procedure of ending the session, re-presenting the stimulus and prompt, and waiting for a correct response from the learner has been found to be less efficient than other error correction procedures (e.g., model/demonstration only after an error is made; Kodak et al., 2016). However, while it may not be as efficient, strategies that allow for more opportunities to respond have been found to be more effective for skill acquisition and retention (Barbetta & Heward, 1993). Because the error correction procedure and errorless teaching procedure involve the same *prompt, transfer, distract,* and *check* steps, both procedures allow for multiple opportunities to respond to the stimulus, and specifically during the *prompt, transfer*, and *check* trials. Because more opportunities to respond is associated with higher acquisition and retention rates, providing response opportunities during all three steps during both instruction of new skills and when errors are made, ensures more skills are learned to fluency. Additionally, when mistakes are made on previously mastered skills, multiple opportunities to respond allow for stronger remediation of those errors so that mastered skills continue to be maintained (Barbetta & Heward, 1993).

**Interspersal of mastered skills.** Not only does the card sort involve the use of an error correction and errorless teaching procedure, but its format also allows for other notable teaching

considerations including the interspersal of mastered items and the ability to mix and vary the type of skill being presented. Historically, discrete trial instruction has employed two task presentation strategies: one in which several trials of an acquisition target are presented within the same skill (i.e. mass trial teaching [MTT]; Charlop, Kurtz, & Milstein, 1992; Lovaas, 1987) and another in which maintenance and other acquisition targets are taught together during one teaching session (i.e. interspersed trial teaching [ITT]; Volkert, Lerman, Trosclair, Addison, & Kodak, 2009). Research has demonstrated that while ITT does not result in faster acquisition of new targets as compared to MTT, and while MTT may actually be more efficient for teaching new target skills, ITT allows for the maintenance of previously acquired skills and for a reduction of challenging behavior during teaching sessions (Rapp & Gunby, 2016).

Indeed, there is a large body of research that supports interspersal of known items at rates as high as 70-90% of teaching trials when teaching skills such as sight words and object names (e.g., MacQuarrie, Tucker, Burns, & Hartman, 2002). Ratios as high as these support those used in a verbal behavior card sort which generally adheres to a known to target ratio presentation of 80:20 during a teaching session. In addition to including both known and target skills, research has also demonstrated the beneficial effects of mixing and varying different types of skills (e.g., skills across all operants being taught such as tacts, listener reponse, and intraverbals) in order to promote stimulus discrimination, faster responding, better attention to the task, and lower rates of challenging behavior (Dunlap & Koegel, 1980).

**Variable ratio schedule of reinforcement.** The final strategy used in the verbal behavior card sort is a variable ratio (VR) schedule of reinforcement. A VR schedule is used over other schedules because of its ability to promote strong and steady responding (Mace, Pratt, Zangrillo, & Steege, 2011). Specifically, when reinforcement is delivered at a variable rate during which

children are reinforced after an *average* number of trials, they tend to remain more engaged and are more active learners during teaching sessions. The use of a VR schedule of reinforcement is particularly conducive to the card sort system because of the ease by which it can be implemented. Once a child's VR is decided upon, the educator providing instruction must only remember to deliver reinforcement after an average number of trials matching the VR schedule. Additionally, under these conditions, responses become chained to this reinforcement schedule and each trial within the card sort serves as the prior trial's reinforcement until more tangible or social reinforcement is delivered at the end of the sequence.

**Sequence of skills to teach.** Given the combined errorless and error correction teaching strategies, the use of a schedule of reinforcement, the need to mix and vary skills within operants and intersperse knowns and target items, and the range of verbal behavior skills taught, the necessity for a program that allows for easy implementation is clear. However, ease of implementation is not the only consideration, and an in-depth understanding of skills to teach depending on a child's communicative abilities and the order in which to teach them is equally as important. Table 3 provides an overview of skills to teach and their order, however a partial outline of this progression is presented here.

When setting up a verbal behavior program for a child, Sundberg's (2008) Verbal Behavior-Milestones Assessment and Placement Program (VB-MAPP) is generally the most effective first step in determining where a child's language skills fall in relation to the language of children who are typically developing. The VB-MAPP is a criterion-referenced assessment and progress monitoring tool based on Skinner's (1957) analysis of verbal behavior. In addition to the analysis of verbal behavior, it also draws from research on developmental milestones that are generally met during typical development, and on research in applied behavior analysis. The

Table 3

*Verbal Behavior Teaching Progression*

| Operant | Level on the VB-MAPP | | |
|---|---|---|---|
| | Level One | Level Two | Level Three |
| Echoic | Purposes of articulation and larger repertoire of vocal skills.<br>• Items that will later be taught as mands and tacts<br>• Sounds for articulation goals as identified by an SLP | Purposes of articulation<br>• Sounds for further articulation goals. | NA |
| Mand | • Objects,<br>• Actions<br>• Activities | • Expand mands for items, actions, activities (100+ or when mands emerge without direct teaching)<br>• Mands for missing items<br>• Spontaneous mands (object/activity not present)<br>• Two-component mands (noun-verb, noun-adjective)<br>• Y/N mands (“Do you want__?” | • Mands for removal of aversive stimuli<br>• Mands for attention<br>• Mands for information |
| Tact | • Simple nouns<br>• May need to teach multiple exemplars | • Expand tacts for items<br>• Tacting actions<br>• Tacting parts and features of items<br>• Tacting class (animals, fruit, vehicles)<br>• Two-compondent tact (noun-verb and adjective-noun)<br>• Tact adjectives and prepositions | • Expand tacts for adjectives and prepositions<br>• Tact of pronouns<br>• Tact at least four aspects of items when presented with rotating questions about them.<br>• Tact private events |

| | | | |
|---|---|---|---|
| Intraverbal | NA | • Yes/No tacts<br>• Fill-in phrases (songs animal sounds, simple fill-ins)<br>• Answers personal information<br>• Intraverebal by feature, function, and class<br>• Simple what, who, and where | • Increase and expand intraverbals by feature, function, and class<br>• Repond to WH questions<br>• Answer intraverbals yes/no<br>• Describe events and stories<br>• Answer questions about a story read<br>• Answer multiple questions regarding a specific topic |
| Listener Response | • Discrimination skills/simple nouns<br>• Actions in context (rock the baby, sit at circle area) | • Discriminating items in larger fields, messy arrays, books, and natural contexts<br>• Expand motor actions on command<br>• LR of parts and features<br>• Follow instructions involving adjectives and prepositions<br>• Follow 2-3 component instructions | • Discriminate 3-4 component non-verbal combinations (e.g., find the pink animal that lives on a farm)<br>• Follow instructions involving pronouns and adverbs<br>• Discriminate among common social situations and emotional states |
| Motor Imitation | For the purpose of a generalized imitative repertoire and to teach skills which can later serve as prompts for manual signs and listener response skills.<br>• With objects<br>• Without objects | • Fine motor imitation<br>• Imitation fluency<br>• Multiple step imitation (not always necessary when child has developed | NA |

| | | | |
|---|---|---|---|
| | | generalized one-step imitation) | |
| Match to Sample | • Identical items<br>• Beginning of non-identical items | • Match non-identical items<br>• Sorting into categories<br>• Matching in the natural environment<br>• Replicating and extending sequence patterns | • Soring more complex categories<br>• Matching models of art/craft activities.<br>• Continue patterns and sequences |

tool serves as a guide for intervention planning with a specific focus on supporting language and social communication skills and measures the language and social skills that typically develop by the time a child reaches the age of four. The VB-MAPP includes 170 developmentally sequenced measurable learning and language milestones skills, and items are clustered across three levels: Level One encompasses skills a child typically acquires between the ages of 0-18 months, Level Two encompasses skills acquired between 18-30 months, and Level Three encompasses skills acquired between 30-48 months.

Once a child's level of language (i.e. level one, two or three on the VB-MAPP) is assessed, other important considerations are necessary when developing goals. At level one, children should first be taught to mand for simple items, activities, and actions and imitate motor movements with and without objects. An imitation program may serves to both establish a generalized imitative repertoire, develop responses that may serve as prompts for future listener response targets such as listener response of nouns and actions, and may serve as future prompts for mands and tacts in the case of students who utilize sign language as a response form. Other skills to teach at level one are match to sample of identical items, simple listener response skills in context (e.g., "rock the baby" when playing with dolls or "sit on the floor" during circle time at school), and echoics when necessary to address both articulation and to develop a larger vocal repertoire. As soon as a child is ready, tacts of common items should be introduced along with listener response of nouns during which the child selects a correct response from a field (e.g., when told to find the dog, the child will select the dog from a field of multiple pictures or objects).

At level two, a manding program should be continued such that children can request 100 or more items, actions, or activities, or can learn novel mands without direct teaching. During

this time, mands can be expanded to consist of 2-3 words instead of simple one-word requests (e.g, noun-verb, noun-adjective, noun-verb-adjective) and should include teaching yes/no mands. In addition, care should be taken to increase a child's rate of manding and ablity to mand for missing items (e.g., "Where is the remote", or "I need some scissors" when doing arts and crafts). At level two, tacts of nouns should continue to be expanded until a child can tact 100 items or more, at which point tacts of actions can be introduced followed by tact of parts and feature (e.g., a child can tact a bus, and then learns to tact wheels and wipers). All of these skills are then followed by tacts of class (e.g., shown a group of animals and the child tacts, "animals"), two component tacts (noun-verb and noun adjective), and tacts of adjectives, preopositions, etc. This detailed progression of skill acquisition continues across operants and into intraverbals, which begin with fill in responses for items such as songs or animal sounds followed by responding to personal information, answering intraverbals regarding features, functions, and classes of items, and answering who, what, and where questions, and finally the ability to describe events and stories, answer questions about a story, or answer multiple questions about a single topic. More information can be found in Table 3 on page 32, however it is necessary to consider this level of detail when programming language goals for a child such that sufficient prerequisite skills are learned prior to the introduction of intraverbals, and so intraverbals can begin to emerge spontaneously and can be taught when necessary. Without considering a strong mand, tact, and listener response repertoire that includes more than just tacts and listener response of simple nouns, necessary prerequisites may not develop.

While the VB-MAPP provides a general picture of the language skills a child possesses, it does not provide a method for determining the exact skills within various operants a child already knows (e.g., the nouns and actions a child is able to tact, or the actions a child is able to

demonstrate as a listener) and which skills should be taught. To assess specific skills within each operant, Language Builder Cards by Ages and Stages, which includes pictures of 300 common nouns, can be used to assess which nouns the child is able to tact or identify as a listener. Additionally, comprehensive lists of common actions (e.g., sitting, walking, running, jumping, blowing, clapping) and simple intraverbal fill-ins and WH questions (e.g., "You brush your__" and "What do you wear on your feet?") can be found on verbal behavior websites such as the one belonging to the VB-MAPP to assess specific skills within operants. Once it is determined which skills a child knows, additional items can be targeted as part of the verbal behavior card sort. Finally, skills targeted for intervention should be chosen specifically for the purposes of programming for generalization. When teaching new language skills to any child, it is important to consider the vocabulary they contact regularly in their everyday environments and routines. As such, interviews of children's families and educators should be conducted so feedback can be given on the toys and activities the child enjoys, foods they eat, and any other items they use regularly during routines.

## Social Validity for Educators in Classrooms

When presented in a card sort format, consistent use of the above teaching procedures can be easily implemented by educators, even when extensive training in ABA and its principles has not been previously received. Additionally, a program in which the materials drive instruction such that teaching becomes less cumbersome and allows for intensive instruction, even in classrooms with high adult to child ratios, may be an invaluable tool if proven to efficiently increase verbal behavior skills across operants.

While a verbal behavior card sort does require some knowledge of the basic principles of ABA, the verbal operants, and methods for teaching them, initial limited knowledge of these

topics do not necessarily preclude it from being implemented in ECSE classrooms. Indeed, Patry and colleagues (in review) found that educators teaching in reverse mainstream classrooms (i.e. 50:50 ratio of typically developing children to children receiving special education services) were able to implement the verbal behavior card sort with high rates of fidelity after a half day training and approximately two weeks of coaching. Additionally, Patry and Troxel (in progress) also found that with the same training and coaching, along with some additional training on the progression of skills to teach within each operant as outlined in Table 3, a preschool educator was able to implement a comprehensive verbal behavior program and identify appropriate operants to target and the skills therein to teach, to successfully implement a verbal behavior card sort with children in her classroom possessing a range of language abilities.

While preliminary, these findings are an important beginning towards demonstrating the components of training needed such that educators in ECSE classrooms are able to implement intensive ABA-based interventions in their classrooms. Moreover, the classrooms in both studies were not "self-contained" such that their focus was on intensive interventions through the use of low adult to child ratios. Instead, they were carried out by educators whose classrooms had large numbers of children (i.e. 12-16) and high adult to child ratios as a means of demonstrating the usability of the verbal behavior card sort in classrooms geared towards a more unified, inclusive model of early childhood education.

## Conclusion

Given the holes in the Verbal Behavior Intervention research surrounding the formation of more complex intraverbals, future research should examine specific verbal behavior interventions such as the card sort for teaching a strong atomic repertoire of verbal skills across operants such that more complex intraverbals can emerge. Additionally, the field of behavior

analysis should continue to publish on and promote specific verbal behavior interventions that are streamlined enough such that they can be implemented in ECSE and other public, special education programs with fidelity. Due to the wide range of services that children with developmental disabilities receive in public special education programs, interventions with high social validity that can be implemented without extensive training, certifications, or degrees in ABA are a valuable tool that, when implemented by educators in classrooms, may have far-reaching benefits for children who receive services in these settings.

# Chapter 3: Methods

## Participants

Three early childhood special educators were recruited from public school district early childhood special education (ECSE) classrooms in a midwestern metropolitan area after obtaining approval by the appropriate institutional review board (IRB). See Appendices A through C for review board approval letter and parent/child and educator consent forms. Each of the three educators then identified a child based on the following inclusion criteria: eligibility for early childhood special education services under the IDEA category of Developmental Delay or Autism and significant language delays as documented by school evaluation reports. All activities with educators and children began after obtaining educator and parent consent.

**Children.** Three children with developmental delays participated in this study. All three attended preschool in their local public schools where they were enrolled in ECSE classrooms, and all three qualified for early childhood special education services under the IDEA category of Developmental Delay. Additionally, each child received speech and language services due to significant language delays as documented by school evaluation reports. All three attended an ECSE program consisting of approximately 50% children with disabilities and 50% children who were typically developing, and each child had been in their respective educator's classroom since starting preschool at the age of three. Finally, none of the three children was receiving services outside of their special education preschool program during the study and had not previously participated in or received verbal behavior-based interventions.

Lisa was a five-year-old African American female who received special education services starting at the age of three. Lisa spoke in one-word utterances, could label some items in her environment, and request some wants and needs spontaneously. Lisa generally required

prompts to make requests, initiate with others, and participate in group activities. Lisa fell on the upper end of level one of the Verbal Behavior-Milestones and Placement Program (VB-MAPP; Sundberg, 2008) and possessed a vocabulary approximately equal to an 18-month-old child. Lisa attended the ECSE preschool in the morning and a private childcare in the afternoon.

Cora was a five-year-old African American female who received special education services starting at the age of three and infant/toddler (i.e. Part C) services prior to that. Cora spoke in one-word utterances and requested some items in her environment. She typically did not engage in other verbal communication other than to request items for which she knew the name. Cora fell in the middle range of level one on the VB-MAPP and possessed a vocabulary approximately equal to a 12-month-old child. Cora attended her public, ECSE program in the mornings and in the afternoons was at home with a parent.

Lilah was a four-year-old Caucasian female who received preschool services beginning at the age of three and infant/toddler services prior to that. Lilah could say a few words prior to the start of this study, however most of her verbalizations consisted of unintelligible jargon. She infrequently initiated with adults and peers. Lilah fell in the middle range of level one on the VB-MAPP and possessed a vocabulary approximately equal to that of a 12-month-old. Lilah attended her ECSE classroom in the morning and spent the remainder of her day at home with a parent.

**Educators.** Three early childhood special educators participated in this study and implemented a comprehensive verbal behavior intervention program with one of the child participants. All three worked in public, inclusive ECSE (i.e. reverse mainstream 50/50) classrooms, and all three were female and identified as Caucasian. Susan, Lisa's teacher, held a bachelor's degree in early childhood special education and had been teaching in an ECSE program for three years at the time of this study. Prior to her position in ECSE, Susan taught for

two years in Head Start and was an educator at a private childcare program for three years with children ranging in age from six weeks to five years. She was also a paraeducator in a school for children with significant (i.e. low incidence) disabilities for three years prior to her years as an educator. Michelle, Lilah's teacher, held a masters degree and endorsement in early childhood special education and had been teaching ECSE for 16 years. Finally, Kate, Cora's teacher, held a bachelor's in English Literature with an emphasis in elementary education and a masters in education with the state's early childhood/early childhood special education blended license. She taught first and second grade for 14 years and had been teaching ECSE education for five years at the time of this study.

**Settings and Materials**

Both baseline and intervention sessions took place in the child's ECSE program. Lisa received instruction from Susan in her classroom on the floor in the reading/book area during centers time. Cora received instruction from Kate during centers time at a table in a room used for multiple purposes such as therapy services and some large group activities. Lilah received instruction from Michelle at a desk in her classroom during an activity her teacher called 'table top activity time' in which toys and other activities were placed on tables for the children to play with in the morning while waiting for their classmates to arrive.

To implement each child's intervention program, a set of picture cards, objects when picture cards were inappropriate, and 3x5 colored index cards were used. The objects and pictures varied by child due to their different language skills and targets, however all materials consisted of either a set of picture cards and objects that could be found around the classroom. Additionally, other items and activities enjoyed by each child were used either as reinforcers during instruction or used as items for which the child could learn to mand. A video recorder that

could easily be plugged into a computer was used to videotape teaching sessions between the educators and their students.

The Verbal Behavior – Milestones Assessment and Placement Program (VB-MAPP; Sundberg, 2008) is a criterion-referenced assessment and progress monitoring tool based on Skinner's (1957) analysis of verbal behavior and was used in this project to both assess the language ability of each child and to develop each child's verbal behavior intervention program. In addition to the analysis of verbal behavior, it also draws from research on developmental milestones that are generally met during typical development, and on research in applied behavior analysis. The tool serves as a guide for intervention planning with a specific focus on supporting language and social communication skills and measures the language and social skills that typically develop by the time a child reaches the age of four. The VB-MAPP includes 170 developmentally sequenced measurable learning and language milestones skills, and items are clustered across three levels: Level one encompasses skills a child typically acquires between the ages of 0-18 months, level two encompasses skills acquired between 18-30 months, and level three encompasses skills acquired between 30-48 months. Skills assessed include mand, tact, echoic, intraverbal, listener, motor imitation, independent play, social and social play, visual perceptual and match-to-sample, linguistic structure, group and classroom skills, and early academics. Skills are assessed via direct assessment and observation resulting in a general profile of a child's language ability.

**Experimental Design**

A multiple baseline design across participants was used to measure cumulative growth in each child's verbal behavior skills once implementation of a verbal behavior card sort began (Gast, Lloyd, & Ledford, 2014). During the intervention, approximately four to seven verbal

behavior skills are taught at a time. Skills are not considered mastered until the child has demonstrated the correct response three consecutive days in a row during daily cold probe data collection sessions. Because each skill may take several days to learn, single-case design research on verbal behavior interventions may take several months, and progress is demonstrated over longer periods of time with less immediacy. As a result, the first child remained in the baseline phase for three weeks before moving to intervention to demonstrate a stable baseline that would adequately contrast with the relatively slow increase in skill acquisition during the intervention phase. Each subsequent child was moved to intervention after an additional week had lapsed provided there was no growth in verbal behavior skills for three consecutive weeks during baseline. Because of the relatively slow growth in language skills and a need for a flat trend during baseline before intervention began, data was reported weekly and each child did not move to intervention if they gained one or more verbal behavior skills during the prior week. Instead, if a child gained one or more skills during a single week in baseline, they remained in baseline until three weeks passed with no additional skill acquisition.

**Dependent Variable**

The dependent variable in the study was the cumulative number of verbal behavior skills each child mastered during verbal behavior intervention during the course of this study. Depending on each child's language skills, the specific operants under which skills were taught varied, however growth in verbal behavior skills was tracked the same way. Lisa began the study learning skills within the mand, tact, and listener response operants and specifically tacts of nouns and listener response of actions. By the end of the study, she was also beginning to tact actions and verb-noun combinations. Cora started off the study learning skills within the mand, tact, imitation, and listener response operants. Specifically, Cora began the study learning skills

related to manding for items, motor imitation with objects, listener response of actions and nouns, and tacts of nouns. By the end of the study she was no longer learning new imitation skills or listener response of nouns, and was beginning to tact some actions for which she could demonstrate the action as a listener response. Finally, Lilah began the study learning mands, listener response of nouns and actions, and tact of nouns and simple actions. By the end of the study she was also learning listener response of verb-noun combinations.

**Independent Variable**

The independent variable was a comprehensive verbal behavior intervention program in which each child's language skills were assessed and language targets across all relevant operants were taught in a developmentally appropriate sequence. Specifically, each child's language was assessed using the VB-MAPP (Sundberg, 2008) and appropriate operants were targeted based on their skills. For children whose language is equivalent to that of a 12 to 18-month-old, operants typically targeted for instruction are mands, tact of nouns, and listener response of actions. Depending on a child's verbal and motor imitation skills, imitation and echoics may be targeted as well. For children whose language skills are more intact and whose vocabularies are relatively large, tacts of actions and verb-noun combinations, and intraverbal skills are introduced. Given the language abilities of the children in this study, targeted skills generally included mands, some imitation, tacts of nouns, and listener response of actions.

In general, a verbal behavior card sort can be delivered across as many sessions a day as deemed appropriate by a child's parents and educational team. For the purposes of this study, instruction was delivered during one, 15-minute session per day, four times per week for approximately five months.

**Teaching procedures.** Teaching procedures used in a comprehensive verbal behavior intervention program occur within the three-term contingency of stimulus-response-consequence (Tincani et al., 2011). Within this contingency, a direction (i.e. stimulus) is presented along with a prompt, the child emits a response and a consequence, such as reinforcement for the correct behavior, is delivered. During verbal behavior intervention both target (i.e. new skills being taught) and mastered skills (i.e. skills the child already knows but which are periodically probed for maintenance purposes) are presented via card or object sort systems (Miklos & Dipuglia, 2010). Two primary teaching procedures, errorless teaching procedure and the error correction procedure, are used. Both procedures involve presenting a stimulus, prompting a correct response, evoking or waiting for an unprompted response, and providing reinforcement. The errorless teaching procedure consists of a prompt, transfer, distract, and check and is used to teach new skills while ensuring children exhibit the expected or correct response without making errors. The error correction procedure ensures a child's errors are immediately corrected to reduce the likelihood of future errors. Error correction procedures are used when an error occurs for a skill the child already knows and involves the following steps: end, prompt, transfer, distract, and check. These steps are identical to those for the errorless teaching procedure, however the additional step of "end" is added to the beginning of the sequence as a means of stopping the teaching and re-presenting the stimulus. Thus, the skill for which an error occurred is immediately corrected and taught errorlessly.

**Variable ratio schedule of reinforcement.** In addition to the error correction and errorless teaching procedures, maintenance of a variable ratio (VR) schedule of reinforcement is used to reinforce student responses during a verbal behavior intervention (Mace et al., 2011). During a VR schedule of reinforcement, reinforcement is delivered after an average number of

trials (e.g., a VR of five would indicate reinforcement after an average of five trials during a teaching session). Delivering reinforcement after an average number of trials as opposed to a fixed number (e.g., reinforcement is always delivered after five trials) keeps responding strong and steady.

**Card and object sort system.** Figures 1 and 2 in Chapter Two, pages 22 and 23 display the materials used to guide instruction during verbal behavior intervention. Different colored 3x5 index cards are used to prompt the instructor on the operant within which a skill is being taught. Specifically, listener response skills are written on pink cards, imitation is written on purple, echoics on yellow, intraverbals on blue, and tacts that cannot be taught with pictures and objects are on green. Additionally, four groups of cards are used to guide instruction. One group consists of pictures of items the child already knows, the second consists of cards on which skills the child already knows are written, the third group consists of skills the child is currently learning, and the fourth consists of picture cards of items the child is learning to tact. In addition, picture cards can be substituted for bins containing objects. One bin holds objects for which the child has already learned the tact, and the other holds target items for which the child is learning the tact.

During a teaching session, educators use the card sort to deliver trials for mastered items and target items in an approximate 80:20 percent ratio in which approximately 80% of the trials are known items and 20% are target items. Having a mixture of target and known items that fall across different operants and which are placed in random order in each group also allows for mixing and varying of skill presentation during instruction. Finally, instruction is delivered via multiple run-throughs that begin with the presentation of the first trial, continues with a number of trials that varies depending on a child's variable ratio schedule of reinforcement, and ends

with the presentation of a reinforcer. A run through can consist of the presentation of a target skill via the errorless teaching procedure and one or more mastered items, mastered items alone, or one target skill alone. A run through typically ends with delivery of reinforcement after the check trial of the errorless teaching procedure when a target item is being taught.

**Procedures**

**Educator training.** Susan participated in a study conducted by Patry, Horn, Martinez, and Bross (in review) in which educators were trained via a four-hour training and on-going coaching in the implementation of a comprehensive verbal behavior intervention program. Likewise, Kate participated in a pilot study in which she received the same training session and coaching. As a result, both Susan and Kate previously demonstrated the ability to implement a verbal behavior program with fidelity. Michelle, however, had not received training and thus participated in the same four-hour training provided to Susan and Kate and in two practice sessions prior to the start of this study.

The four-hour training consisted of a presentation and introduction of the verbal behavior intervention materials (i.e. colored index cards with sample targets across all operants and picture cards) and included information on the three-term contingency (i.e. antecedent-behavior-consequence), motivation, the verbal operants, variable ratio schedule of reinforcement, and the errorless and error correction teaching procedures. See Table 4 for a detailed description of topics covered in the training. In addition, each educator practiced implementing the card-sort system and teaching procedures with the author during the training and had the opportunity to practice implementing targets across all operants. Finally, each educator implemented the card sort system until they correctly displayed 100% of the steps in both the errorless teaching procedure and error correction procedure two consecutive times.

Table 4

*Topics Covered in Verbal Behavior Training*

| Intervention Training Topic |
| --- |
| Three-term contingency of Antecedent-Behavior-Consequence |
| Three-term contingency: Examples |
| Reinforcement: positive and negative |
| Punishment |
| Three aspects of the antecedent: motivation, discriminative stimuli, prompts |
| Why do we use prompts and how do we pick them?<br>• Prompts ensure the desired behavior will occur<br>• When it occurs, we can reinforce |
| The verbal operants: mand, tact, echoic, intraverbal |
| Other relevant operants: listener response, imitation |
| Examples and practice: The verbal operants |
| During discrete trial teaching, prompted trials include the prompt and the discriminative stimulus |
| Introduction to transfer trials: In discrete trial teaching, prompts are removed via a transfer trial |
| Examples of prompts in verbal behavior intervention:<br>• Echoic to tact<br>• Tact to intraverbal<br>• Imitation to receptive<br>• Gestural to match to sample<br>• Physical to imitation<br>• Gestural to receptive |
| Overview of errorless teaching: Why is it important |
| Use of prompts in errorless teaching and fading prompts through transfer trial. |
| Errorless teaching procedure: prompt, transfer, distract, check |
| The distract trial: purpose and skills used for distract trials |
| Check trial: purpose |
| Delivery of reinforcement directly after check trial |
| Card/object sort system<br>• Colored 3x5 cards and picture cards/objects<br>• Known picture and 3x5 cards<br>• Target skill 3x5 cards<br>• Target picture cards/objects |
| Error correction procedure: used on previously mastered skills on which an error is made |
| Error correction procedure: End, prompt, transfer, distract, check. |
| Types of errors: Incorrect response, no response, self-correction |
| Structure of verbal behavior intervention<br>• Card sort<br>• Run through: Sequence of trials beginning with the first discriminative stimulus and ending with reinforcement. |
| Variable ratio schedule of reinforcement<br>• Rationale for its use during verbal behavior intervention sessions |

Practice errorless teaching procedure

- Practice until it was done correctly two times in a row.

Practice error correction procedure

- Practice until it was done correctly two times in a row.

Coaching for Susan and Kate took place in real time directly after each data collection session during the intervention phase of the study and consisted of corrective feedback when mistakes were made during the intervention session. Specifically, if a mistake was made on a teaching procedure during the data collection session, the mistake was discussed, the correct procedure was identified, and practice opportunities were provided. Finally, any questions posed by teachers were answered and discussed. Because Michelle did not participate in a prior study in which coaching was involved, she did not receive coaching and instead participated in two practice sessions with the researcher to ensure her ability to implement each teaching procedure. In addition, Michelle went on medical leave for six weeks during the intervention phase, and the student teacher in her classroom implemented the intervention in her place. Because this implementer switch was made quickly, the student teacher also only received the four hour training and did not receive coaching.

**Assessment of language skills.** Assessment was conducted in each child's classroom using the VB-MAPP and involved observation and direct assessment of language skills using picture cards and toys found around the classroom. Specifically, each child worked with the author and her educator one on one during convenient times based on the classroom schedule and routines. Language skills across operants were probed during both naturalistic play-based and discrete trial activities to determine the language skills the child possessed.

While the VB-MAPP provides a general picture of the language skills a child possesses, it does not provide a method for determining the exact skills within various operants a child already knows (e.g., the nouns and actions a child is able to tact, or the actions a child is able to demonstrate as a listener) and which skills need to be taught. To assess specific skills within each operant, Language Builder Cards by Ages and Stages, which includes pictures of 300 common

nouns, were used to assess which nouns the child could tact or identify as a listener. Additionally, comprehensive lists of common actions (e.g., sitting, walking, running, jumping, blowing, clapping) and simple intraverbal fill-ins and WH questions (e.g., "You brush your__" and "What do you wear on your feet?") were used to assess specific skills within operants. Once it was determined which skills a child knew, more skills could be targeted as part of the verbal behavior card sort. Finally, skills targeted for intervention were chosen specifically for the purposes of programming for generalization. When teaching new language skills to any child, it is important to consider vocabulary they contact regularly in their everyday environments and routines. As such, each educator gave feedback on the toys and activities their child enjoyed in the classroom such that nouns and verbs from those could be targeted for intervention. Likewise, other vocabulary each child came in contact with daily such as backpack, simple body parts, or vocabulary from daily routines such as fork, bathtub, or hairbrush were chosen so that new skills were more likely to generalize to the natural environment.

**Measurement of dependent variables.** Based on results of the VB-MAPP assessment, 1-2 skills from each applicable operant were chosen and taught using the comprehensive verbal behavior intervention program. As each of these skills were mastered, they were replaced by another skill within that operant. Data collection was carried out via daily cold probe data in which each target skill was assessed prior to the start of the teaching session. During data collection, each target was presented to the child without prompts. Once the child correctly responded to a target three consecutive days in a row during cold probe, the target was considered mastered. Appendix D contains both a blank copy of the cold probe data sheet and a copy of a completed data sheet from this study. Weekly cumulative gains in verbal behavior skills were then graphed to for each operant to demonstrate growth in discrete verbal behavior

skills. Finally, each learned skill was tracked on a skills tracking sheet, which were separated by operants. Refer to Appendices F and G for copies of sample and completed graphs and skills tracking sheets respectively.

**Baseline phase.** After assessment of each child's language abilities, skills from across the applicable operants were chosen on which data was taken daily, but which were not taught during verbal behavior intervention teaching sessions each day. Because the baseline phase lasted three weeks or more for each child, and in an effort to ensure instruction was not withheld, a second set of skills was chosen, taught, and then replaced as they were mastered throughout the baseline phase. As such, daily data was collected on the target skills chosen specifically for the purpose of this study and on a second set of skills that could then be taught during verbal behavior instruction so that learning could progress. Table 5 lists both the skills that were taught and those which were not taught during the baseline phase for each child.

**Intervention phase.** Once the children moved into the intervention phase, the five skills that remained in baseline were then taught during verbal behavior intervention teaching sessions. As these original five targets were mastered according to daily data collection procedures, they were replaced by new skills as the intervention phase progressed.

**Generalization.** Once the school year and intervention phase ended, a list was created of all the skills mastered by each child. The author then observed each child in their classroom setting during typical classroom routines for a total of three hours over the course of three different observations. When an opportunity to emit a learned skill arose, the skill was marked with either a plus or minus to indicate whether the child emitted the skill correctly. Additionally, each child's parent was sent a list of the skills their child learned during the study and were asked to mark the skills they had seen their child use at home.

Table 5

*Baseline Skills Chosen for Each Child*

| Child | Verbal Behavior Skills Chosen at Baseline | Verbal Behavior Skills Taught Throughout Baseline |
|---|---|---|
| Lisa | Listener Response of action-Blowing | Echoic-Say, "Skirt" |
| | Listener Response of action-Blinking | Listener Response of Noun-Chin |
| | Tact of noun-Broom | Tact of Noun-Knife |
| | Tact of noun-Cheese | Tact of Noun-Fork |
| | Tact of noun-Pan | Tact of Noun-Skirt |
| | | Intraverbal-"A Horse Says__" |
| | | Tact of Noun-Bathtub |
| | | Intraverbal-A cat says___" |
| | | Tact of noun-Sink |
| | | Tact of noun-Pillow |
| | | Tact of noun-Eyes |
| | | Listener Response of Nouns-Fingers |
| | | Tact of Noun-Soap |
| | | Tact of Noun-Comb |
| | | Tact of Noun-TV |
| | | Tact of Noun-Fingers |
| | | Listener Response of Noun-Knee |
| | | Tact of Noun-Neck |
| | | Tact of Noun-Stairs |
| | | Tact of Noun-Teeth |
| | | Listener Response of Action-Clapping |
| | | Tact of Actions-Clapping |
| | | Tact of Actions-Crying |
| | | Listener Response of Noun-Cheeks |
| | | Tact of Noun-Brush |
| | | Tact of Noun-Milk |
| | | Tact of Noun-Bunny |
| | | Tact of Action-Coughing |
| | | Listener Response of Noun-Elbow |
| Cora | Tact of noun-Wagon | Tact of Noun-Bathtub |
| | Tact of noun-gloves | Imitation-Stir cup with spoon |
| | Tact of noun-Bike | Listener Response of Action-Clapping |
| | Tact of noun-Stairs | Tact of Noun-Shirt |
| | Listener Response-Arms up | Listener Response of Action-Stomping |
| | Listener Response-Waving | Listener Response of Action-Jumping |
| | Listener Response-Nose | Listener Response of Action-Sitting |
| | | Tact of Noun-Slide |
| | | Tact of Noun-Backpack |
| | | Imitation-Shake Maraca |
| | | Imitation-Rub Hands Together |
| | | Tact of Noun-Glue |

| | | |
|---|---|---|
| | | Imitation-Push Car<br>Imitation- Waving<br>Tact of Noun-Sink<br>Tact of Noun-Eyes<br>Imitation-Arms out Front<br>Tact of Noun-Crayons<br>Imitation-Hands on Head<br>Imitation-Tapping<br>Tact of Noun-Bed<br>Tact of Noun-Play Doh<br>Tact of Noun-Shoes |
| Lilah | Tact of noun-Socks<br>Tact of noun-Couch<br>Tact of Action-Sneezing | Tact of Noun-French Fries<br>Listener Response of Actions-Sleeping<br>Tact of Noun-Candy<br>Tact Action-Dancing<br>Tact of Action-Clapping<br>Listener Response of Action-Eating<br>Tact of Action-Shorts<br>Tact of Noun-Bread<br>Tact of Noun-Chicken Nuggets<br>Tact of Action-Sitting<br>Listener Response of Actions-Sitting<br>Tact of Noun-Duck<br>Tact of Noun-Watermelon<br>Tact of Noun-Grapes<br>Tact of Noun-Pants |

**Fidelity of intervention implementation.** Fidelity of implementation of both the errorless teaching procedure and error correction procedure was taken during at least 20% of sessions during the intervention phase. Because cumulative gains in verbal behavior skills are reported weekly, percentages of fidelity of implementation are presented weekly as well. Specifically, teaching sessions were recorded daily for 20% or more of the weeks during the intervention phase across educators. Additionally, because the errorless teaching procedure and error correction procedures contain four and five steps respectively, percentage of steps carried out correctly and in the correct order were calculated across all teaching trials and teaching sessions during the weeks in which fidelity of implementation was assessed. Because Michelle did not participate in coaching, data was collected on Michelle's implementation of teaching procedures for the first five weeks of the intervention phase to ensure fidelity.

**Interobserver agreement.** Interobserver agreement was calculated for a minimum of 20% of data collection sessions across baseline and intervention phases. Additionally, because cumulative gains are reported weekly, agreement was conducted on daily data collection sessions during 20% of the weeks during which this study took place. This ensured agreement between the educator and author regarding the number of skills acquired weekly. Based on IOA calculations, there was 100% agreement regarding the number of skills mastered weekly by each child. Additionally, IOA was calculated for fidelity of implementation data by another individual trained in the verbal behavior card sort. For Susan, IOA was 98% and 93% for the errorless teaching and error correction procedures respectively, 97% and 95% for Kate, and 93% and 91% for Michelle.

**Social validity.** Each educator was given a six-item questionnaire regarding the feasibility of implementing a verbal behavior intervention program in their classrooms. Each

question was rated on a 5-point Likert scale (i.e. 1= *strongly agree* to 5 = *strongly disagree)*, and addressed the feasibility of implementing a verbal behavior intervention program in the classroom, and the extent to which educators felt the verbal behavior intervention program improved the language skills of their student.

## Chapter 4: Results

Results of this multiple baseline across participants will be presented according to the three research questions presented above: acquisition of new verbal behavior skills, generalization of those skills to other classroom activities and the home, and social validity of the intervention as viewed by each educator. Additionally, fidelity of implementation data was collected and will be presented in the final section.

### Acquisition of Verbal Behavior Skills

In accordance with single case research, visual analysis was used to determine whether the verbal behavior card sort was an effective method for increasing the verbal behavior skills of each child. Specifically, because data in this study was cumulative in nature, immediacy and magnitude of change were examined by calculating the absolute level change (i.e. identifying the ordinate values of the last data point of baseline and the first data point of intervention and subtracting the smaller from the larger) and the relative level change (i.e. identify the median value of the last half of baseline and the first half of intervention and subtracting the smaller from the larger) between the baseline and intervention conditions.

**Lisa and Susan.** Figure 3 displays data for child acquisition of verbal behavior skills. Data indicate that change in verbal behavior skill acquisition was immediate for Lisa as evidenced by an absolute level change of five, which was determined by taking the number of skills she learned during the final week of baseline (i.e. zero) and subtracting it from the number of skills she learned during the first week of intervention (i.e. five). Additionally, her relative level change was 17.25, which was determined by taking the median value for the second half of baseline data and subtracting it from the median value for the first half of intervention data. Finally, Lisa learned 65 skills over the course of 19 weeks and an average of 3.4 new verbal

behavior skills learned every week (range 0-7).

**Cora and Kate.** Verbal behavior skill acquisition was also immediate for Cora, whose data had an absolute level change of three and a relative level change of 13.17. Cora mastered one new verbal behavior skill during week two of baseline (i.e. "touch your nose") but did not learn any more during weeks three and four. When the intervention phase began during week five, Cora mastered four new targets and learned 73 new skills over the course of 18 weeks with an average of four new verbal behavior skills learned per week (range 0-7).

**Lilah and Michelle.** Lilah did not learn any target skills during all five weeks of her baseline phase, but mastered three new targets during the first week of intervention for an absolute level change of three. Her relative level change was 10.75 and she learned a total of 39 skills over 17 weeks for an average of 2.3 new verbal behavior skills each week (range 0-4).

**Other findings.** In addition to acquisition of new skills, various phase changes are noted in Figure 3 that further indicate the effectiveness of the verbal behavior card sort. For Lisa and Cora, these indicate when a more difficult level of targets were introduced in their verbal behavior programs (i.e. Lisa began to be taught the listener response and tact for verb/noun combinations such as 'blowing bubbles' and Cora began to be taught the listener response and tacts of actions). Despite being taught a new category of skills, the introduction of these did not slow down the acquisition rate of skills, further demonstrating the utility of the card sort and its associated teaching strategies. In Lilah's case, these lines indicated a change of implementers when her teacher took an extended leave due to an illness. There was a student teacher in the classroom at the time who was trained on the intervention and implemented it during this time period. This teacher had previous training in ABA and discrete trial strategies but had not previously used the card sort system. Despite this change, Lilah continued to make progress.

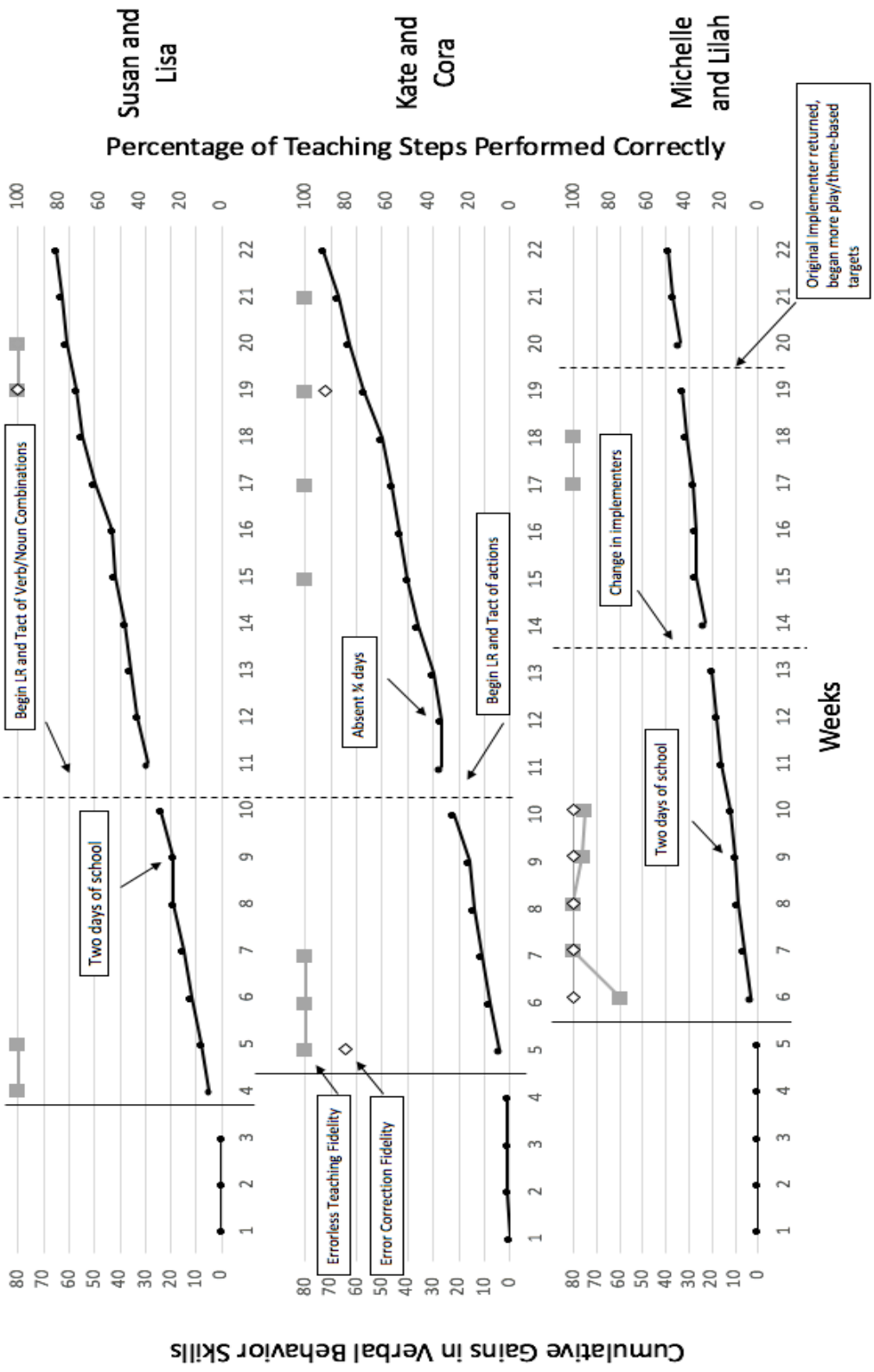


*Figure 3:* Cumulative Gains in Verbal Behavior Skills

In addition to tracking skills learned, lost skills were also tracked and documented. A skill that was previously mastered is considered lost if the following occurs: the child provides an incorrect answer, self corrects, or does not respond when the skill is presented. When this happens, cold probe data is taken the following day, and if the child still does not know the skill, it is taught errorlessly the remainder of the day. This is repeated for two more days, and if the child emits an incorrect answer on the third day, the skill is considered lost. Over the course of the intervention phase, Cora did not lose any skills, Lisa lost two skills during weeks 13 and 16 (i.e. elbow and pan), and Lilah lost four skills during weeks 10, 12, 16, and 19 (i.e. dress, couch, pencil, and goose). As detailed in the methods section, lost skills were removed from the known items list, marked as lost on data sheets and graphs, and retaught as new targets. Finally, weeks during which children only learned one or did not learn any new skills were generally those during which a child was absent several days or the district had a short week for holidays or teacher professional development. These weeks are noted in Figure 3 on page 58.

**Generalization**

Two generalization tasks were conducted, the first of which involved observing each child in their classroom and taking data on whether learned verbal behavior skills were emitted correctly when they arose during natural interactions and activities in the classroom. The second involved sending a list of all learned skills home and asking parents to share which ones they had heard at home.

**Generalization task one.** The first generalization task in which learned skills were marked as emitted correctly or incorrectly when an opportunity arose during natural classroom routines and interactions resulted in the following. Of the 65 skills learned by Lauren, 16 were observed during the three hour observation of the natural classroom routine and environment,

88% of which were emitted correctly. Of the 73 skills learned by Cora, 17 were observed in the natural environment, 94% of which were emitted correctly, and finally, of the 39 skills learned by Lilah, 14 were observed in the natural classroom environment ,93% of which were emitted correctly.

**Generalization task two.** The second generalization task in which parents were sent home a list of skills their child learned and asked which they had seen their child demonstrate revealed the following. Of the 65 skills Cayla learned, parents indicated she demonstrated 56 of those at home. Cora's parents indicated she had demonstrated 40 of the 73 she learned at home and commented, "Cora's language has come a long way. At one time she couldn't really tell us what she wanted and I know it was frustrating for her. Now she will tell us what she wants and even ask for things. She does a great job labeling things (or naming them). She knows a lot of animals and foods and is always open to learning more. She's made great progress." Finally, of the 39 skills Lilah learned, her parents indicated she had demonstrated 19 at home and said, "I noticed much more consistent labeling of items and actions, more willingness to mimic words, and more effort to get her point across in words before crying/yelling." Table 6 lists the skills seen during observations of classroom activities and those parents reported to have seen at home.

**Social Validity**

Social validity was measured via a questionnaire, provided to each educator regarding the usability and effectiveness of the verbal behavior card sort. Results of the questionnaire are displayed in Table 7 and indicate that educator participants generally felt the concepts related to the analysis of verbal behavior and the teaching procedures were easy to apply and implement. While Susan (Lisa's teacher) disagreed that the errorless teaching and error correction procedures were easy to implement and remember, she did agree the verbal behavior concepts

Table 6

*Generalized Verbal Behavior Skills*

| Operant | Lisa | | | Cora | | | | Lilah | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Skill | Home | School | Operant | Skill | Home | School | Operant | Skill | Home | School |
| Tact-Nouns | Brush | X | | Tact-Nouns | Cookies | X | | Tact-Nouns | Hamburger | | |
| | Milk | X | | | Juice | X | | | Socks | X | |
| | Bunny | X | | | Milk | X | | | Couch | | O |
| | Legs | X | | | Chips | X | | | Swimsuit | | |
| | Elbow | X | | | Grapes | | | | Giraffe | X | |
| | Phone | X | X | | Eggs | X | | | Dress | X | |
| | Pan | | | | Duck | X | | | Grass | | |
| | Chin | X | | | Car | X | X | | Sheep | X | X |
| | Chair | X | | | Bread | | | | Cow | X | X |
| | Computer | | X | | Chair | X | | | Clouds | X | |
| | Jacket | X | X | | Blocks | X | | | Leaf | X | |
| | Pencil | | | | Table | | | | Grass | X | |
| | Towel | X | | | Wagon | | | | Backpack | X | |
| | Backpack | X | X | | Bike | | | | Fork | | |
| | Swimming pool | | | | Gloves | | | | Vacuum | | |
| | Sink | X | O | | Fishing Pole (toy) | | | | Carrots | | |
| | Arm | X | | | Nose | X | | | Pencil | | |
| | Cheeks | X | | | Ears | X | | | Scissors | | |
| | Leaf | X | O | | Water Beads | | | | Farmer | | X |
| | Grass | X | | | Drum | X | | | Tractor | | |
| | Elephant | | | | Hammer (toy) | | | | Pig | | X |
| | Broom | | | | | | | | | | |
| | Cheese | | | | | | | | | | |
| | Legs | | | | Saw (toy) | | | | Goose | | X |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LR-Nouns | Elbow | | | Stickers | X | | | Horse | | |
| | Shoulders | | | Drill (toy) | | | Tact Actions | Coughing | X | X |
| | Neck | | | Turtle | X | | | Squeezing | | |
| | Teeth | | X | Heart (toy) | X | | | Hopping | X | X |
| LR-Actions | Coloring | X | | Monkey | X | X | | Drinking | | |
| | Crying | X | X | Horse | X | | | Singing | | |
| | Coughing | X | | Puzzle | X | | | Coloring | | X |
| | Cutting | | | Brush | X | | | Counting | | |
| | Crawling | | | House | X | | | Cutting | | |
| | Waving | | | People (toy) | | | | Walking | X | X |
| | Give a high five | X | X | Bus | X | | | Eating | | X |
| | Sneezing | X | | Gears (toy) | | | | Sitting | | X |
| | Sleeping | X | | Stackers (toy) | | | LR Actions | Coughing | X | |
| | Bounce the ball | X | | Ball | X | X | | Squeezing | | |
| | Drinking | X | X | Chicken | X | X | | Jumping | | |
| | Blowing | | | | | | | | | |
| | Blinking | | | | | | | | | |
| Tact-Actions | Walking | X | X | Sink | | | | Waving | | |
| | Coughing | X | X | Pizza | X | | | Knocking | | |
| | Coloring | X | | Broom | | | | | | |
| | Rolling Ball | | | Oranges | X | | | | | |
| | Blowing | X | | Penguins | X | | | | | |
| | Cutting | X | X | Firetruck | X | | | | | |
| | Crawling | X | | Computer | | X | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sleeping | X | | | Dragon (toy) | X | |
| Sneezing | X | | | Zebra | | |
| Dancing | X | | | Kangaroo | | |
| Drinking | X | X | | Caterpillar (toy) | | X |
| Yawning | X | | | Bells (toy) | | |
| Pulling Wagon | | X | | "Shakey egg" (toy) | | |
| Hugging Minnie | X | | | Ladybug (toy) | | X |
| Bouncing Ball | X | | LR-Actions | Dumping | | |
| Waving | X | | | Put in | X | X |
| Giving a High Five | X | | | Brushing | X | |
| Blowing Bubbles | X | X | | Blowing | X | X |
| Rolling Ball | X | | | Knocking | | |
| Blinking | | | | | | |
| | | | | Crying | X | |
| | | | | Touch Your Head | X | |
| | | | | Drawing | | X |
| | | | | Gluing | | X |
| | | | | Dancing | | |
| | | | | Hugging | | X |
| | | | Tact Actions | Sitting | X | |
| | | | | Jumping | X | X |

| | | | |
|---|---|---|---|
| | Crying | X | |
| | Clapping | X | X |
| | Knocking | | O |
| | Stomping | | X |

Table 7

*Social Validity Survey Results*

| Survey Item | Kate | Michelle | Susan | Average score |
|---|---|---|---|---|
| Once I received training, the verbal operants were easy to understand and apply to my student's language ability. | 4 | 4 | 4 | 4.0 |
| After receiving training and practice opportunities, the errorless teaching and error correction procedures were easy to implement and remember. | 4 | 4 | 2 | 3.33 |
| After receiving training and practice opportunities, the variable ratio schedule of reinforcement was easy to implement during instruction with my student. | 4 | 4 | 5 | 4.33 |
| A verbal behavior intervention program is a simple and easy way to provide intensive language intervention to students in my classroom. | 4 | 5 | 2 | 3.67 |
| I would like to continue implementing a verbal behavior intervention program with students in my classroom for whom it could benefit. | 5 | 5 | 5 | 5.0 |
| I will need additional support to effectively plan for and develop verbal behavior intervention programs for future students in my classroom. | 4 | 3 | 5 | 4.0 |

Note: Scores based on a Likert scale ranging from 1-5 with 1 being strongly disagree and 5 being strongly agree

could be easily applied to her student's language and the VR schedule of reinforcement was easy to implement. Additionally, while Susan may have initially felt uncomfortable implementing the teaching procedures, data suggest she was able to implement both procedures with fidelity. With regard to its simplicity and usability in the classroom, Kate (Cora's teacher) and Michelle (Lilah's teacher) agreed that a comprehensive verbal behavior intervention program is an easy way to provide language instruction to children in classrooms, while Susan disagreed. Despite differing views on the extent to which it is a user-friendly way to address language delays, all three indicated they would like to continue to use the intervention. Finally, all three indicated they would need additional support to implement the intervention in the future, and indicate support would need to be centered around language goals to ensure targets that follow a typical developmental path are identified. Michelle also indicated she felt comfortable implementing the intervention with a child whose language profile was similar to that of Lilah's, but would need assistance choosing appropriate goals and language target sequences for children with different language profiles and abilities.

**Fidelity of Intervention Implementation**

Fidelity of intervention implementation by the educator was taken across 20% of the weeks during the intervention phase for all three dyads. Four weeks of data were collected for Susan (Lisa's teacher) who implemented both the errorless teaching procedure and error correction procedure with 100% fidelity. Seven weeks of fidelity of implementation data were taken for Kate (Cora's teacher), who implemented the errorless teaching procedure with 100% fidelity across all seven weeks, and implemented the error correction procedure with 80% and 90% fidelity during the two weeks it occurred. Finally, five weeks of fidelity data were taken for Michelle (Lilah's teacher) who implemented the errorless teaching procedure with 92.8 percent

fidelity and the error correction procedure with 100% fidelity. While Michelle was absent on medical leave, the student teacher who temporarily took her place implemented the errorless teaching procedure with 100% fidelity.

# Chapter 5: Discussion

The present study examined the effects of a verbal behavior card sort implemented by early childhood special educators on the cumulative growth of verbal behavior skills of three preschoolers with developmental disabilities. This chapter will summarize findings regarding growth in verbal behavior skills, generalization of those skills to other contexts, and the social validity of the intervention as rated by educator participants. Next, results will be examined in relation to findings within previous literature in order to highlight key contributions of this study regarding efficacy and feasibility of implementation in settings outside those in which Verbal Behavior Interventions are typically implemented (i.e. intensive ABA-based programs). Finally, limitations and directions for future research are addressed.

## Summary of Findings

Results of this study offer preliminary findings that a verbal behavior card sort can support the acquisition of new verbal behavior skills across multiple operants both towards the development of intraverbals, and for direct teaching of intraverbals once a child is ready. Two of the three children (i.e. Lisa and Lilah) in this study failed to gain any of their target verbal behavior skills during the weeks in which they were in baseline, and one child (i.e. Cayla) gained only one. Upon introduction of the verbal behavior card sort, all three children saw immediate gains in verbal behavior skills during the first week of intervention implementation, and weekly growth in verbal behavior skills continued for each child until the school year was over and the study was concluded. In total, Lisa gained 65 new verbal behavior skills across 19 weeks, Cayla gained 73 over 18 weeks, and Lilah gained 39 over 17 weeks for an average of 3.4, 4.0, and 2.3 learned on average every week respectively.

Not only did each child gain new skills every week, but when probed for generalization, the majority of the skills that arose during other classroom activities were emitted correctly, indicating that not only were they learned during the verbal behavior card sort, but they could then be used appropriately in other settings. Likewise, parents indicated they observed their child emit many of the learned skills at home, and noted anecdotally that they believed their child's generalized language skills improved over the course of the study.

After implementing the verbal behavior card sort for one school year, all three educators strongly agreed they would like to continue its implementation with children in the future. They also agreed they would require additional support to do so, particularly with regard to goal development for children whose language profiles are different from the children in this study.

## Efficacy of Verbal Behavior Intervention

While previous research has demonstrated the efficacy of Verbal Behavior Intervention on increasing the verbal skills of children with developmental disabilities, research has focused primarily on ways to teach single operants instead of on interventions that teach multiple skills across operants such that a strong base of skills towards complex intraverbals can be established. As a result, this study provided an initial contribution to the literature by demonstrating the ability of a verbal behavior card sort to support language development across operants.

Additionally, this study also added to the verbal behavior literature by demonstrating the efficacy of an intervention that can also be implemented with ease by early childhood educators in classrooms. This is a departure from much of the previous literature which examined Verbal Behavior Intervention in clinic and home based settings implemented by individuals highly trained in the principles of ABA. Interventions that are easy to implement have far-reaching implications for children who receive special education services in public schools, as verbal

behavior interventions may become accessible not only for children receiving intensive ABA therapy in clinics, but for children receiving services in public schools.

## Benefits of Implementation in ECSE Settings

Preschool aged children constitute a large proportion of individuals who receive intensive ABA-based programming and interventions (Love et al., 2009), which seems logical given the importance of early intervention on later outcomes and the flexibility of school schedules at this age, after which children are generally enrolled in full time education programs in kindergarten. Additionally, preschool age children who receive ABA typically do so in home- or clinic-based settings, but do not receive a large portion of ABA services at school (Love et al., 2009). Indeed, research has demonstrated that due to a lack of instruction in ABA in preservice educator preparation programs (Loiacono & Allen, 2008) educators of children with developmental disabilities infrequently implement evidence-based practices derived from ABA in their classrooms (Hendricks, 2011; Hess, Morrier, Heflin, & Ivey, 2008).

Likewise, a verbal behavior card sort is a relatively complicated intervention that requires high adult to child ratios for implementation and training in specific components of applied behavior analysis and the verbal operants. Additionally, while a verbal behavior card sort involves three teaching strategies (i.e. errorless teaching, error correction, and variable ratio schedule of reinforcement), different prompts are required when teaching each operant, and some operants require the use of different prompts depending on the skill being taught (refer to Table 2 in Chapter Two, page 15 for a description of prompts used to teach skills within each operant). As such, a comprehensive verbal behavior program can be complex, and detailed attention and adherence to fidelity of implementation is required to obtain positive results from children.

Despite the barriers that may prevent high-quality verbal behavior interventions from being delivered in early childhood special education programs (i.e. Part B), there may be some advantages to its implementation in these settings. Not only do children with developmental disabilities typically receive special education services in public early childhood classrooms, but these classrooms can also be optimal settings for generalization of skills due to the presence of typically developing peers with whom skills can be practiced (Lawton et al., 2014). Additionally, the Individuals with Disabilities Education Act (IDEA) mandates the use of practices that improve the social and communicative skills of children with developmental delays (IDEA, 2004), and public ECSE classrooms can provide multiple opportunities for daily intervention due to the number of hours per week that children spend in school.

While a verbal behavior card sort does require some knowledge of the basic principles of ABA, the verbal operants, and methods for teaching them, limited knowledge of these topics do not necessarily preclude it from being implemented in ECSE classrooms. Indeed, Patry and colleagues (in review) found that educators teaching in reverse mainstream classrooms (i.e. 50:50 ratio of typically developing children to children receiving special education services) were able to implement the verbal behavior card sort with high rates of fidelity after a half day training and approximately two weeks of coaching. Additionally, Patry and Troxel (in progress) also found that with the same training and coaching, along with some additional training on the progression of skills to teach within each operant as outlined in Table 3 in Chapter Two, page 32, a preschool educator was able to implement a comprehensive verbal behavior program and identify appropriate operants to target and the skills therein to teach, to successfully implement a verbal behavior card sort with children in her classroom possessing a range of language abilities.

While preliminary, these findings are an important beginning towards demonstrating the components of training needed such that educators in ECSE classrooms are able to implement intensive ABA-based interventions in their classrooms. Moreover, the classrooms in both studies were not "self-contained" such that their focus was on intensive interventions through the use of low adult to child ratios. Instead, they were carried out by educators whose classrooms had large numbers of children (i.e. 15-20) and high adult to child ratios as a means of demonstrating the usability of a verbal behavior card sort in classrooms geared towards a more unified, inclusive model of early childhood education.

## Intervention Intensity

In addition to considerations regarding who can effectively implement a verbal behavior card sort and in which settings, it is also important to consider the level of intervention intensity needed for the most optimal language improvements. In the current study, the verbal behavior card sort was implemented for approximately 15 minutes one time per day, which was the most time each educator was able to use given their other classroom responsibilities. If implemented by ABA specialists as part of a child's early and intensive behavioral intervention, it is possible to do several sessions of the verbal behavior card sort per day, and possibly more than one cold probe data collection session in order to move skills through mastery more quickly. Future research should examine how much more quickly children learn skills when more than one session of the card sort and cold probe data collection are implemented per day. However, regardless of whether higher intensities result in faster skill acquisition, this study suggests that even a relatively small amount of intervention per day can result in significant increases in language skills such that gains can be seen across operants.

## Limitations

While this study demonstrated important findings regarding the ability to teach new verbal behavior skills across operants via a verbal behavior card sort, it is the first study examining this particular verbal behavior intervention, and because a single-case methodology was used, only demonstrated effects across three children. According to Horner and colleagues (2005) single subject research can be used to identify an evidence-based practice when a minimum of five single-subject studies published in peer-reviewed journals demonstrate experimental control using the intervention, studies are carried out by at least three different researchers across multiple geographic locations, and a total of at least 20 participants are included across studies. Given these requirements, more research is needed to both replicate these findings and to classify the verbal behavior card sort as an evidence-based practice for improving the language of children with developmental disabilities.

Not only did this study include only three children, but all three had similar language profiles (i.e. language abilities generally mirroring that of a typically developing 18-month old), and more research should be conducted with children who have more or less language to determine if the same effects are found across language ability. This may be particularly important considering findings that suggest direct teaching strategies, by which the verbal behavior card sort is classified, are more effective for improving the language skills of children with a mean length of utterance of 2.5 and above, while more naturalistic strategies such as Milieu teaching may be more effective for children who are developing early language (Warren & Yoder, 1997). Findings such as these may suggest that children whose language is just beginning to emerge would not demonstrate the same growth in language skills as the children in this study, possibly due to the need for other prerequisite learning readiness skills and the ability

to learn outside of a natural environment in which learning targets are directly related to the items and activities within the child's natural attentional focus.

Finally, the educators in this study had several years of experience teaching both early childhood and special education. Two had masters degrees in the subject, and all three came from districts that had multiple resources for professional development. Educators with different experience and education levels may not implement the intervention with the same fidelity or have the same amounts of personnel resources needed to implement the intervention. Indeed, while there were large adult to child ratios in each of the classrooms in this study, each class had approximately two para educators who could carry out other classroom responsibilities while the intervention was implemented.

## Considerations for Future Research

Future research on the verbal behavior card sort should examine its effectiveness with children who possess more or less language as compared to the children in this study. Because some research suggests that children whose language is only beginning to emerge may learn best from more naturalistic, incidental, and play-based strategies, the verbal behavior card sort may not be an effective method for developing initial language skills in children with this communicative profile. Likewise, future research should examine the point at which language skills, and particularly intraverbals, become too complex to be taught via the card sort and other interventions become more effective instead. Indeed, while DeSouza and colleagues (2019) identified the necessary prerequisite skills for the emergence of intraverbals with conditional discriminations (e.g., "Name a big brown animal that lives in the forest"), these intraverbals are still not as complex as those emitted in everyday interactions. While intraverbals involving

conditional discriminations can be taught via a verbal behavior card sort, others that more naturally occur during daily interactions may require more naturalistic interventions.

In addition to the effects of the verbal behavior card sort on language growth in children with varying language profiles, future research should involve group design studies so the effects of the verbal behavior card sort on the development of more generalized language and mean length of utterance can be examined. After this study was completed, educator participants anecdotally shared observations of large improvements in each child's daily language use during other classroom activities, and that the children seemed to emit more spontaneous language and put more words together. If gains in generalized language skills did occur, future research should be conducted to confirm this outcome, and that these results are due to implementation of the verbal behavior card sort and not some other factor such as maturation.

**Implications for Practice.**

Not only does this study offer preliminary evidence of growth in verbal behavior skills after implementation of a verbal behavior card sort, but, combined with results from Patry and colleagues (in review) and Patry and Troxel (in progress), it also offers evidence of social validity for implementation in classrooms by educators. Given this knowledge, future research should examine the most effective and efficient ways to both train teachers in the card sort and disseminate it so that more children receiving special education services can access it. Additionally, this study has immediate implications and as such, it is unnecessary to wait for more research before implementation. Nevertheless, the card sort's effectiveness is still unknown with regard to children who have more or fewer language abilities, and it is still unknown how prepared educators will be to plan the appropriate sequence of skills to teach after only minimal training. Thus, caution regarding these factors should be considered before implementation.

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# Appendix A: IRB Approval Letter

KU THE UNIVERSITY OF KANSAS Research

**APPROVAL OF PROTOCOL**

February 28, 2017

Mary Patry
meholt@ku.edu

Dear Mary Patry:

On 2/27/2017, the IRB reviewed the following submission:

| | |
|---|---|
| Type of Review: | Initial Study |
| Title of Study: | Effects of Verbal Behavior Intervention on the verbal behavior of children with autism |
| Investigator: | Mary Patry |
| IRB ID: | STUDY00140454 |
| Funding: | None |
| Grant ID: | None |
| Documents Reviewed: | • Parent and Student Consent Form-VB Student Study.docx, • Teacher Consent Form-VB Student Study.docx, • HSCL VB Student Study.pdf, • Assent Procedures for VB student study.docx, • Confirmation letter from research sight.pdf, • IMG_3446.JPG, • Letter for IRB Revisions-Student Study.docx, |

The IRB approved the study on 2/27/2017.

1. Notify HSCL about any new investigators not named in original application. Note that new investigators must take the online tutorial at https://rgs.drupal.ku.edu/human_subjects_compliance_training.
2. Any injury to a subject because of the research procedure must be reported immediately.
3. When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity.

Continuing review is not required for this project, however you are required to report any significant changes to the protocol prior to altering the project.

Please note university data security and handling requirements for your project:
https://documents.ku.edu/policies/IT/DataClassificationandHandlingProceduresGuide.htm

You must use the final, watermarked version of the consent form, available under the "Documents" tab in eCompliance.

Sincerely,

Stephanie Dyson Elms, MPA
IRB Administrator, KU Lawrence Campus

Human Research Protection Program
Youngberg Hall | 2385 Irving Hill Rd | Lawrence, KS 66045 | (785) 864-7429 | research.ku.edu/hrpp

## Appendix B: Child and Parent Consent Letter

**Informed Consent Statement for Students**

Effect of Verbal Behavior Intervention on the Verbal Behavior Skills of Students in Early Childhood Classrooms

INTRODUCTION
The Department of Special Education at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You may refuse to sign this form and not participate in this study. You should be aware that even if you agree to participate, you are free to withdraw at any time. If you do withdraw from this study, it will not affect your relationship with this unit, the services it may provide to you, or the University of Kansas.

PURPOSE OF THE STUDY
The purpose of this study will be to examine whether there is growth in the verbal behavior (expressive and receptive language ability) of students in early childhood when their teacher implements verbal behavior teaching procedures. Cumulative gains in verbal behavior skills and changes in mean length utterance (average number of words spoken when the child speaks) will be documented for each student to determine if verbal behavior intervention improves the language ability to each student.

PROCEDURES
Each teacher will be asked to choose one child from his or her classroom to whom they will provide verbal behavior intervention. Together, the author and the teacher will conduct an assessment of the student's language using the Verbal Behavior Milestones and Placement Program (VB-MAPP; Sundberg, 2008) to determine a general picture of the child's developmental language ability and to determine the specific skills that will be taught. This assessment will take place in the student's classroom.

There will be two phases to this study: baseline and intervention. The baseline phase will consist of one daily data collection probe (approximately 30 seconds) in which the teacher will determine if there is growth in the student's target language items. No teaching sessions will occur during the baseline phase. During the intervention phase data collection will occur every day on the child's language targets. Teaching sessions will also occur daily for approximately 20 minutes and will consist of intensive teaching in which teachers will teach varying language skills (tact, echoic, intraverbal, listener response, and imitation) and manding (ability to make requests for wanted items and activities).

During intensive teaching sessions, the teacher will provide verbal behavior instruction via discrete trial training (a type of individualized instruction). The targeted verbal skills will include the tact (labeling items, actions, adjectives), listener response (following directions and receptively identifying items and adjectives), intraverbal (can consist of a range of skills from fill-in-the-blanks, to answering questions, to conversation skills), motor imitation skills (not a

verbal behavior but an important skill for student learning), and echoic (echoing what someone else said). The precise skills to be taught in each verbal category will vary depending on the language ability of the student (which will be determined as described above via the VB-MAPP), however skills will generally be taught within all five verbal behavior areas.

Manding sessions, in which the student learns to make requests, will utilize teaching procedures similar to discrete trials, but will take place in natural play areas in the classroom with some of the student's preferred items (as assessed on preference assessments). During these sessions teachers will use teaching procedures to teach students to request items and activities for which they are motivated.

Time commitment*:* Because only a few (approximately five) new language skills are taught at one time, and because a skill has to be demonstrated correctly three consecutive days in a row before it is considered mastered, it can take several months before changes in language are demonstrated. As a result, this study will last approximately one school year, however if the teacher and parents feel the intervention is proving effective, teaching can continue past the length of the study.

Video Recording: Approximately 20% of teaching sessions between the teacher and the student will be video recorded in order to take data on correct implementation by the teacher. All videos will be transcribed by the researcher and will be stored on a password protected computer and/or flash drive in a locked desk drawer. Videos will be destroyed once the study is complete.

RISKS

The potential risks to participants may include time away (20 minutes per day) from normal classroom activities and disclosure of student's disabilities. In addition to missing some normal classroom activities, the researcher will also learn each student's disability and developmental abilities as a result of interacting with and assessing their language ability.

BENEFITS

Teachers: Participants will have support and collaboration for implementation of comprehensive verbal behavior programming in a school setting for their students. The teacher can use this skill with other students in his/her classroom and students in future classes.

Students: Students will gain access to comprehensive verbal behavior programming that will aid in language development.

PAYMENT TO PARTICIPANTS

This study will not involve payment to participants.

PARTICIPANT CONFIDENTIALITY

Your name will not be associated in any publication or presentation with the information collected about you or with the research findings from this study. Instead, the researcher will use a study number or a pseudonym rather than your name. Your identifiable information will not be shared unless it is required by law or university policy.

REFUSAL TO SIGN CONSENT AND AUTHORIZATION
You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from the University of Kansas or to participate in any programs or events of the University of Kansas. However, if you refuse to sign, you cannot participate in this study.

CANCELLING THIS CONSENT AND AUTHORIZATION
You may withdraw your consent to participate in this study at any time. You also have the right to cancel your permission to use and disclose further information collected about you, in writing, at any time, by sending your written request to: Mary Beth Patry, Joseph R. Pearson Hall, 1122 W. Campus Rd. Rm 505, Lawrence, KS 66045.

If you cancel permission to use your information, the researchers will stop collecting additional information about you. However, the research team may use and disclose information that was gathered before they received your cancellation, as described above.

QUESTIONS ABOUT PARTICIPATION
Questions about procedures should be directed to the researcher listed at the end of this consent form.

PARTICIPANT CERTIFICATION:
I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429 or (785) 864-7385, write the Human Research Protection Program (HRPP), University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7568, or email irb@ku.edu.

I agree to my child's participation in this study as a research participant. By my signature I affirm that I am at least 18 years old and that I have received a copy of this Consent and Authorization form.

_____ _____
Type/Print Participant's Name Date

_____
Participant's Signature

Mary Beth Patry, M.S.Ed, BCBA
Principal Investigator
1122 W. Campus Rd Rm 505
University of Kansas
Lawrence, KS 66045
(303) 249-4585
meholt@ku.edu

Eva Horn, Ph.D
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Lawrence, KS 66045
(785) 864-0615
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## Appendix C: Educator Consent Letter

**Informed Consent Statement for Teachers**

Effect of Verbal Behavior Intervention on the Verbal Behavior Skills of Students in Early Childhood Special Education

INTRODUCTION
The Department of Special Education at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You may refuse to sign this form and not participate in this study. You should be aware that even if you agree to participate, you are free to withdraw at any time. If you do withdraw from this study, it will not affect your relationship with this unit, the services it may provide to you, or the University of Kansas.

PURPOSE OF THE STUDY
The purpose of this study will be to examine whether students make gains in language skills when their teacher implements verbal behavior intervention procedures.

PROCEDURES
Each teacher will be asked to choose one to two children from his or her classroom with whom they will provide verbal behavior intervention. Together, the author and the teacher will conduct an assessment of the students' language using the VB-MAPP (Sundberg, 2008) to determine a general picture of their developmental language abilities and to determine the specific skills that will be taught. This assessment will take place in the students' classroom. The mean length utterance of each student will also be taken prior to and after the intervention phase to determine growth in length of utterance after intervention.

There will be two phases to this study: baseline and intervention. The baseline phase will consist of one data collection probe (approximately 30 seconds) every few days in which the teacher will determine if there is growth in the student's target language items. No teaching sessions will occur during the baseline phase. During the intervention phase data collection will occur every day on the child's language targets. Teaching sessions will also occur daily for approximately 20 minutes and will consist of intensive teaching in which teachers will teach varying language skills (tact, echoic, intraverbal, listener response, and imitation) and manding (ability to make requests for wanted items and activities).

During intensive teaching sessions, the teacher will provide verbal behavior instruction via discrete trial training (a type of individualized instruction). The targeted verbal skills will include the tact (labeling items, actions, adjectives), listener response (following directions and receptively identifying items and adjectives), intraverbal (can consist of a range of skills from fill-in-the-blanks, to answering questions, to conversation skills), motor imitation skills (not a verbal behavior but an important skill for student learning), and echoic (echoing what someone else said). The precise skills to be taught in each verbal category will vary depending on the

language ability of the student (which will be determined as described above via the VB-MAPP), however skills will generally be taught within all five verbal behavior areas.

Manding sessions, in which the student learns to make requests, will utilize teaching procedures similar to discrete trials, but will take place in natural play areas in the classroom with some of the student's preferred items (as assessed on preference assessments). During these sessions teachers will use teaching procedures to teach students to request items and activities for which they are motivated.

Time commitment*:* Because only a few (approximately five) new language skills are taught at one time, and because a skill has to be demonstrated correctly three consecutive days in a row before it is considered mastered, it can take several months before changes in language are demonstrated. As a result, this study will last approximately one school year, however if the teacher and parents feel the intervention if proving effective, teaching can continue past the length of the study.

One half-day (four hour) training session between the teacher and researcher will also occur so that the teacher can become trained in verbal behavior teaching strategies.

Video Recording: Approximately 20% of teaching sessions between the teacher and the student will be video recorded in order to take data on correct implementation by the teacher. All videos will be transcribed by the researcher and will be stored on a password protected computer and/or flash drive in a locked desk drawer. Videos will be destroyed once the study is complete

RISKS

The potential risks to participants may include loss of time, temporary disruption to normal classroom activities during half-day training, uncomfortable feelings about being video-taped, and disclosure of student's disabilities. First, teachers will be expected to spend time away from their classroom for training purposes and make minimal changes to their schedule to accommodate teaching sessions. Second, some teaching sessions will be videotaped for fidelity purposes, which may make some participants uncomfortable. Third, the researcher will learn about each student's disability and developmental abilities as a result of interacting with and assessing their language ability.

BENEFITS

Teachers: Participants will learn to implement comprehensive verbal behavior programming in a school setting for their students. The teacher can use this skill with other students in his/her classroom and students in future classes.

Students: Students will gain access to comprehensive verbal behavior programming that will aid in language development.

PAYMENT TO PARTICIPANTS

This study will not involve payment to participants.

PARTICIPANT CONFIDENTIALITY

Your name will not be associated in any publication or presentation with the information collected about you or with the research findings from this study. Instead, the researcher will use a study number or a pseudonym rather than your name. Your identifiable information will not be shared unless it is required by law or university policy.

REFUSAL TO SIGN CONSENT AND AUTHORIZATION
You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from the University of Kansas or to participate in any programs or events of the University of Kansas. However, if you refuse to sign, you cannot participate in this study.

CANCELLING THIS CONSENT AND AUTHORIZATION
You may withdraw your consent to participate in this study at any time. You also have the right to cancel your permission to use and disclose further information collected about you, in writing, at any time, by sending your written request to: Mary Beth Patry, Joseph R. Pearson Hall, 1122 W. Campus Rd. Rm 505, Lawrence, KS 66045.

If you cancel permission to use your information, the researchers will stop collecting additional information about you. However, the research team may use and disclose information that was gathered before they received your cancellation, as described above.

QUESTIONS ABOUT PARTICIPATION
Questions about procedures should be directed to the researcher listed at the end of this consent form.

PARTICIPANT CERTIFICATION:
I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429 or (785) 864-7385, write the Human Research Protection Program (HRPP), University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7568, or email irb@ku.edu.

I agree to take part in this study as a research participant. By my signature I affirm that I am at least 18 years old and that I have received a copy of this Consent and Authorization form.

_____ _____

Type/Print Participant's Name Date

_____

Participant's Signature

Researcher Contact Information:

Mary Beth Patry, M.S.Ed, BCBA
Principal Investigator
Department of Special Education
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## Appendix D: Cold Probe Data Sheet

Name:

Week of:

### Weekly Probe Sheet

| | # days active | Operant | Target Skill | Previous Y | Mon | Tue | Wed | Thur. | Fri |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | Y N | Y N | Y N | Y N | Y N |
| 2 | | | | | Y N | Y N | Y N | Y N | Y N |
| 3 | | | | | Y N | Y N | Y N | Y N | Y N |
| 4 | | | | | Y N | Y N | Y N | Y N | Y N |
| 5 | | | | | Y N | Y N | Y N | Y N | Y N |
| 6 | | | | | Y N | Y N | Y N | Y N | Y N |
| 7 | | | | | Y N | Y N | Y N | Y N | Y N |
| 8 | | | | | Y N | Y N | Y N | Y N | Y N |
| 9 | | | | | Y N | Y N | Y N | Y N | Y N |
| 10 | | | | | Y N | Y N | Y N | Y N | Y N |
| 11 | | | | | Y N | Y N | Y N | Y N | Y N |
| 12 | | | | | Y N | Y N | Y N | Y N | Y N |
| 13 | | | | | Y N | Y N | Y N | Y N | Y N |
| 14 | | | | | Y N | Y N | Y N | Y N | Y N |
| 15 | | | | | Y N | Y N | Y N | Y N | Y N |
| 16 | | | | | Y N | Y N | Y N | Y N | Y N |
| 17 | | | | | Y N | Y N | Y N | Y N | Y N |
| 18 | | | | | Y N | Y N | Y N | Y N | Y N |
| 19 | | | | | Y N | Y N | Y N | Y N | Y N |
| 20 | | | | | Y N | Y N | Y N | Y N | Y N |
| 21 | | | | | Y N | Y N | Y N | Y N | Y N |
| 22 | | | | | Y N | Y N | Y N | Y N | Y N |
| 23 | | | | | Y N | Y N | Y N | Y N | Y N |
| 24 | | | | | Y N | Y N | Y N | Y N | Y N |
| 25 | | | | | Y N | Y N | Y N | Y N | Y N |
| 26 | | | | | Y N | Y N | Y N | Y N | Y N |
| 27 | | | | | Y N | Y N | Y N | Y N | Y N |
| 28 | | | | | Y N | Y N | Y N | Y N | Y N |
| 29 | | | | | Y N | Y N | Y N | Y N | Y N |
| 30 | | | | | Y N | Y N | Y N | Y N | Y N |
| 31 | | | | | Y N | Y N | Y N | Y N | Y N |
| 32 | | | | | Y N | Y N | Y N | Y N | Y N |
| 33 | | | | | Y N | Y N | Y N | Y N | Y N |
| 34 | | | | | Y N | Y N | Y N | Y N | Y N |
| 35 | | | | | Y N | Y N | Y N | Y N | Y N |

Red: receptive ID  Green: Tact  Yellow: Echoic  Purple: Motor Imitation  Blue: Intraverbal

**Criteria for mastery: _____ consecutive yes'**

*If program change made, indicate by drawing a phase change line on the corresponding date of the applicable target.*

**Notes/Reminders:**

Name:

Week of: Jan. 22-26

## Weekly Probe Sheet

| | # days active | Operant | Target Skill | Previous Y | Mon | Tue | Wed | Thur | Fri |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 | T | bread | Ø | Y N | Y N | Y N | Y N | Y N |
| 2 | 4 | T | chair | 1 | Y N | Y N | Y N | Y N | Y N |
| 3 | 2 | IMT "Mom fed baby" /spoon | | 1 | Y N | Y N | Y N | Y N | Y N |
| 4 | 1 | LR | show me "crying" | Ø | Y N | Y N | Y N | Y N | Y N |
| 5 | Ø | T | car | Ø | Y N | Y N | Y N | Y N | Y N |
| 6 | Ø | IMT | Shake first | Ø | Y N | Y N | Y N | Y N | Y N |
| 7 | Ø | IMT "I am. tape. s | | Ø | Y N | Y N | Y N | Y N | Y N |
| 8 | Ø | T | grapes | Ø | Y N | Y N | Y N | Y N | Y N |
| 9 | | | | | Y N | Y N | Y N | Y N | Y N |
| 10 | | | | | Y N | Y N | Y N | Y N | Y N |
| 11 | | | | | Y N | Y N | Y N | Y N | Y N |
| 12 | | | | | Y N | Y N | Y N | Y N | Y N |
| 13 | | | | | Y N | Y N | Y N | Y N | Y N |
| 14 | | | | | Y N | Y N | Y N | Y N | Y N |
| 15 | | | | | Y N | Y N | Y N | Y N | Y N |
| 16 | | | | | Y N | Y N | Y N | Y N | Y N |
| 17 | | | | | Y N | Y N | Y N | Y N | Y N |
| 18 | | | | | Y N | Y N | Y N | Y N | Y N |
| | | | | | Y N | Y N | Y N | Y N | Y N |
| 20 | | | | | Y N | Y N | Y N | Y N | Y N |
| 21 | | | | | Y N | Y N | Y N | Y N | Y N |
| 22 | | | | | Y N | Y N | Y N | Y N | Y N |
| 23 | | | | | Y N | Y N | Y N | Y N | Y N |
| 24 | | | | | Y N | Y N | Y N | Y N | Y N |
| 25 | | | | | Y N | Y N | Y N | Y N | Y N |
| 26 | | | | | Y N | Y N | Y N | Y N | Y N |
| 27 | | | | | Y N | Y N | Y N | Y N | Y N |
| 28 | | | | | Y N | Y N | Y N | Y N | Y N |
| 29 | | | | | Y N | Y N | Y N | Y N | Y N |
| 30 | | | | | Y N | Y N | Y N | Y N | Y N |
| 31 | | | | | Y N | Y N | Y N | Y N | Y N |
| 32 | | | | | Y N | Y N | Y N | Y N | Y N |
| 33 | | | | | Y N | Y N | Y N | Y N | Y N |
| 34 | | | | | Y N | Y N | Y N | Y N | Y N |
| 35 | | | | | Y N | Y N | Y N | Y N | Y N |

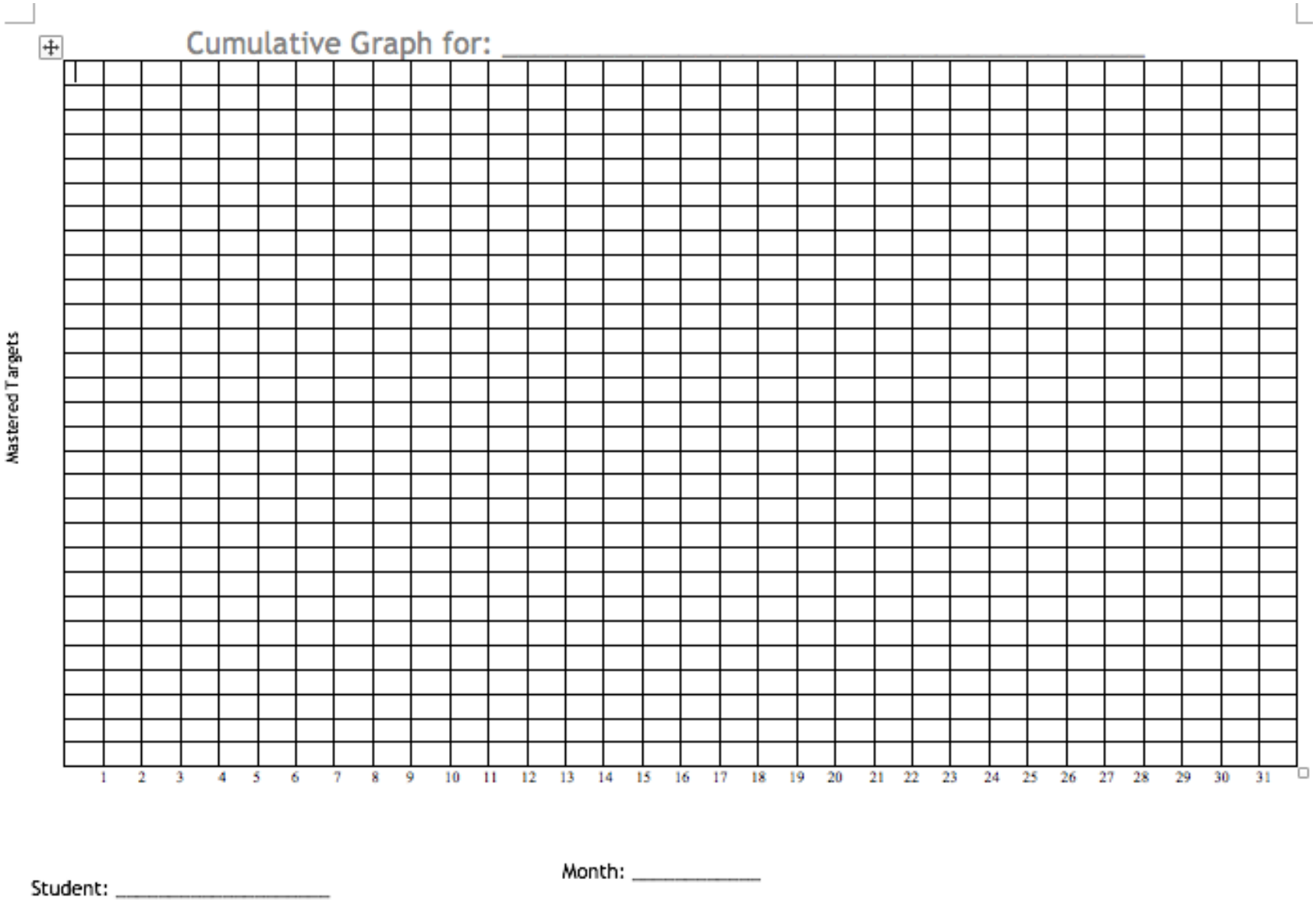
Yellow: Echoic

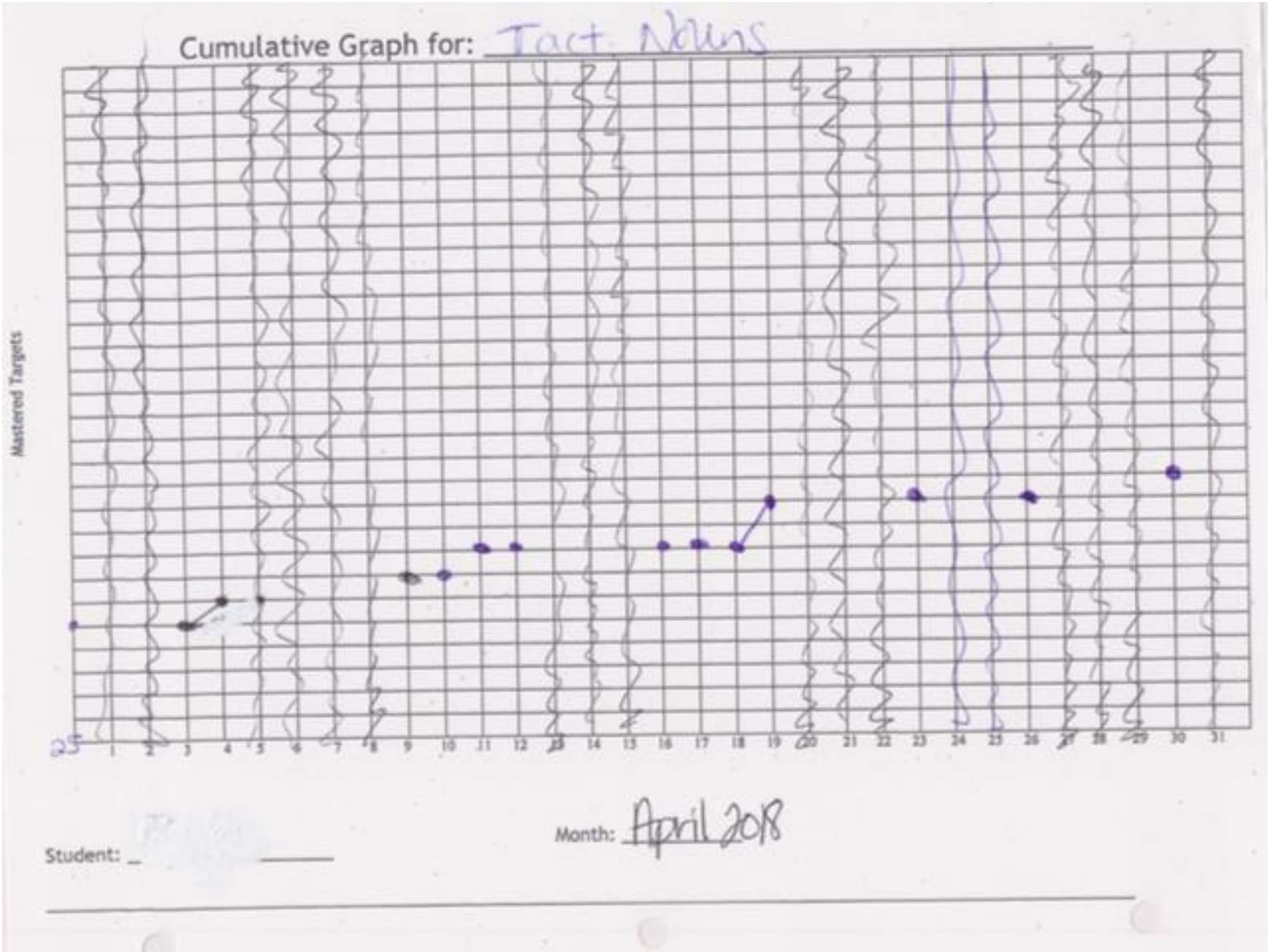
**Criteria for mastery: _____ consecutive yes'**

*If program change made, indicate by drawing a phase change line on the corresponding date of the applicable target.*

**Notes/Reminders:**

## Appendix E: Cumulative Graph




Cumulative Graph for: Tact. Nouns
Mastered Targets
25
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Month: April 2018
Student:

## Appendix F. Skills Tracking Sheet

Student:

Mastery Criteria:

### Skill Tracking Sheet

Skill: _____

| | Target | Date introduced | Date Mastered |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |
| 11 | | | |
| 12 | | | |
| 13 | | | |
| 14 | | | |
| 15 | | | |
| 16 | | | |
| 17 | | | |
| 18 | | | |
| 19 | | | |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | | | |
| 24 | | | |
| 25 | | | |

Student

Mastery Criteria: 3X consecutive

## Skill Tracking Sheet

Skill: Tact - nouns

| | Target | Date introduced | Date Mastered |
|---|---|---|---|
| 1 | cup | 12/7 | 12/13 |
| 2 | blocks | 12/7 | 12/13 |
| 3 | bread | 12/13 | 1/25 |
| 4 | chair | 12/13 | 1/24 |
| 5 | car | 1/24 | 1/30 |
| 6 | diapers | 1/25 | 2/28 |
| 7 | truck | 1/30 | 2/12 |
| 8 | eggs | 2/12 | 2/28 |
| 9 | chips | 2/26 | 3/5 |
| 10 | juice | 2/28 | 3/12 |
| 11 | milk | 3/5 | 3/13 |
| 12 | cookies | 3/12 | 3/27 |
| 13 | sink | 3/13 | 4/9 |
| 14 | chicken | 3/27 | 4-5-18 |
| 15 | broom | 4/5 | 4-19-18 |
| 16 | pizza | 4/5 | 4/11 |
| 17 | orange | 4/11 | 4-19-18 |
| 18 | zebra | 4-18 | 4/30 |
| 19 | kangaroo | 4-18 | 5/1 |
| 20 | fork | 4/30 | |
| 21 | cereal | 5/1 | |
| 22 | | | |
| 23 | | | |
| 24 | | | |
| 25 | | | |