THE COMPARATIVE EFFECTS OF SIMPLE AND COMPLEX INSTRUCTIONAL LANGUAGE ON THE ACQUISITION AND GENERALIZATION OF RECEPTIVE LANGUAGE TASKS BY CHILDREN WITH AUTISM

A Dissertation

Prepared in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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ABSTRACT

Research is needed to identify effective and efficient instructional methods for teaching receptive language skills to children with autism. Six preschoolers, ages 3-6 years, diagnosed with autism participated in two experiments on the effects of simple or complex instructional language on the children's acquisition and generalization of receptive language tasks. Each session in Experiment I consisted of 10 discrete discrimination training trials in which the teacher used either simplified instructional language (e.g., "pencil" for an object identification task) or complex language (e.g., "Remember, balls are fun to throw and play catch with. Can you find the one?") for each trial. The dependent variable was the number of sessions required to master an item (at least 90% correct responses for two consecutive sessions).

Results of Experiment I showed all children learned receptive tasks in fewer sessions when their teachers used simple instructional language rather than complex language. In Experiment II, the teacher presented items with simple language that the child had mastered with complex language in Experiment I, and vice versa. Results of Experiment II showed that the youngest children (3 years old) were more accurate when responding to simple language for items that had been taught with complex language in Experiment I. The oldest children (6 years old) responded with
100% accuracy to complex and simple instructions. The children who were 4 years old showed no difference in responding between simple and complex instructions.
I thank my faculty advisor, Dr. William Heward, for being a tremendous source of support, encouragement, and guidance throughout my graduate studies at The Ohio State University. He has continually served as a mentor, an editor, and a friend for five years. He remained my advisor after becoming professor emeritus and for that I am eternally grateful.

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I extend my gratitude to the 6 children of 4 families who participated in this study. During the course of the study these children participated in over 600 study sessions and learned over 115 new receptive labels. Good work!

I thank my colleagues at Children’s Hospital Autism Center who administered the study sessions and generalization assessments. Over 30 instructional aides were trained on the study procedures and conducted the study sessions. Without their hard work and tremendous attention to detail this study would not have been possible.

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A special thank you to my parents, Patrick & Eileen, my brother, Brendan, and my sister-in-law, Kate. Even when I did not believe it myself, they knew I would finish. Thank you for your never-ending love and support.
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Special Education

Applied Behavior Analysis
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CHAPTER 1

INTRODUCTION

Autism is a developmental disorder characterized by impairments in communication, socialization, cognitive functioning, and repetitive or perseveratory behaviors. The diagnostic criteria for autism outlined by the Diagnostic and Statistical Manual, Fourth Edition, Text Revision (DSM-IV) (APA, 1994) includes marked impairment in nonverbal behaviors (e.g., facial expressions), failure to develop peer relationships, lack of social reciprocity, delay in or lack of spoken language, stereotypic speech, lack of make-believe play, ritualistic behaviors, and repetitive motor movements. Although autism can be diagnosed as early as 12 months, diagnosis at 18 months or more is found to be reliable. Many parents notice a marked difference in the communication skills of their children between 12 and 18 months. This difference can come in two forms, a lack of development of language or a regression in already developed language (Exkorn, 2005). The Centers for Disease Control 2005 has estimated that 1:166 births results in a diagnosis of an autism
spectrum disorder. During the 2004 school year, 165,552 children, students ages 6 through 21 received special education services under the disability category of autism (U.S. Office of Special Education, 2005).

Although diagnostic criteria specify a delay in spoken, or expressive, language, parents and educators of children with autism notice and express concern regarding impaired receptive skills as well (Autism Society of America, 2005). Expressive language is the ability to produce language, whether by speech or via augmentative communication systems. Receptive language is the ability to comprehend language, as evidenced by appropriate verbal or motor responses to cues (e.g., a child responding to a mother’s verbal request to “sit down” or a student responding to the instructions written on the chalkboard) (Sundberg & Partington, 1998). For a variety of developmental disorders, including autism, negative behaviors, such as aggression and ritualistic behaviors, are correlated with expressive and receptive language delays (Carr & Durand, 1995). As a result of both the language delay and increased problem behaviors, educators and parents often make language acquisition their number one priority for treating a child with autism.

Since the late 1960s educators and parents alike have been trying to find effective interventions for persons with autism. Interventions attempted have including holding therapy (Welch, 1983), chelating treatment (Deitrick et al., 2004), auditory integration training (Rimland & Edelson, 1995), and intensive behavioral intervention (Lovaas, 1987; Smith, 2001; Smith, Donahue, & Davis, 2001). Among these widely varied treatments, currently only intensive behavioral intervention has empirical evidence showing improvements in the behaviors of individuals with
autism (Smith, 2001): still parents, teachers, psychologists, and other academics continue to search for effective interventions that will change the behavior of persons with autism (National Research Council, 2001).

Behaviorally based treatment encompasses a common and widely sought after group of interventions for children with autism. These interventions use systematic teaching protocols based on the principles of applied behavior analysis. Applied behavior analysis (ABA) is a discipline that utilizes a scientific approach to identifying, defining, and measuring observable everyday behaviors, prioritizing these behaviors with regard to importance in everyday life, and improving those behaviors (Cooper, Heron, & Heward, 2007; Heward, 2006). Interventions based on ABA, include: an approach based on principles outlined in Skinner’s (1957) analysis of verbal behavior, a primarily home-based model of instruction (Sundberg & Partington, 1998); the UCLA Young Autism Project, a primarily home-based model of instruction (Lovaas, 1981; Lovaas & Smith, 1989; Smith & Lovaas, 1998; Smith, Donahoe, & Davis, 2001); discrete trial training, a primarily home-based model of instruction (Maurice, Green, & Foxx, 2001; Smith, 2001); and parent-guided interventions (Maurice, Green, & Luce, 1996). All of these behaviorally based interventions share characteristics of applied behavior analysis described by Baer, Wolf, and Risley (1968): applied, behavioral, analytic, technological, conceptually systematic, effective, and generality. The training protocols for each intervention differ with regard to the emphasis of each of these characteristics. While the training protocols vary among these approaches, the teaching guidelines address a considerable amount of attention to the form and use of instructional language.
*Instructional language* is a term used to describe the way that teachers, aides, parents, and other instructional staff talk to children during instruction. As a child ages, the complexity of the speech expected of him/her and the complexity of the language he/she is exposed to during instruction increases in both grammatical form and in length of utterance (Engelmann & Carnine, 1982). For instance, when teaching a 12-month-old to identify a dog, a mother might point to a dog and say, “dog.” As the child grows older this simple, one word, instructional language increases in complexity to statements such as, “Look, a dog!” and “That is a dog.” The complexity of instructional language used, and the everyday language to which the child is exposed, show some positive correlation with the children’s ages (Phillips, 1973). It can be debated that instructional language and everyday language are not necessarily correlates of age, but actually correlates of language ability of the child: however, limited research is available to support such an alternative.

If instructional language is correlated with the developmental age of the child’s language repertoire, intervention programs and instructional protocols for learners with autism would logically prescribe instructional language based on the learner’s developmental age. However, the behavioral programs listed previously consistently recommend simple forms of instructional language that are not necessarily representative of the child’s developmental age with respect to language, nor representative of the language the child encounters in her everyday environment.

Conversely, the language used by teachers in many preschool and kindergarten classrooms serving children with autism does not prescribe the specific nature of instructional language. Instead the language used in such classrooms is
observed as related to the child’s chronological age. Regardless of the learner’s developmental language level, the grammatical form of instructional language used in many classrooms increases with time and is characterized by longer length of utterances, as students get older.

In addition to the differences in instructional language commonly found between typical classrooms and behaviorally based programs, differences can be found in the presentation of new language concepts. When teaching new language concepts behaviorally based programs recommend simplifying new language concepts and gradually progressing to more complicated and natural use of the language concepts based on a student’s improving performance. This procedure would be repeated several times. For example, to teach the object name *dog*, a behavioral approach may present the student with a picture of a dog by itself, tell the student, “dog,” and have the student touch the dog. By contrast, approaches found in the typical preschool settings recommend constantly exposing children to language concepts in the most natural and typical environment. In a preschool setting, the teacher might begin by reading or telling a story about dogs while sharing some pictures of dogs. Clear differences can be seen between the common preschool format and the behaviorally based format in both the presentation of the concept, *dog* and the language used to present the concept.

Previous research on instructional language used to present such concepts has been limited and yielded mixed results. Clark (2000) and Chavez-Brown, Scott, and Ross (2005) assessed the comparative effects of simple versus typical (i.e., more complex) instructional language on the accuracy of responses and the rate of
acquisition of target concepts during a receptive language task by children with
autism. Clark (2000) used an alternating treatments design to compare the accuracy of
responses to visual discrimination tasks presented in a discrete trial training format
differing in the type of instructional language used. The results supported Clark’s
hypothesis that students with more severe levels of autism were more likely to benefit
from a simplified instructional language than students with mild levels of autism, who
were more likely to learn from a discriminative stimulus made of typical speech.

In a systematic replication of the Clark (2000) study, Chavez-Brown and
colleagues (2005) obtained mixed results on performance on picture discrimination
tasks by four children with autism, ranging in age from 28 to 39 months. One child
achieved mastery criterion, performing more correct responses during the simplified
instructional language conditions. Two children achieved mastery criterion,
performing more correct responses during the typical verbal antecedent conditions.
No clear differences in performance between the two instructional language
conditions were obtained for the fourth child.

The present study was designed to extend previous research investigating the
comparative effects of simple and more complex instructional language on the
acquisition of receptive language tasks taught in a discrete trial format.

Purpose of the Study

This study investigated the differential effects of simple and complex
language used by teachers to instruct students with autism. Two experiments
evaluated the effects of simple and complex verbal instructions on the accuracy of
children’s responses to receptive language tasks. Specifically, Experiment I compared
the responses to receptive tasks presented with simple and complex instructional language, to determine variances in accuracy of individual responses and trials to criterion of items of receptive skills. Experiment II investigated the differing effects of simple and complex instructions used by teachers when assessing maintenance and generalization of previously learned receptive tasks.

Research Questions

This study was designed to yield experimental data in response to the following research questions.

Experiment I – Discrimination Training (DT)

Experiment I examined the effects of simple and complex instructional language on accuracy of receptive tasks and the number of sessions to criterion to learn receptive tasks during discrimination training. The specific research question addressed by the experiment was the following:

- What are the comparative effects of teachers’ simple versus complex instructional language, during discrete trial discrimination training of receptive language tasks, on the number of sessions needed to learn those tasks by children with autism?
Experiment II – Known Task Assessment (KTA)

Experiment II investigated the effects of simple and complex instructions on the generalization of previously learned receptive tasks. The specific research questions addressed by the experiment were the following:

- What are the effects of complex instructional language on the response accuracy to receptive language tasks initially learned with simple instructional language by children with autism?
- What are the effects of simple instructional language on the response accuracy to receptive language tasks initially learned with complex instructional language by children with autism?
Glossary of Terms

*acquisition criterion* – The number of sessions that the student must respond to correctly of a receptive language task item at a specified level of accuracy. In this study, an item was considered mastered if the student correctly responded to the item at 90% accuracy over two experimental sessions.

*complex instructional language* – Statements representative of common sentence structures used commonly in school and community settings. Statements may be comprised of the following parts of speech: subject, verb, object, article, adjective, and predicate (e.g., “Remember, an airplane is a vehicle that flies from one place to another, find it.”).

*consequence* – The third component of a discrete, three-term instructional trial. For the purposes of this study, the instructional assistant’s response to the student behavior during each discrete trial (e.g. “You’re right. Nice work!”).

*discrete trial* – An instructional unit comprised of three components: a discriminative stimulus, the student’s response, and consequence. In this study, each discrete trial included the instructional aide’s verbal instruction (e.g., “Remember, an airplane is a vehicle that flies from one place to another. Find it.”), student’s behavior (e.g., points to the picture of the airplane), and the instructional aide’s consequence (e.g., “Good work!”).
discrimination training – Teaching protocol where the child selects a target item from among a group of items. Discrimination training involves systematic instruction levels increasing in difficulty as target behaviors are acquired. In this study three levels of discrimination training were conducted: mass trial alone, mass trial with distractor, and random rotation all.

discriminative stimulus – The first component of a three-term discrete instructional trial. In this study, the instructional aide’s verbal instruction (e.g., “Remember, an airplane is a vehicle that flies from one place to another. Find it.”) is the discriminative stimulus.

distractor stimulus – A blank picture card presented in addition to the target item during mass trial with distractor.

experimenter – Member of research team charged with training instructional aides and in experimental protocol, guiding order of experimental sessions and conditions, and ensuring interobserver agreement and procedural integrity.

generalization assessors – Members of research team that implemented the Experiment II and the pretest. Generalization assessors were senior level staff members of the Children’s Hospital Autism Center staff with extensive training and experience using discrimination training methods and development of curriculum for home-based interventions.

instructional aides – Members of research team who implemented the protocols in Experiments I & II.
**instructional language** – The first component of a discrete trial, instructional language serves as an indicator of expectation for the receptive language task. In this study, instructional language is the aide’s verbal instruction (e.g., “Remember, an airplane is a vehicle that flies from one place to another, find it.”). The instructional language was the independent variable in this study.

**item** – A target within a receptive language task. For example, *red, orange, yellow,* and *blue* items in the receptive colors task.

**known stimulus** – An item of a receptive language task that the student correctly responded to under assessment conditions. For example, for receptive colors, the student correctly identifies red under assessment conditions; red would therefore be considered a known item.

**learned task** – A receptive language activity (e.g., letter identification, picture discrimination) that is no longer part of the child’s behavioral program because the student has demonstrated the ability to complete the task across a variety of stimulus targets and situations.

**noun** – Labels for object classes (e.g., shirts, snakes, balls, sports); can include subtypes with names (e.g., turtleneck, rattler, football, soccer).

**preferred stimulus** – A toy (e.g., spinning tops, noise-makers, and bubbles) or small amount of food (e.g., cookies, crackers, and lollipops) known to function as a reinforcer (been associated with an increase in targeted behavior) for each child.

**pretest** – The no feedback condition to assess whether the child successfully responds to a target item.
prompt – Physical assistance provided by an instructional aide and paired with the
discriminative stimulus during the discrete trial procedure. For example, the
instructional aide points to the car while giving the verbal instruction, “Touch
car.” Prompts were provided after one incorrect response and were recorded
as error correction.

receptive language task – The activity designed to teach a receptive language skill.
For example, to teach color identification, the receptive language task
Receptive Colors involved the student correctly identifying/pointing to a color
specified by the instructional antecedent (e.g., “Red” and the student touches a
red item).

response – The second component of a discrete three-term instructional trial. An
example of a response in this study is the student response behavior following
the discriminative stimulus, “car,” the student touching the picture of the car.

session – Each experimental session consisted of 10 discrete trials.

simple instructional language – Statements containing grammatical units essential to
completing a receptive task. The name of the target item comprised the
entirety of a simple instructional language statement (e.g., “Car.”).

target – An item of the receptive language task selected for instruction. For example,
red, orange, green, blue, and purple were targets for the receptive language
task of color discrimination.

task assessment – The no feedback condition to assess the mastery level, known or
unknown, of a target.
unknown item – A member of a receptive language task to which the student has responded incorrectly on the pretest (For example, for the receptive colors task, the student incorrectly identifies blue on the pretest, blue would be an unknown item).
CHAPTER 2

LITERATURE REVIEW

This chapter reviews the literature on autism spectrum disorders, language delays, and treatment options. The review also highlights the procedural details and results of two studies that assessed the effects of simple and complex instructional language on the acquisition of receptive language.

Autism

 Autos the Greek word for self, used in 1911 by Swiss Psychiatrist Eugene Bleuler in his work with schizophrenic patients, is the root word for autism. Leo Kanner (1943) was the first to identify a group of young men who displayed symptoms of impaired social interaction, lack of imaginative play, and severe communication problems as having autism, which was later, called early infantile autism. The disorder is both spectral and developmental in nature. Five developmental disorders comprise the autism spectrum: childhood disintegrative disorder, Rett’s syndrome, Asperger’s syndrome, pervasive developmental disorder – not otherwise specified (PDD-NOS), and autistic disorder.
There is no medical test for autism; the condition is diagnosed based on the presence or absence of a certain set of behaviors or skill sets. A diagnosis of autism is made when an individual displays at least 6 of 12 symptoms distributed across three major areas: social interaction, communication, and repetitive/stereotyped patterns of behavior and interest. There are several instruments used to assess children (Bopp, et al., 2005) including: intelligence tests such as the Stanford-Binet Intelligence Scales: Fifth Edition (SB-V) (Roid, 2004), the Mullen Scales of Early Learning (Mullen) (Mullen, 1995), the Leiter International Performance Scale – Revised (Leiter-R) (Roid & Miller, 1995,1997), and the Wechsler Preschool and Primary Scale of Intelligence: Revised (WPPSI-R) (Wechsler, 2002); language assessments such the Expressive One-Word Picture Vocabulary Test (EOW) (Brownell, 2000) and the Peabody Picture Vocabulary Test: Third Edition (PPVT-III) (Dunn & Dunn, 1997); and scales that measure the severity of autistic symptoms such as the Childhood Autism Rating Scale (CARS) (Schopler, Reichler, & Renner, 1999), and the Gilliam Autism Rating Scale (GARS) (Gilliam, 1995).

The WPPSI-R, SB-V, and Mullen are general intelligence tests. The Leiter-R is a test assessing non-verbal cognitive abilities. The EOW and the PPVT-III are language assessments. The CARS and the GARS are tests that assess the presence of autistic characteristics. The GARS is normed for children over 3 years old.

One-year-olds with autism lack responsivity to their name and do not look at others around them (Osterling, Dawson, & Munson, 2002). Regression is often reported after a period of ‘normal’ development (Davidovitch, Glick, Holtzman, Tirosh, & Safir, 2000; Werner, Osterling, Dawson, & Munson, 2002). Milestones of
typical development for 12-17 months include attending to books or toys for about
two minutes, pointing or gesturing to objects, pictures, and people, speaking two to
three words to label a person or object and gross imitation of simple words. Some
children with autism reach these milestones, however they regress in development or
they slow in their development so the 18-24 milestones are not reached (Landa &
Garret-Meyer, 2006) including pointing to simple body parts such as "nose," correctly
pronouncing most vowels and \( n, m, p, h \), beginning use of other speech sounds,
consistent use of 8 to 10 words, requesting common foods by name, imitating animal
sounds such as “moo,” and beginning 2-3 word statements such as “milk mommy.”
Variations from typical and language-delayed development are detectable in many
children with ASD using a measure of general development by 24 months of age
(NIDCD, 2006).

In place of the typical developmental milestones, children with autism display
resistance to change, insist on sameness, and have difficulty expressing their needs.
These children often repeat words or phrases in place of normal, responsive language
and are observed laughing, crying, or showing distress for reasons that are not
apparent to others. Children with autism often play alone and often display disruptive
and inappropriate behaviors for longer periods of time than their same-age peers.
They engage in little eye contact and display repetitive play patterns such as spinning
or flipping objects (ASA, 2005).

A multi-site study of 351 children with autism spectrum disorders (ASD) and
31 typically developing children used caregiver interviews to describe the children’s
early acquisition and loss of social-communication milestones (Richler et al., 2006)
such as those described above. Poorer outcomes were found for the majority of children with ASD who had experienced a regression. Children who had lost skills showed slightly poorer outcomes in verbal IQ and social reciprocity, mean age of onset of autistic symptoms that was later, and more gastrointestinal symptoms than children with ASD who had not had a regression.

The severity of the disorder is not the only concern for researchers and clinicians. Current prevalence estimates indicate that as many as 1 to 1.5 million Americans have a diagnosis on the autism spectrum (Autism Society of America, 2004). There has been speculation over the recent years that prevalence has been rising. Newschaffer, Falb, and Gurney (2005), using US Census Bureau estimates, published a report analyzing annual birth cohorts from 1975 to 1995. There did appear to be an increase in prevalences among the successive cohorts. The increase was greatest from the 1987 cohort to the 1992 cohort. In addition to looking at the prevalence trends, the authors indicated that there were no coinciding decreases in categories of mental retardation or speech/language during this time. Cohorts born after 1992, had prevalence increases but those increases were not as great, perhaps indicating a slowing of the autism prevalence increase.

Autism is a lifelong disability. Despite crucial and life-altering gains made by many individuals with autism, long-term deficits, especially in social areas, persist even in the case of best outcomes (10% of population) (Fombonne, 2003).

Language of Children with Autism

Children with autism exhibit delays in both expressive and receptive language skills. Receptive language delays are evident when the child fails to follow simple
directions (e.g., “Touch your ear.”) or to identify picture concepts such as names, classes, or colors of objects when asked by the parent or teacher. Delays in pragmatics, the use of language, are common in the apparent misuse of eye contact (avoiding eye contact at all or staring for an inappropriate period of time), inability to successfully engage in turn-taking conversations (either by talking when it is appropriate for the conversation partner to be speaking or by remaining silent when it is the child’s turn to talk), or by making irrelevant comments during conversation (someone is talking about his favorite type of music and the child makes a statement about skiing in the Alps instead of commenting on the music topic). Children with autism sometimes display unusual prosody in their speech. The children will stress words that would not ordinarily or should not be stressed. In addition, many children with autism display repetitive speech, repeating a phrase or statement they have heard immediately upon hearing it (echolalia) or sometimes repeating the statement hours, days, or weeks later (palalia or delayed echolalia) (ASA, 2005; Eaves & Ho, 2004; NIDCD, 2006; Wilkinson, 1998).

The generalization of language use by children with autism has been a topic for investigation as well. Hetzroni and Shalem (2005) identified 6 students, ages 10 to 13 years, with autism spectrum diagnoses to participate in study investigating the generalization of words using different fonts. At the start, students were able to identify the logos of 8 food items with the actual food items; however, the students were not able to identify a plain text version of the name of the food with the actual food item. The investigators employed a seven-step, computer based, fading procedure to teach the students the association between the logo and its associated
plain text version. Once the successful association was made between the plain text version and the logo, generalization assessments were done to assess whether the students could then make the association between the plain text version and the actual food item (a task which proved unsuccessful at the pretest). All students were able to make the associations.

Generalization across expressive and receptive language skills was assessed in a study by Wynn and Smith (2003). Six boys (ages 4-11 to 6-3) diagnosed with autism spectrum disorder and participating in home-based early intensive behavior intervention program received training on word pairs such as hot/cold. Half of the word pairs were taught expressively (e.g., the experiment asked, “What is it?” and the child responded, “Hot.”) and then tested receptively (e.g., the experiment said, “Touch hot.” and the child touched the corresponding picture) for generalization. The other half of the word pairs were taught receptively and then tested expressively for generalization. In general, the pattern of teaching with expressive first led to greater generalization gains for most participants. However, one participant had greater generalizing for word pairs taught receptively.

**Autism Treatments**

A treatment that completely addresses all of the needs for individuals with autism has yet to be discovered (Schoen 2003). When a diagnosis of autism is confirmed, parents face a barrage of treatment options. By 1999, the number of treatments and the strength of the advocacy for each individual treatment had grown to proportions to warrant a satire by Bondy (1999), a well-known researcher in the field, who colorfully illustrated the level of absurdity of the effectiveness claims of
overnight cures. For example, Bondy paralleled Pivitol Response Training to Divotal Response Training, in which children are taught to remove the grass clumps from golf courses without getting hit with golf balls. Testimonials were widely available for every available treatment as were ever-deteriorating descriptions of the treatments. In addition, ethical concerns over the efficacy of treatments were on the rise (Bondy, 1999).

The National Research Council, a group of distinguished scholars was charged by the U.S. Department of Education’s Office of Special Education Programs with describing the current state of knowledge and advising the federal government on scientific research (NRC, 2001). The purpose of the project was to consider the state of the scientific evidence of the effects of early educational intervention provided to children with autism spectrum disorders. The NRC’s report, *Educating Children with Autism*, covered a wide range of issues surrounding autism spectrum disorders, from diagnosis, prevalence, interventions, and research to public policy and the role of families. Following the publication and distribution of the NRC’s report, The Organization for Autism Research (OAR), (2003) published a guide for parents that highlights how to determine whether a treatment has been shown effective and what elements of a treatment package need to be identified for their specific child. The OAR’s guide differentiates peer-reviewed empirical research from anecdotal evidence that is easy to understand for parents. However, even though there is an ever-growing body of empirically validated approaches, parents are still inundated with anecdotal evidence from “breakthrough” interventions (Favell, 2005). Parents are faced with choices including auditory integration training (Dietrick et al., 2004;
Jacobson, Mulick, & Foxx, 2005), sensory diets (Jacobson, et al., 2005), holding therapy (Welch, 1983), and facilitated communication (Jacobson, et al., 2005) to name a few. Although advocates for these interventions promise amazing results, there is little, if any, empirical evidence to support such claims. The eagerness for new and effective treatments often fuels these interventions that make great promises but deliver disappointing results (Smith, 2005).

Biomedical Interventions

A variety of medical treatments exist including medication, psychotherapy, vitamin therapy, anti-yeast therapy, the use of secretin (hormonal treatment), and the control of allergies (from food to metal allergies) (Dempsey & Foreman, 2001). Medicines prescribed can include tranquilizers, anti-depressants, anti-anxiety drugs, and chelating drugs (used to decrease metal levels in the blood) (Schoen, 2003). These treatments are usually provided in conjunction with other therapies. However, no peer-reviewed studies to date have compared the effects of pairing specific medications with specific interventions on autism spectrum disorders (Jacobson, et al., 2005). Volkmar (2001) indicated that biomedical treatments have been found effective for certain symptoms of autism (e.g., repetitive behaviors, intensity and frequency of aggressive behaviors, emotional regulation) but not for the primary deficits of persons with autism spectrum disorders. Social awareness and communication are not as effected by medications. The NRC (2001) associated more effective medication interventions when medications were prescribed after a functional behavioral assessment to determine the function(s) of problem behaviors.
**Dietary Interventions**

The gluten-free, casein-free (GF/CF) diet and the megavitamin approaches have plagued parents with anecdotal reports of overnight cures. Based on the theory that children with autism spectrum disorders are more likely to have food allergies and higher levels of yeast, gastrointestinal problems, and an inability to break down certain proteins, GF/CF diet removes all foods containing gluten (found in wheat, oats, barley, and rye) and casein (found in all dairy products) (Exkorn, 2005).

Elder et al., (2006), conducted the most recent analysis of the GF/CF diet. Fifteen children, ages 2–16 years, with autism spectrum disorder participated in the study over a 12-week period. Analyses of autistic symptoms were collected with group data indicating no statistically significant findings in autistic symptoms even though several parents reported improvement in their children. There was some speculation regarding parental placebo effects related to the GF/CF diet effectiveness. This may have partly accounted for families reporting improvements that were not empirically supported. These parents reportedly chose to continue the diet even after the results of the study were released.

The megavitamin approach was based on the theory that metabolic errors afflict some children with autism spectrum disorders. The theory furthers that large amounts of certain vitamins and minerals, specifically B₆ and Magnesium, will counteract the metabolic errors. Anecdotal reports have indicated decrease behavior issue as well as increased levels of concentration and eye contact, (Exkorn, 2005). Little empirical, peer-reviewed evidence is available to support these claims at this point (NRC, 2001).
Facilitated Communication

Facilitated communication is a controversial intervention that has been touted by anecdotal reports, news coverage, and made-for-TV movies. Facilitated communication is a procedure that assumes that individuals with autism and other developmental disabilities may have a motor problem that prevents them from expressing themselves (Biklen, 1993). Facilitators are trained to hold the individual’s hand, wrist or arm to assist them to type messages on a keyboard or communication board. Anecdotal reports include sudden and dramatic improvements in communication with the use of this method. Shane and Kearns (1994) found the reviews of the method consistent; the claims of improvements in communication by individuals with autism and other impairments are unfounded. In 1994, The American Speech-Language-Hearing Association (ASHA) as well as the American Psychological Association (APA), publicly denounced the effectiveness of facilitated communication, still the technique is being used today with a continual stream of anecdotal evidence available on the Internet. The danger of a technique such as facilitated communication lies in the fact that the use of facilitated communication may detract from the implementation of other, more effective programs (Smith, 1996, 2005). The research has demonstrated that the individuals typing the answers may not be independently choosing the keys to press, but that facilitators (presumably inadvertently) may be influencing the individual’s answer. Thus functional communication has repeatedly been demonstrated to not be valid (Beck & Pirovano, 1996; NRC, 2001).
Sensory-Motor Therapies

Sensory integration training and auditory integration training are two of the most well known sensory motor therapies (Exkorn, 2005). Both approaches are aimed at improving the sensory processing capabilities of the brain by stimulating the vestibular system (Smith, 1996). Although effects of sensory processing cannot be seen in the brain, they are inferred by observing typically autistic behaviors such as self-injurious, repetitive or perseveratory behavior and apparent changes in eye contact and motor skills. Occupational therapies typically prescribe a “sensory diet,” that includes activities such as swinging, spinning, brushing sections of the body (e.g., arms and legs) with a plastic brush, joint compressions, and balance activities aimed at improving the sensory processing (Grandin, 1996; King, 1987). Sensory integration therapy has not been empirically validated to date. No enhancement of language abilities or reduction in repetitive or inappropriate autistic behaviors have been reliably associated with the sensory diets: however, anecdotal reports indicate that those receiving sensory integration treatment appear to enjoy the activities and the treatment appears to have been “helpful” (Grandin, 1996).

Auditory integration training consists of a child listening to filtered tones to improve sensory processing. In formal auditory integration training, an audiogram is completed to determine those frequencies to which the child is intolerant or overly sensitive, as measured by behavioral observations, excessive screaming, repetitive behaviors, and increased crying. The child listens to 10 hours of music per week for a period of two weeks. The frequencies identified from the audiogram have been filtered out of the music. Peer-reviewed research has not associated benefits in
learning or reduction in inappropriate behaviors with auditory integration training, though anecdotal parent reports do exist to the contrary (Edelson et al., 1999). Double-blind studies should be performed to determine the effects, if any, of auditory integration training.

Developmental Approach

**TEACCH.** The Treatment and Education of Autistic and Related Communication Handicapped Children at the University of North Carolina School of Medicine at Chapel Hill, identified as a comprehensive program by the NRC (2001), provides regular consultation and training to parents, schools, preschools, daycare centers, and other placements in NC. TEACCH focuses on developing the learning process for students and criticizes the behavioral approach as being too narrow in teaching students specific behaviors that do not have a broad enough impact (NRC, 2001). The TEACCH program incorporates sensory stimulation activities based on the presence of assumed neuropsychological deficits. TEACCH programs use students’ stronger areas to develop their weaker ones and the need for complex skills to be broken into smaller components to be more easily learned (Jennett, Harris, & Mesibov, 2003).

TEACCH has one model classroom where a structured teaching approach is organized with clear concrete visual information about daily activities. The curriculum is communication based, meaning the students are responsible for initiating communication, and takes a developmental approach to setting goals. Intervention is directed at teaching broad goals that attempt to impact the nature of autism spectrum disorders. Teachers focus on unobservable events such as how their
students think, integrate information and understand the environment (Jennett et al., 2003). TEACCH programming seeks to help their students acquire “implicit understanding” of a task and does not employ contrived reinforcement procedures found in behavioral programs (Marcus et al., 2000). However, Jennett and colleagues (2003) indicated that TEACCH programs use consequences to motivate students. TEACCH incorporates some behavioral procedures with adjustments that incorporate more naturalistic procedures along with alternative communication strategies (Marcus et al., 2000; NRC, 2001).

For example, one aim of a behaviorally based program would be to teach student behaviors that would make that student indistinguishable from his typically developing peers (Kazdin, 2001). By contrast, the TEACCH approach views autism as a culture and would try to teach the student skills that would allow him to function in his classroom but would not change behaviors that distinguished the student from his peers (Mesibov & Shea 2006).

Pivotal Response Training (PRT). Though Koegal and Koegal (1995; Koegel et al., 1989), two well-known behavioral researchers, developed PRT the approach has been controversially identified as developmental (NRC, 2001). As with TEACCH, PRT theorizes that the key to treating autism spectrum disorders is to aim intervention at specific deficit areas that will then bring broad and universal change for the student, thus distinguishing itself from the traditional behavioral approach aimed at targeting specific behaviors and building skill sets. PRT has identified variables, child choice, motivation to respond, and the use of natural and direct reinforcers, which increase social awareness and decrease inappropriate behaviors.
These effects can be seen by measuring student social initiations, response latency, and changes in affect (Koegal, Koegal, & McNerney, 2001). Behavioral procedures are employed such as reinforcement and the measurement of observable behaviors, however, the theory appears to be and has controversially been identified as developmental in nature.

*Applied Behavior Analysis*

The treatment of autism spectrum disorders has been plagued by a series of failed treatments (facilitated communication), fads (seratonin injections) (Vyse, 2005), and misinformed theories of etiology (e.g., from Bettleheim’s refrigerator mother theory to the measles, mumps, and rubella vaccination). The quality of life of individuals diagnosed with autism spectrum disorders has been increased substantially, with advances in teaching methods derived from the science of applied behavior analysis (ABA) (Ogletree & Oren, 2001; Maurice, Mannion, Letso, & Perry, 2001; Schreibman & Winter, 2003). “It is now widely acknowledged that, to date, the forms of treatment enjoying the broadest empirical validation for effectiveness with individuals with autism are those treatments based upon a behavioral model” (Schreibman, 2000, p. 373). Schreibman (2000) noted that there is a deficiency in the existing body of research supporting behavioral-based treatment, namely studies that make comparisons with other competing treatments are lacking. However, the present author would suggest determining the valid and reliable effectiveness of competing treatments before being compared to behavioral based treatments.

ABA assumes that carefully controlling the training environment can change the behavioral deficits and excesses that characterize autism despite the possibility
that those excesses and deficits are neurologically based (Lovaas & Smith, 1989). ABA defines measurable and observable units of behavior. These small units are taught systematically, much like building blocks, to target complex skills. For example, single-step imitation (e.g., raising hand) would target the more complex skills of imitating peers in the classroom (e.g., when to sit down during circletime and when to line-up for gym).

*Classroom Based Approaches.* Project Data (Developmentally Appropriate Treatment for Autism) (Schwartz, 2004) was a federally funded demonstration model for developing school-based inclusive programs for children with autism. The program was set up with five goals; high-quality early childhood environment, extended instructional time (beyond the 6-hour day provided to most school children), social and technical support for families (provided on a minimum of a monthly basis in the home), collaboration and cooperation across all service providers, and transition support between programs. Staff members were required to have extensive understanding of the principles of applied behavior analysis and recommended practices in early childhood special education. The model incorporated systematic instruction, ongoing data collection, positive behavior support, and ongoing teacher training, including both classroom teachers and extended day teachers.

The 48 children, participating in the one of three model classrooms, were assessed on five elements; use of speech to communicate, ability to follow complex directions, motor imitation, toilet training, and cooperative play with peers. These children, ages 3 to 6 years, made gains in all categories. The most gains were made in the area of toilet training, while the least gains occurred across both areas of play.
Communication measures were based on the spontaneous use of five words. At the beginning of the study 63% of the participants met these standards, which increased to 83% of the participants by the end of the study. Future research should compare this school-based inclusive model to early intensive intervention services provided primarily in a home-based model.

*Early Intensive Behavioral Intervention.* The goals of this treatment include developing language, increasing cognitive and social skills, as well as decreasing inappropriate behaviors such as aggression and repetitive or ritualistic behaviors (Smith, Eikeseth, Klevstrand, & Lovaas, 1997). Target skills sets are determined for each child and programs are implemented to address each skill set. Skills are taught one at a time and build upon each other. Appropriate responses to cues, in the form of verbal or visual instructions, are followed by consequences that have been found to be reinforcing for each child. Following the reinforcement principles of behavior analysis, the intervention assumes that this sequence will increase the performance of appropriate responses by the child. Similarly, the function of inappropriate behaviors is determined and systems are developed to reduce the occurrence, often in the form of differential reinforcement of other, alternative, or incompatible behaviors. Inappropriate behaviors (e.g., repetitive or aggressive behaviors) are not reinforced but punished in the sense that the occurrence of the behavior decreases.

Lovaas (1987) compared the 40-hour per week participation of 19 children in an early intensive behavioral intervention program called The University of California at Los Angeles (UCLA) Young Autism Project to a control group, containing 19 children, who received only 10 hours per week of the intervention. All
participants were in treatment phase for 2-3 years. 47% (9 students) of the experimental group achieved normal intellectual and educational functioning. The group successfully participated in the first grade in each member’s respective public school. 40% of the group showed mild intellectual disability and received special education services for language delays only. A portion of the group (10%) were assigned to classes for children with severe disabilities and tested in the profound intellectual disability category. Conversely, only 2% of the control group children achieved normal educational and intellectual functioning. Mild intellectual disability was achieved by 45% of the control group who were subsequently placed in language-delayed classes. Severe intellectual disability was displayed by 53% of the control group who were subsequently placed in other special classes (Lovaas, 1987).

A follow-up of the children in the 1987 study (average age 13 years), reported that participants in the experimental group had maintained their level of intellectual functioning and were continuing to function in their respective classrooms. Eight of the nine children (42%) of the experimental group were considered normal functioning. Children in the experimental group had a mean gain of 20 IQ points compared to those children in the control group who had a mean gain of 5 points. On measures of adaptive behavior and personality the experimental group displayed higher levels of functioning than did controls in McEachin, Smith, & Lovaas (1993). The outcomes of the Lovaas (1987) and the follow-up (McEachin, Smith, & Lovaas, 1993) suggested that the number of hours of treatment was critical to the functioning outcome of children with autism spectrum disorders.
Other research has attempted to replicate the above findings with regard to number of treatment options. In studies where children have received between 20 and 30 hours per week behavioral treatment and gains have been more modest showing average IQ gains between 4 and 17 points (Anderson et al., 1987; Birnbrauer & Leach, 1993; Eikeseth, et al. 2002, Smith, Groen, & Wynn, 2000). However, it is difficult to compare these studies directly because a number of other factors that may relate to outcome also varied. These include age and IQ at intake, duration of treatment, and level of parent involvement and training.

Eldevik, Eikeseth, Jahr, and Smith (2006) compared 13 children who had received intensive behavioral treatment to a comparison group of 12 children who had received intensive, eclectic intervention. The intensive behavioral group gained an average of 17 IQ points, 13 points in language comprehension, 23 points on an expressive language scale, and 11 points in adaptive behavior. The comparison group increased on average 4 IQ points, decreased by an average of 1 point in language comprehension, decreased by 2 points on an expressive language scale, and made no change in adaptive behavior. Similar results were found by Eldevick and colleagues (2006): however, the magnitude of change was less but may be due to a slightly lower number of treatment hours for both the comparison and treatment groups. Caution should be used when making comparisons across the studies as several levels of dissimilarity exist such as IQ and age at intake, duration of treatment, and level of parent involvement.

The positive changes in behavior that occur as a result of treatment programs directed at treating children with autism spectrum disorders should not be momentary.
A change in behavior has generality when “it lasts over time, appears in environments other than the one in which the behavioral techniques were applied, or spreads to other behaviors not directly treated by the behavior change techniques.” (Cooper, Heron & Heward, 1987, p.6). Perry, Prichard, and Penn (2006) identified creating generalization opportunities as an indicator of high quality teaching. In the advent of applied behavior analysis as a discipline, Baer et al., (1968) called for the existence of generalization furthered by Stokes and Baer (1977) call for the planning rather than the expectation of generalization. Unfortunately, intensive behavioral intervention has been criticized for its inability to program for and assess generalization from the teaching environment to the natural environment (Schoen, 2003). As such it is important to highlight several recent and successful studies identifying the successful programming and assessing for generalization within behavioral intervention programs.

Language Acquisition Within Treatments

The above literature review highlighted the effectiveness of early intensive behavioral intervention programs and how they assess for generalization. Because almost all children with autism spectrum disorders have a deficit of, or are delayed in the development of, receptive language (Eisenmajer et al., 1998; Gillum & Camarata 2004; Koegel, 2004; Lovaas, 1987), teaching receptive language skills is an important component of these early intensive behavioral intervention programs.

As important a component as receptive language appears to be, there have been relatively few studies evaluating the effectiveness of treatment for such skills (Gillum & Camarata, 2004). Receptive language skills are critical for participation in
school, ability to build social relationships, and independent functioning. Receptive language skills are essential for functioning in a natural and everyday context; however, for many children with autism, the learning of complex auditory comprehension is a slow and arduous process (Peterson, Larrson, & Reidesel, 2003).

One important tool of behavioral programs, called discrete trial training (DTT), is used to address receptive language deficits (Lovaas, 1977, 1987; Smith, 2001). DTT is not the only component of behavioral intervention programs: others include preference assessment, incidental teaching, stimulus fading, shaping and chaining, though even these procedures have been argued to be based in DTT (Baer, 2005). Discrete trial training is initially the main and most powerful component used to add new forms of behavior to a repertoire as well as new discriminations between stimuli (Baer, 2005; Maurice & Taylor, 2005; Smith, 2001). Discrete trial training is the teaching approach with the most empirical evidence supporting the increase of receptive language skills of children with autism. It has, however, been criticized as highly structured and may inhibit children from transferring the newly learned skills to a new teaching environment (Smith, 2001).

According to Kimball (2002), behavior analysis exists on three interrelated levels: technology, science, and philosophy. Discrete trial training should be considered a part of the technology used to provide behavioral services. Ogletree and Oren (2001) called for a more thorough evaluation of the technologies to be employed before they are included in the repertoires of treatment provided.

A few researchers have been responsive to the call for increased evaluation of the technology: discrete trial training (Kimball, 2002; Ogletree & Oren 2001),
promoting of receptive language skills (Gillum & Camarata, 2004), and programming for generalization (Smith, 2001). Clark (2000) and Chavez-Brown, Scott, and Ross (2005) assessed the comparative effects of simple versus typical (i.e., more complex) instructional language on the accuracy of responses and the rate of acquisition of target responses during a receptive language task by children with autism. The research has been limited and yielded mixed results.

Clark (2000) used an alternating treatments design to compare the accuracy of responses to visual discrimination tasks presented in a discrete trial training format differing in the type of instructional language used. Four prekindergarten students diagnosed with autism (Developmental Profile [DP-2]) IQs ranged from 47-78, Childhood Autism Rating Scale (CARS) scores ranged from 35-49) participated in two experimental sessions per day. One session consisted of 10 consecutive discrete trials. Prior to the 10 consecutive discrete trials, four items (e.g., nurse, dime, milk, and snow) were presented to the student accompanied by a verbal description of each item. Verbal descriptions were varied in length and qualified as simple (e.g., “Ball”) or typical (e.g., “This is a ball. We catch a ball.”). Following the verbal descriptions, the experimenter placed the items on the table in a 2 X 2 array, and then executed the 10 consecutive discrete trials. Each trial consisted of a discriminative stimulus (e.g., “Touch ball”), the learner’s response (e.g., learner touches the ball), and a consequence (e.g., experimenter said “good job” if the student correctly identified the item, or “no” if the student was incorrect). Response accuracy was reported as a percentage of correct response per 10 consecutive trials. If typical speech was used in the discriminative stimulus and description of the stimuli during the first experimental
session of the day, then the second session that day would use the simple speech and vice versa.

Clark hypothesized that students with higher severity levels of autism would perform better with a discriminative stimulus made of simplified speech and students with mild autism were more likely to learn from a discriminative stimulus made of typical speech. The results of the study supported the hypothesis.

Chavez-Brown, Scott, and Ross (2005) conducted a systematic replication of Clark’s (2000) study. Four participants, ranging in age from 28 to 39 months, were asked to perform picture discrimination tasks. For example, when 3 pictures were placed on the table (e.g., dog, bird, and house) the experimenter verbally instructed the student to identify one picture (e.g., “Touch dog.”). The target behavior was defined as the student touches a target picture from an array of three pictures (one target and two non-targets) within 5 seconds of the experimenter’s verbal instruction. Responses were considered incorrect when the participant pointed to another picture, emitted no response, or pointed to the correct picture after the 5-second response period had lapsed. Additional measures included the number of items that reached mastery criteria and the number of sessions required to reach mastery criterion. Mastery criteria achieved was defined as 70% correct responding to presentations of picture triads across two consecutive sessions.

The discriminative stimulus consisting of typical speech was defined as a sentence structure similar to sentence structures used with same-age students without disabilities (e.g., “We ride in a car. Show me the car”). Simplified discriminative stimuli were defined as in Clark (2000), the use of a simple speech structure
comprised of (a) a noun (e.g., “dog”), (b) a verb and object (e.g., “Touch cake”), or (c) a verb and noun attribute (e.g., “Touch hot,” or “Give me red”). An alternating treatments design however both conditions were implemented each experimental session. Each experimental session consisted of 10 trials under one condition, a 5-minute break, and then 10 trials under the second condition.

Results showed that only one participant achieved mastery criterion, performing more correct responses during the simplified verbal antecedent conditions. Two participants achieved mastery criterion, performing more correct responses during the typical verbal antecedent conditions. For the fourth participant there did not appear to be any clear differences in behavior when compared across the verbal antecedent conditions. Limitations, as reported by Chavez-Brown, et al., (2005), the author included a limited generality of findings to other children due to the limited number of training sessions and the limited number of participants. Additionally, sequence effects produced by the adapted alternating treatments design, during which participants were allotted only a brief break before a second treatment was implemented, could have confounded data.

Conclusion

With the increase in prevalence of autism over the years, it becomes increasingly important that researchers and interventionists work together to determine the most effective and efficient interventions for treating autism spectrum disorders. Early intensive behavioral interventions continue to have the largest and most supportive research base.
The importance and influence of language across all areas of an individual’s life makes language programming a top priority within interventions. Interventions must focus on the efficiency of teaching acquisition and generalization of both expressive and receptive language skills. The effects of systematic instruction on skill acquisition should continue to be studied as well as transferred to public practice once such instruction is determined effective.

This study extends previous research investigating the comparative effects of varying complexities of instructional language on acquisition of receptive language tasks taught in an intensive behavioral format across a variety of different learners and receptive language tasks. The study also assessed the generalization of acquired receptive language skills.
CHAPTER 3

METHOD

This chapter describes the participants, settings, materials, experimental design, dependent variables, and procedures used in this study.

Participants

Six children ages 3 to 6 years old with a diagnosis of autism participated in the study. Each child had a diagnosis on the autism spectrum as determined by staff at the Children’s Hospital Autism Center (CHAC) through a battery of diagnostic tools including intelligence assessments, behavioral assessments, and parent interviews. Each child was participating in a home-based early intensive behavioral intervention program. Children whose program consisted of receptive language goals and who were recommended by their supervising psychologist were asked to participate. All of the instructional procedures used during this study were procedures that were currently in use in each child’s home-based early intensive behavioral intervention program.

Each child’s home program typically consisted of 25 to 40 hours of intensive behavioral therapy per week provided by a CHAC instructional aide in a room of
each child’s home reserved for therapy sessions that contained a child-size table and chairs, toys, task materials (such as pictures), and art supplies. Therapy sessions were conducted Monday-Saturday and lasted 2-3 hours per session, 1-2 sessions occurred per day, Monday-Saturday. Program learning goals were addressed during each session through a series of instructional tasks, with each task lasting 3-5 minutes. Examples of these tasks include Ball Play (e.g., kicking, hitting, and throwing), Receptive Colors (e.g., the instructional aide say, “Touch red” and the child touches the red object), and Verbal Imitation (e.g., the instructional aide verbally models a sound, “Say /a/” and the child repeats the sound, “/a/”). These tasks addressed a variety of behavioral goals including social, communication, academic, self-help, and play. Each session consisted of 18-22 tasks with a 2- to 5-minute free-play break between each task. Table 3.1 shows a schedule for a typical 2-hour therapy session.

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00p</td>
<td>Instructional Aide greet child – play with child in therapy room (10 minutes)</td>
</tr>
<tr>
<td>3:10p</td>
<td>Call child to table for first task (5 minutes)</td>
</tr>
<tr>
<td>3:15p</td>
<td>Send child to play (in therapy room) (3 minutes)</td>
</tr>
<tr>
<td>3:18p</td>
<td>Call child to table for task (3 minutes)</td>
</tr>
<tr>
<td>3:21p</td>
<td>Send child to play (in therapy room) (4 minutes)</td>
</tr>
<tr>
<td>3:25p</td>
<td>Call child to table for task (3 minutes)</td>
</tr>
<tr>
<td>3:28p</td>
<td>Send child to play (in therapy room) (2 minutes)</td>
</tr>
<tr>
<td>3:30p</td>
<td>Call child to table for task (5 minutes)</td>
</tr>
<tr>
<td>3:35p</td>
<td>Send child to play (in therapy room) (5 minutes)</td>
</tr>
<tr>
<td>3:40p</td>
<td>Call child to table for task (4 minutes)</td>
</tr>
<tr>
<td>3:44p</td>
<td>Send child to play (in therapy room) (3 minutes)</td>
</tr>
<tr>
<td>3:47p</td>
<td>Call child to table for task (3 minutes)</td>
</tr>
<tr>
<td>3:50p</td>
<td>Take child outside room for mid-session break (10 minutes)</td>
</tr>
<tr>
<td>4:00p – 5:00p</td>
<td>Second hour of therapy conducted similar to first hour</td>
</tr>
</tbody>
</table>

Table 3.1: Sample schedule for a typical 2-hour behavioral therapy session
Permission to participate in the study was obtained from each child’s parents prior to the start of research. A letter explaining the purpose and procedures of the study was provided to the parents in addition to the consent form (Appendix A). Demographic and diagnostic information per participant is shown in Table 3.2.

Alpha

Alpha was 3-years 4-months old at the start of the study. He lived at home with his twin brother Beta (who also participated in this study), one older brother and two parents. Nine months prior to the study Alpha was assessed using the following tests and measures: Mullen Scales of Early Learning (Mullen) (Mullen, 1995), Childhood Autism Rating Scale (CARS) (Schopler, Aichler, & Renner, 1988), and Gilliam Autism Rating Scale (GARS) (Gilliam, 1995).

Alpha’s standard score on the Mullen was 50, which placed him in the 1st percentile for cognitive and developmental ability. This score reflects an age equivalency of 13 months for receptive language and 14 months for expressive language. The score on the CARS, an assessment that measures the severity of autism symptoms, was 31 out of 100, placing Alpha in the mild to moderate autistic range. The GARS, another measure of the severity of autism symptoms, diagnostic tool yielded an Autism Quotient of 78, the mild range of autism. However, examiners noted that the GARS scale was likely an underestimate of symptom severity as it was normed using a population of children over the age 3 years.
<table>
<thead>
<tr>
<th>Gender</th>
<th>Age (Yr:Mths)</th>
<th>Autism Symptoms</th>
<th>Cognitive Ability</th>
<th>Reynell Developmental Language Scales – Receptive</th>
<th>Language Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha</td>
<td>M 3:4</td>
<td>31 (CARS) 78 (GARS)</td>
<td>50 (Mullen)</td>
<td>19(^a) (1:8)(^b)</td>
<td></td>
</tr>
<tr>
<td>Beta</td>
<td>M 3:4</td>
<td>40.5 (CARS) 76 (GARS)</td>
<td>58 (Mullen)</td>
<td>7 (1:0)</td>
<td></td>
</tr>
<tr>
<td>Gamma</td>
<td>M 5:2</td>
<td>59 (Stanford Binet) 98 (Leiter)</td>
<td>20 (1:7)</td>
<td>40 (PPVT)</td>
<td></td>
</tr>
<tr>
<td>Delta</td>
<td>M 4:7</td>
<td>34 (CARS)</td>
<td>70 (WPPSI-R) 105 (Leiter)</td>
<td>20 (1:9)</td>
<td>&lt;59 (EOW) 89 (PPVT)</td>
</tr>
<tr>
<td>Epsilon</td>
<td>F 6:0</td>
<td>97 (GARS)</td>
<td>55 (Stanford Binet) 80 (Leiter)</td>
<td>37 (2:7)</td>
<td>No Basal (EOW)</td>
</tr>
<tr>
<td>Six</td>
<td>F 6:0</td>
<td>115 (GARS)</td>
<td>50 (Stanford Binet) 80 (Leiter)</td>
<td>36 (2:6)</td>
<td>14 (EOW)</td>
</tr>
</tbody>
</table>

Notes: CARS = Childhood Autism Scale; GARS = Gilliam Autism Scale; Mullen = Mullen Scales of Early Learning; Stanford Binet = Stanford Binet Intelligence Scales – 5th Edition; Leiter = Leiter International Performance Scale; WPPSI-R = Wechsler Preschool and Primary Scale of Intelligence – Revised; PPVT = Peabody Picture Vocabulary Test – 3rd Edition – Form A; EOW = Expressive One-Word Picture Vocabulary Test – 3rd Edition; \(a\) = Raw score; \(b\) = Chronological age

Table 3.2. Most recent diagnostic scores of each participant. The Reynell was administered by the experimenter prior to the start of the experiment.
Alpha’s behavioral therapy program consisted of 30-35 hours per week of in-home therapy during which he participated in 18 tasks including Receptive Object Labels, Self Help Skills, and Nonverbal Imitation. While participating in therapy, Alpha was quick to display smiles and giggles and he responded well to music, candy, books, and tickles.

Beta

Beta was 3 years 4 months old at the start of the study. He lived at home with his twin brother, Alpha, one older brother and two parents. Eleven months prior to the start of the study Beta was assessed using the following tests and measures: *Mullen Scales of Early Learning* (Mullen) (Mullen, 1995), *Childhood Autism Rating Scale* (CARS) (Schopler, Eichler, & Renner, 1988), and *Gilliam Autism Rating Scale* (GARS) (Gilliam, 1995).

His standard score on the Mullen was less than 58, which placed Beta in the 1st percentile regarding cognitive and developmental ability, and was consistent with a diagnosis of autism spectrum disorder. This score reflected an age equivalency of 7 months for receptive language and 4 months for expressive language. The score on the CARS, an assessment that measures of the severity of autism symptoms, was 40.5 out of 100 placing Beta in the mild to moderate autistic range. The GARS diagnostic tool, another measure of the severity of autism symptoms, yielded an Autism Quotient of 76, the mild range of children with autism spectrum disorder. However, examiners noted that the GARS scale was likely an underestimate of symptom severity as it was normed using a population of children over the age 3 years.
Beta’s behavioral therapy program consisted of 30-35 hours per week of in-home therapy during which he participated in 18 tasks including Receptive Object Labels, Self Help Skills, and Nonverbal Imitation. While participating in therapy, Beta was quiet but did display smiles and giggles when tickled by the instructional aides. He would often pick a book to look at between tasks. He responded well to books, tickles and tops.

Gamma

Gamma was 5 years 2 months old at the start of the study. He lived at home with one older sister and two parents. Eight months prior to the start of the study, Gamma was assessed using the following tests and measures: Stanford Binet Intelligence Scales: Fifth Edition (SB-5), Leiter International Performance Scale: Revised (Leiter-R) (Roid and Miller, 1995,1997), Peabody Picture Vocabulary Test – Third Edition, Form A (PPVT-III) (Dunn & Dunn, 1997), and Expressive One-Word Picture Vocabulary Test: Third Edition (EOW-PVT3) (Brownell, 2000).

Gamma’s full scale IQ score on the SB-V was 59 placing his performance in 1st percentile and a nonverbal IQ score of 66 placing his performance in the 1st percentile, both scores represent significant impairment in Gamma’s overall functioning. Gamma’s performance on the nonverbal intelligence assessment, Leiter, was 98 placing Gamma in the average range. The results of the PPVT-III indicated significant delays in overall independent functioning with a standard score of 40 placing Gamma’s performance amid the 1st percentile and age equivalency of 1 year, 9 months. The standard score on the EOWPVT-3 was below 55 placing Gamma below the 1st percentile and within the far below average range. The Bracken-R was a
receptive language test of basic concepts on which Gamma scored 68, placing him around the 2nd percentile. Gamma’s scores on the assessments reflected impaired communication and social interaction behaviors consistent with a diagnosis of autism spectrum disorder.

Gamma’s behavioral therapy program consisted of 30-35 hours per week of in-home therapy during which he participated in 21 tasks including Receptive Instructions, Self Help Skills, and Ball Play. Gamma presented with a calm temperament while involved in treatment. He often needed additional prompts to be responsive during therapy but did respond when Thomas the Tank Engine pictures, juice, tickles, a koosh ball, and sunglasses were used as reinforcers.

Delta

Delta was 4 years 7 months old at the start of the study. He lived at home with one older sister and two parents. Four months prior to the start of the study, Delta was assessed using the tests and measures: *Wechsler Preschool and Primary Scale of Intelligence: Revised* (WPPSI-R) (Wechsler, 2002), *Leiter International Performance Scale: Revised* (Leiter-R) (Roid & Miller, 1997), *Peabody Picture Vocabulary Test: Third Edition* (PPVT-III) (Dunn & Dunn, 1997), *Expressive One Word Picture Vocabulary Test* (EOW) (Brownell, 2000), and the *Childhood Autism Rating Scale* (CARS) (Schopler, Eichler, & Renner, 1988).

His performance IQ on the WPPSI-R , a test of general intelligence, was scored at 84 where 100 is the mean and 15 is the standard deviation, This score placed Delta 2 standard deviations below the mean. On the Leiter-R, a test of non-verbal cognitive abilities, Delta obtained a Full IQ score of 105, around the 63rd
percentile for his age group. This score is within average range and suggests that his nonverbal cognitive abilities are far better than his verbal abilities. Delta achieved a standard score of 59 on the EOW (an expressive language measure), translating to an age equivalency of 1-year, 6-months. On the PPVT-III, a test of receptive vocabulary, Delta’s score of 89 placed him at the 23rd percentile and his age equivalency at 3 years, 5 months. On the Bracken-R, a test of basic receptive language concepts, Delta scored around the 16th percentile, demonstrating strengths in the identification of colors and basic shapes, and difficulties with the identification of number as well as size and comparative concepts. The CARS, a measure of the severity of autism symptoms, resulted in a score of 34, placing Delta in the mildly autistic range.

Delta’s treatment package from the CHAC, IBI Clinic consisted 25-30 hours per week of in-home therapy and 23 programs including 2-Step Receptive Instructions, Self Help Skills, and Verbal Imitation. During therapy Delta often requested to work on the computer between tasks. He giggled when tickled by instructional aides and responded well to computer time, candy, token systems, and tickles.

**Epsilon**

Epsilon was 6 years old at the start of the study. She lived at home with her twin sister, Six (also a participant in this study), two older brothers and two parents. One year prior to the start of the study, Epsilon was assessed using the following tests and measures: *Stanford Binet Intelligence Scales: Fifth Edition (SBV)* (Roid, 2000), *Leiter International Performance Scale: Revised (Leiter-R)*, (Roid and Miller,
Epsilon’s performance IQ on the SBV, a test of general intelligence, was scored at 55 where 100 is the mean and 15 is the standard deviation. This score placed Epsilon far below the average of her same-age peers. On the Leiter-R, a test of non-verbal cognitive abilities, Epsilon obtained a Brief IQ score of 80, around the 9th percentile for her age group. The score reflects a discrepancy between Epsilon’s nonverbal and verbal abilities, with her nonverbal abilities being significantly better than her verbal abilities. On the EOW, a basal could not be obtained due to Epsilon’s impoverished vocabulary. Epsilon was able to label pictures apple and train but not items such as toe, boat, or tree. Epsilon’s GARS score was 97, placing her performance at the 42nd percentile. The mean for children with autism on this measure is 100 thus Epsilon’s higher score reflects an average level of symptoms of autism.

Epsilon’s behavioral therapy program consisted of 25-30 hours per week of in-home therapy during which she participated in 14 tasks including Counting, Drawing, Receptive Action Labels, Conversation Questions, Tolerance, Writing, and Self Help Skills. Epsilon was quick to display smiles and giggles while involved in treatment and responded well to books, music, candy, dolls, and tickles.

Six

Six was 6 years old at the start of the study. She lived at home with her twin sister, Epsilon, two older brothers and both parents. One year prior to the start of the study, Six was assessed using the following tests and measures: Stanford Binet Intelligence Scales: Fifth Edition (SB-V) (Roid, 2000), Leiter International

Her performance IQ on the SB-V, a test of general intelligence, was scored at 50 where 100 is the mean and 15 is the standard deviation. This score placed Six far below the average of her same-age peers. On the Leiter-R, a test of non-verbal cognitive abilities, Six obtained a Brief IQ score of 80, around the 9th percentile for her age group. The score reflects a discrepancy between Six’s nonverbal and verbal abilities, with her nonverbal abilities being significantly better than her verbal abilities. Six received a standard score below 55 on the EOW, placing her below the 1st percentile for expressive language. Six was able to label pictures of certain animals, common modes of transportation, basic body parts, and kinds of food. Six’s score of 115 on the GARS placed her at the 84th percentile. The mean for children with autism on this measure is 100 thus Six’s higher score reflects the presence of more significant symptoms of autism.

Six’s therapy program consisted of 25-30 hours per week of in-home behavioral therapy during which she participated in 14 tasks including Writing, Counting, Tolerance, Self Help Skills, Receptive Action Labels, and Conversation Questions. Six requested tickles and tag often during treatment. Six responded to instructional aides’ questions and instructions very quickly. Six maintained eye contact with the instructional aide during the majority of tasks, however eye contact dropped during free play times. She also responded well to books, music, candy, dolls, and tickles.
Experimenter

The experimenter was a doctoral candidate in special education and applied behavior analysis at The Ohio State University. She received a bachelor’s degree in psychology and speech and hearing science and a master’s degree in applied behavior analysis from The Ohio State University in 2000 and 2003, respectively. She had 6 years experience working with children with autism as a behavior consultant and supervisor in an early intensive behavioral intervention clinic, in home, school, and community settings. In addition, she worked 20 hours per week for the previous two years as a classroom behavior consultant and inclusion coordinator for an urban community (charter) school in Columbus, Ohio.

Instructional Aides

The 32 instructional aides (IAs) who conducted experimental sessions during the study were staff members of the CHAC, Intensive Behavioral Intervention Clinic. These individuals had been trained in discrete trial instruction methods (see General Procedures) by senior level staff of the clinic. In addition, each IA had been trained to implement discrimination training (see General Procedures) and the behavioral program as defined by the CHAC. IAs were assigned in teams of 3-4 by the CHAC for the purposes of implementing each participant’s behavioral program.

Generalization Assessors

The 5 generalization assessors who conducted experimental sessions for Experiment II were senior level staff of the CHAC, Intensive Behavioral Intervention Clinic. Senior staff had extensive training in discrimination training, discrete trial
training, and various assessment methods used to identify current levels of functioning across various domains such as expressive and receptive language and self-help skills.

Setting

The study was conducted in the intensive behavior intervention therapy rooms in the home of each child. Each child’s parents had created these rooms, with input from the staff of CHAC. These rooms were approximately 12’ X 12’ and lined with shelving units that were approximately 3 feet above the floor. These shelves typically contained toys and activities related to the child’s ongoing therapy protocols. In the center of each room was a child-sized table with 2-4 accompanying chairs (Appendix B). This “therapy table” was used for activities throughout the child’s therapy sessions including art projects and academic activities such as reading a book. All experimental sessions for the study were conducted at this table. Therapy sessions ranged in length from 2 to 3 hours. The number of therapy sessions per day ranged from 1 to 2. Two to three experimental sessions, each lasting 5 to 10 minutes, occurred during the child’s ongoing therapy sessions.

Materials

*Instructional Tasks*

Senior level staff members of the CHAC developed instructional tasks for each child based upon annual intellectual, social, behavioral, and academic assessments. Instructional tasks typically incorporated the parents’ goals for their child, the child’s interests and school recommendations. Receptive language tasks used in this study were selected from the instructional tasks already being
implemented in the behavioral program provided by CHAC. Materials necessary to complete the receptive task included picture cards of target items (Appendix C).

**Reinforcers**

A variety of toys (e.g., spinning tops, noise-makers, and bubbles) and small amounts of food (e.g., cookies, crackers, and lollipops) previously found to function as reinforcers for each child were used throughout the study.

**Distractor Stimuli**

Distractor stimuli were blank picture cards that were not related to the receptive task being presented during the experimental sessions.

**Definition and Measurement of Dependent Variables**

Two dependent variables were measured throughout the study: response accuracy to receptive instructions and sessions to criterion for target acquisition.

**Response Accuracy**

A child’s response was recorded on the data sheet (Appendix D) as correct (C) if it matched the instruction provided by the instructional aide (IA). For example, given a field of three target picture cards *dog, chair* and *truck*, the IA gives the child an instruction. Following the IA’s instruction, “truck,” the child pointed to the picture of the truck. A child’s response was scored incorrect (I) if it did not match the instruction provided by the instructional aide. For example, given a field of 3 pictures including a dog, chair, and truck and following the IA’s instruction of “Point to truck,” the child pointed to the picture of the chair. If no response was made to the instruction within 5 seconds of the IA’s instruction, then the observer recorded a non-response (NR). If the child response was aggressive, destructive, or otherwise
disruptive, the response was scored as a problem behavior (PB). For example, if following the IA’s instruction of “truck,” the child hit the table or the instructional aide, the response was counted as a PB. A prompted response (P) was recorded if the instructional aide physically manipulated the stimuli so as to provide an additional indicator of the expected response to the child beyond the original verbal instruction. For example, in addition to the IA’s instruction of “truck,” the IA pointed the picture of the truck and then the child pointed to the truck, the child’s response was recorded as P. Response accuracy for each session was calculated by dividing the total number of correct responses by the total number of trials and multiplying by 100.

A frequency measure was used to tally the number of correct, incorrect, problem behavior, non-response, and prompt occurrences during each session. These responses were coded respectively as C, I, PB, NR, and P.

Sessions to Criterion

The rate at which each child learned each target was based on the number of sessions required to reach the mastery criterion for the target. The initial mastery criterion for each target was set at a minimum of 90% for one session with 2 different IAs. This criterion was changed to at least 90% for two consecutive experimental sessions to accommodate the various IA schedules for each child. The number of study sessions required to reach criterion within a condition was averaged across targets to determine the mean number of sessions necessary to reach criteria per target per condition. For example, if a child took 8 and 10 sessions to reach criterion of bat and ball respectfully, under the complex verbal instruction, then the mean rate of acquisition for targets during complex verbal instruction was 9 sessions.
Procedures to Enhance Believability of Data

*Interobserver Agreement*

The experimenter independently observed and recorded the dependent variables during experimental sessions. The experimenter compared her data with those obtained by the instructional aides and calculated interobserver agreement (IOA) for each session. The number of trials when the IA and the observer matched was divided by the total number of trials in the session and multiplied by 100. If at any point during the study the IOA for an instructional assistant or generalization assessor’s data did not reach 90% agreement, retraining of data collection procedures occurred.

*Procedural Integrity*

Four levels of procedural integrity were assessed: two items were provided for the reinforcer assessment, a 10-second period of free access to the items was provided during the reinforcer assessment, the accuracy of the discrimination training level used by the IA, and the implementation of the discrete trials. The instructional aides’ implementation of the discrete variables was assessed by the experimenter counting the number of experimenter behaviors that matched the procedures for delivering instructions and feedback according to the checklist (Appendix E) per session and then dividing by the total number of instructional aides’ behaviors and multiplying by 100. If at any point during the study the procedural integrity for the instructional aides or generalization assessors did not reach a minimum of 90%, then the experimenter retrained the instructional assistant on those procedures. The training checklist can be found in Appendix F.
Independent Variables

The independent variable in this study was the complexity of instructional language. Two levels of instructional language were assessed, simple and complex. Each target to be taught was assigned to a condition, either Condition S during which the IA used simple instructional language to begin the discrete trial or Condition C during which the IA used complex instructional language to begin the discrete trial.

*Simple Instructional Language*

Simple instructional language was a statement containing only those words essential to completing the receptive task. Simple statements were comprised of only a verb and object or a verb and targeted attribute. Examples of simple statements include “apple” and “house.” See Appendix G for a complete list of receptive language tasks and examples of simple instructional language corresponding to each task.

*Complex Instructional Language*

Complex instructional language was comprised of a statement representative of common sentence structures found in school and community settings. Such statements were comprised of a common grammatical structure found in preschool and kindergarten environments. Examples of such statements include, “Remember, airplanes are vehicles that fly very high in the sky. Can you find one?” and “Remember, the largest instrument in the band is the tuba. Can you find it?” See Appendix F for a complete list of receptive targets and examples of complex instructional language corresponding to each target.
Experimental Design

The study consisted of two experiments, Discrimination Training (DT) and Known Task Assessment (KTA).

Discrimination Training

The discrimination training (DT) experiment of the study assessed response accuracy and rate of target acquisition when the antecedent stimuli were presented using two different levels of verbal complexity, simple and complex, in a discrimination training format.

The DT experiment of the study used an alternating treatments design (Cooper, Heron, & Heward, 2007) to compare the effects of verbal antecedent complexity on response accuracy and acquisition rates by children with autism spectrum disorders. The basic design of this study took form in two parts, condition S, during which response accuracy was measured with relation to instructions given using simple verbal antecedents, and condition C, during which response accuracy was measured with relation to instructions given using complex verbal antecedents.

The conditions were counterbalanced.

Known Task Assessment (KTA)

Known Task Assessment assessed response accuracy of previously learned receptive tasks using an alternating treatments design (Cooper et al., 2007) to compare the effects of verbal antecedent complexity on response accuracy of targets that met trials to criterion during the DT experiment of the experiment. The basic design of the KTA experiment takes form in two parts, condition S and condition C. These conditions were counterbalanced.
Procedures

Pretest

A pretest was conducted prior to the first experimental session to determine what items were known and unknown for receptive language tasks for each participant. For example, the task receptive object labels requires a participant to identify an item, in a field of two other items, based on a verbal label (discriminative stimulus) provided by the instructor. “Apple,” is an example of the discriminative stimulus. To be correct, the participant would touch the apple picture card. If the participant touched any picture card other than the apple card, an incorrect response was recorded. Generalization assessors presented 10 items for each receptive task to each participant during each pretest. A discrete trial presentation was used in a random/rotation all format for all items.

Due to the assessment nature of the pretest, a variable interval 1-minute schedule of verbal praise was used. All pretest sessions were conducted using the simple verbal antecedent. An item was considered unknown if the child’s response was incorrect 2 of 3 attempts. An item was considered known if the child’s response was correct 2 of 3 attempts. Unknown items were used as targets during Experiment I.

General Procedures

The following procedures remained consistent through all conditions and experiments of the study. The instructional aide called the child to the table. The child walked over and sat in a chair at the table. The instructional aide sat in a chair at the
adjoining side of the table. The instructional aide conducted a brief reinforcer assessment, which was followed immediately by 10 discrete trials.

The brief reinforcer assessment consisted of the IA placing two objects, which had been known to function as reinforcers for the child in the past (e.g., bubbles and a spinning top), on the table and allowed the child 10 seconds of free access to both objects. After 10 seconds, the IA removed the objects from the table. The IA gave the object that the child had interacted with the most to the child after every 2-3 correct responses during the experimental session. If the child did not reach toward either item to indicate a preference, the IA replaced those objects with two different objects in the same format described above. If the child failed to indicate a preference a second time, the IA chose one of the four items at random to use during the consequence portion in the correct discrete trial sequence.

Experiment I – Discrimination Training (DT)

Experiment I was comprised of two conditions: simple instructional language (S), and complex instructional language (C). Each session began with a brief reinforcer assessment. Throughout this experiment a discrimination training procedure was used to teach each target to the child. The training procedure for each target progressed through three levels, mass trial alone (MTA), mass trial with distractor (MTD), and random rotation all (RR/ALL). Each target was introduced in to MTA. Once the criterion of 8 out of 10 correct trials during an experimental session in MTA was met, the target was moved to RR/ALL. Once the child has met the 9 out of 10 trials criterion across two different therapists the target was considered learned. If RR/ALL accuracy did not reach 90% within 5 study sessions, the target
was placed in MTD. Once 80% correct responding in MTD was reached, the target was moved back into RR/ALL. If again the target did not reach 90% within 5 study sessions, the target was discontinued and a new target was then introduced.

Each experimental session consisted of 10 trials, each trial consisting of the verbal antecedent (IA’s verbal instruction and presentation of the target stimulus), a child response, and feedback given by the instructional aide. If an incorrect response, then the instructional aide prompted the next trial using a hand over hand prompt simultaneous to giving the instruction. Following the prompted trial an unprompted trial was given.

**Mass Trial Alone (MTA).** The target stimulus was placed on the table alone in the discrete trial format. No other stimuli were present at any time throughout the presentation. See the top panel of Figure 3.1.

**Mass Trial with Distractor (MTD).** The target stimulus was placed on the table with a distractor in the discrete trial format. See the middle panel of Figure 3.1.

**Random Rotation All (RR/ALL).** The target stimulus was placed on the table with 2 previously learned stimuli (those stimuli that have already gone through discrete trial training and met acquisition criterion). All stimuli were tested through random presentation during this stage of training. See bottom panel Figure 3.1.
<table>
<thead>
<tr>
<th>Simple</th>
<th>Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mass Trial Alone</strong></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Diagram of Mass Trial Alone" /></td>
<td>“You eat apples, can you find one?”</td>
</tr>
<tr>
<td><strong>Mass Trial with Distractor</strong></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Diagram of Mass Trial with Distractor" /></td>
<td>“Trees and grass are green, find the same color.”</td>
</tr>
<tr>
<td><strong>Random Rotation All</strong></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Diagram of Random Rotation All" /></td>
<td>“Trucks have lots of wheels and are used to move big things, can you find the truck?”</td>
</tr>
</tbody>
</table>

Figure 3.1: Three levels of discrimination training to be used during Experiment I.
Experiment II – Known Task Assessment

For all Known Task Assessment (KTA) sessions, the generalization assessor began with a brief reinforcer assessment similar to Experiment I. KTA sessions used a random rotation all format (RR/ALL) to assess each participant’s ability to maintain known targets and generalize those responses to verbal instructions that were different than the instructions used during the original teaching trials. Targets selected for this experiment consisted of those targets that met mastery criteria during Experiment I of the study. For example, the targets *orange, ball,* and *monkey* were reported previously mastered in the random rotation all format using simple instructions such as “orange,” “ball,” and “monkey.” The generalization assessor placed a picture of three previously mastered targets on the table. The generalization assessor then gave the complex instruction associated with each picture and the child was assessed with regard to the accuracy of his/her response. Conversely, if an target was originally mastered using the complex verbal instruction, the associated simple instruction was used during KTA.

Each KTA experimental session consisted of 10 trials and lasted approximately 3-5 minutes. One type of verbal instruction was used during KTA experimental sessions. Generalization assessors did not give prompts or provide error correction during this experiment. If a participant answered incorrectly, the target was removed from the field for the remaining trials of that probe only. Three probes occurred for each target set. Each target was asked one time during each probe. Types of verbal instructions were not mixed within an experimental session. An target was
considered mastered with the new instruction if the child correctly identified the
target at least twice during the three probes.

Obtaining Parents’ and Aides Opinions

Following Experiment II, the experimenter provided the parents and
instructional aides of each participant with an experimenter-made social validity
questionnaire (Appendix G). All responses were collected at the end of a team
meeting at the CHAC. The experimenter provided a box in which the respondents
placed their questionnaires. All responses were collected prior to the discussion of the
results of the study. Each respondent was ensured complete anonymity from all
sources including the experimenter.
CHAPTER 4

RESULTS

This chapter presents the results of the study. Interobserver agreement of the measurement of the dependent variables and the integrity of implementation of the independent variable are presented first. Next, data are presented for each participant on the dependent measure, number of correct responses per session. Finally, data regarding social validity are presented.

Believability of Dependent Measures and Integrity of Procedures

Interobserver Agreement

Interobserver agreement (IOA) data on the response accuracy were collected on at least 23.5% of Experiment I DT sessions and on 100% of Experiment II KTA sessions for all participants. Agreement was assessed on a discrete trial-by-trial basis. The number of agreements was totaled, divided by the total number of discrete trials presented and then multiplied by 100.

Table 4.1 summarizes the mean percent of agreement between the IA and secondary observer on the measurement of response accuracy for all participants. Mean IOA for response accuracy during Experiment I was 99.6% with a range of 90% to 100%.
Table 4.2 summarizes the data of the procedural integrity for the brief reinforcer assessment, discrimination training level, and discrete trial procedures.

Procedural Integrity

Table 4.1: Mean across sessions of interobserver agreement on response accuracy.

Mean IOA on the measurement of response accuracy during Experiment II KTA was 100% with a range of 100% to 100% for all participants.

Procedural Integrity

Table 4.2 summarizes the data of the procedural integrity for the brief reinforcer assessment, discrimination training level, and discrete trial procedures. Procedural integrity data were collected on at least 23.5% of Experiment I sessions, and on 100% of Experiment II KTA sessions for all participants. Procedural integrity of the brief reinforcer assessment for all participants during Experiment I was a mean of 98.4%. Procedural integrity for all participants for the brief reinforcer assessment during Experiment II was 100%.
<table>
<thead>
<tr>
<th></th>
<th>Percent of Sessions Assessed</th>
<th>Brief Reinforcer Assessment</th>
<th>Discrimination Training Level</th>
<th>Discrete Trial Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exp. I</td>
<td>Exp. II</td>
<td>Exp. I</td>
<td>Exp. II</td>
</tr>
<tr>
<td>Alpha</td>
<td>24.7 (21)(^a)</td>
<td>100</td>
<td>95</td>
<td>100</td>
</tr>
<tr>
<td>Beta</td>
<td>23.5 (24)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Gamma</td>
<td>25.0 (22)</td>
<td>100</td>
<td>95.5</td>
<td>100</td>
</tr>
<tr>
<td>Delta</td>
<td>26.7 (28)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Epsilon</td>
<td>30.0 (30)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Six</td>
<td>25.9 (21)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Notes: \(^a\) = number of IOA sessions assessed; \(^b\) = range across sessions

Table 4.2: Mean across sessions of procedural integrity.
Procedural integrity on the discrimination training level for all participants during Experiment I was a mean of 99.2%. Procedural integrity for the discrimination training level for all participants was not collected during Experiment II as this was not part of the procedures for that Experiment.

Procedural integrity of discrete trial procedure for all participants during Experiment I was a mean of 99.6%. Procedural integrity for discrete trial procedure for all participants during Experiment II was 100%.

Results by Participant

Alpha

Alpha participated in 85 sessions in Experiment I over a period of 7 weeks and six Experiment II sessions, 4 days following the final session of Experiment I. The receptive language task for Alpha was Receptive Object Labels. The targets and corresponding SDs used during Alpha’s experiment can be found in Appendix F.

Experiment I. Figure 4.1 displays the accuracy data of each target for Alpha. The mean number of sessions to mastery criterion (where 3.0 is the minimum number of sessions and 16.0 is the maximum number of sessions to mastery criterion) for Alpha during Condition S was 3.2 sessions, with a range of 3.0 – 4.0. The mean number of sessions required to reach mastery criteria across targets for Alpha during Condition C was 5.5 sessions, with a range of 3.0 – 15.0. During Condition S, Alpha reached mastery criterion on 10 targets, which is 100% of all targets presented during this condition. During Condition C, Alpha reached mastery criterion on 10 targets, which is 100% of all targets presented during this condition. Table 4.3 displays the number of targets to which Alpha was exposed, the number of experimental sessions
Figure 4.1: Percent correct responses by Alpha to targets presented by simple (S) and complex (C) instructional language during Experiment I. Open squares represent the discrimination training level, MTA. Closed squares represent the discrimination training level, RR/All. Open triangles represent the discrimination training level, MTD.
Table 4.3: Number of targets introduced, percentage of targets reaching mastery criterion, and mean number of sessions to criterion for each condition – Experiment I.

to reach mastery criterion, and the percentage of targets mastered during Experiment I. Figure 4.2 displays the number of sessions necessary to reach mastery criterion per target across time in Experiment I. A slight decrease in the number of sessions necessary to reach mastery criterion can be seen in Conditions C while the number of sessions necessary to reach master criterion remained stable during Condition B.
Figure 4.2: Number of sessions to reach mastery criterion by Alpha for targets presented by simple and complex instructional language.

*Experiment II.* Fifty percent of targets mastered during Experiment I using a simple verbal instruction were successfully generalized to a probe SD during Experiment II. Fifty percent of targets mastered during Experiment I using a simple verbal instruction were unsuccessfully generalized to a probe SD during Experiment II. One hundred percent of targets mastered during Experiment I using a complex verbal instruction were successfully generalized to a probe SD during Experiment II. Table 4.4 summarizes the successful and unsuccessful generalization of mastered targets to previously untaught SDs during Experiment II.

*Beta*

Beta participated in 102 sessions in Experiment I over a period of 6 weeks and six Experiment II sessions, 5 days following the final session of Experiment I. The receptive language task for Beta was Receptive Object Labels. The targets and corresponding SDs used during Beta’s experiment can be found in Appendix G.
Table 4.4: Percent accuracy of child responses during Experiment II KTA.

<table>
<thead>
<tr>
<th></th>
<th>Experiment I Simple</th>
<th>Experiment I Complex</th>
<th>Experiment II Complex</th>
<th>Experiment II Simple</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Correct</td>
<td>% Incorrect</td>
<td>% Correct</td>
<td>% Incorrect</td>
</tr>
<tr>
<td>Alpha</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Beta</td>
<td>33.3</td>
<td>66.7</td>
<td>87.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Gamma</td>
<td>70</td>
<td>30</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Delta</td>
<td>70</td>
<td>30</td>
<td>64</td>
<td>36</td>
</tr>
<tr>
<td>Epsilon</td>
<td>100</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Six</td>
<td>100</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>

*Experiment I.* Figure 4.3 displays the accuracy data of each target for Beta. The mean number of sessions to mastery criterion for Beta during Condition S was 4.8 sessions, with a range of 3.0 – 16.0. The mean number of sessions required to reach mastery criteria across targets for Beta during Condition C was 6.4 sessions, with a range of 3.0 – 16.0. During Condition S, Beta reached mastery criterion on 9 targets, which is 90% of all targets presented during this condition. During Condition C, Beta reached mastery criterion on 8 targets, which is 80% of all targets presented during this condition. The targets *tuba* (a complex target), *drums* (a complex target),
Figure 4.3: Percent correct responses by Beta to targets presented by simple (S) and complex (C) instructional language during Experiment I. Open squares represent the discrimination training level, MTA. Closed squares represent the discrimination training level, RR/All. Open triangles represent the discrimination training level, MTD. * indicates a target that did not meet mastery criterion within 16 experimental sessions.
and *worm* (a simple target) did not reach mastery criterion after 16 experimental sessions and were stopped, however the mean number of sessions to reach mastery criterion for both conditions reflects these targets with a 16 session maximum for each target. Table 4.3 displays the number of targets to which Beta was exposed, the number of experimental sessions to reach mastery criterion, and the percentage of targets mastered during Experiment I. Figure 4.4 displays the number of sessions necessary to reach mastery criterion per target across time in Experiment I. A decreasing trend is evident in the number of sessions necessary to reach mastery criterion can be seen in both conditions as the study progressed.

![Figure 4.4: Number of sessions to reach mastery criterion by Beta targets presented by simple and complex instructional language. * indicate that Beta did not reach criterion for targets 2 (taught with complex instructional language), 4 (taught with complex instructional language), and 5 (taught with simple instructional language).](image)

*Experiment II.* Thirty-three percent of targets mastered during Experiment I using a simple verbal instruction were successfully generalized to a probe SD during
Experiment II. Sixty-seven percent of targets mastered during Experiment I using a simple verbal instruction were unsuccessfully generalized to a probe SD during Experiment II. Eighty-seven percent of targets mastered during Experiment I using a complex verbal instruction were successfully generalized to a probe SD during Experiment II. Twelve and a half percent of targets mastered during Experiment I using a complex verbal instruction were unsuccessfully generalized to a probe SD during Experiment II. Table 4.4 summarizes the successful and unsuccessful generalization of mastered targets to previously untaught SDs during Experiment II.

**Gamma**

Gamma participated in 88 sessions in Experiment I over a period of 6 weeks and six Experiment II sessions, 3 days following the final session of Experiment I. The receptive language task for Gamma was Receptive Object Labels. The targets and corresponding SDs used during Gamma’s experiment are found in Appendix G.

*Experiment I.* Figure 4.5 displays the accuracy data of each target for Gamma. The mean number of sessions to mastery criterion for Gamma during Condition S was 3.2 sessions, with a range of 3.0 – 4.0. The mean number of sessions required to reach mastery criteria across targets for Gamma during Condition C was 4.8 sessions, with a range of 3.0 – 8.0. During Condition S, Gamma reached mastery criterion on 10 targets, which is 100% of all targets presented during this condition. During Condition C, Gamma reached mastery criterion on 10 targets, which is 100% of all targets presented during this condition. Table 4.3 displays the number of targets to which Gamma was exposed, the number of experimental sessions to reach mastery criterion, and the percentage of targets mastered during Experiment I.
Figure 4.5: Percent correct responses by Gamma to targets presented by simple (S) and complex (C) instructional language during Experiment I. Open squares represent the discrimination training level, MTA. Closed squares represent the discrimination training level, RR/All. Open triangles represent the discrimination training level, MTD.
Figure 4.6: Number of sessions to reach mastery criterion by Gamma targets presented by simple and complex instructional language.

*Experiment II.* Seventy percent of targets mastered during Experiment I using a simple verbal instruction were successfully generalized to a probe SD during Experiment II. Thirty percent of targets mastered during Experiment I using a simple verbal instruction were unsuccessfully generalized to a probe SD during Experiment II. Sixty percent of targets mastered during Experiment I using a complex verbal instruction were successfully generalized to a probe SD during Experiment II. Forty percent of targets mastered during Experiment I using a complex verbal instruction were unsuccessfully generalized to a probe SD during Experiment II. Table 4.4 summarizes the successful and unsuccessful generalization of mastered targets to previously untaught SDs during Experiment II.
*Delta*

Delta participated in 105 sessions in Experiment I over a period of 7 weeks and six Experiment II sessions, 4 days following the final session of Experiment I. The receptive language task for Delta was Receptive Letters. The targets and corresponding SDs used during Delta’s experiment can be found in Appendix G.

*Experiment I.* Figure 4.7 displays the accuracy data of each target for Delta. The mean number of sessions to mastery criterion for Delta during Condition S was 4.3 sessions, with a range of 3.0 – 9.0. The mean number of sessions required to reach mastery criteria across targets for Delta during Condition C was 5.0 sessions, with a range of 3.0 – 11.0. During Condition S, Delta reached mastery criterion on 9 targets, which is 100% of all targets presented during this condition. During Condition C, Delta reached mastery criterion on 10 targets, which is 100% of all targets presented during this condition. As with the other participants, all members of the vowel family were put on. Table 4.3 displays the number of targets to which Delta was exposed, the number of experimental sessions to reach mastery criterion, and the percentage of targets mastered during Experiment I. Figure 4.8 displays the number of sessions necessary to reach mastery criterion per target across time in Experiment I. A slight decrease in the number of sessions necessary to reach mastery criterion can be seen in both conditions as the study progressed.
Figure 4.7: Percent correct responses by Delta to targets presented by simple (S) and complex (C) instructional language during Experiment I. Open squares represent the discrimination training level, MTA. Closed squares represent the discrimination training level, RR/All. Open triangles represent the discrimination training level, MTD.
Figure 4.8: Number of sessions to reach mastery criterion by Delta targets presented by simple and complex instructional language.

*Experiment II.* Seventy percent of targets mastered during Experiment I using a simple verbal instruction were successfully generalized to a probe SD during Experiment II. Thirty percent of targets mastered during Experiment I using a simple verbal instruction were unsuccessfully generalized to a probe SD during Experiment II. Sixty-four percent of targets mastered during Experiment I using a complex verbal instruction were successfully generalized to a probe SD during Experiment II. Thirty-six percent of targets mastered during Experiment I using a complex verbal instruction were unsuccessfully generalized to a probe SD during Experiment II.

Table 4.4 summarizes the successful and unsuccessful generalization of mastered targets to previously untaught SDs during Experiment II.

*Epsilon*

Epsilon participated in 90 sessions in Experiment I over a period of six weeks and six Experiment II sessions, 4 days following the final session of Experiment I.
The receptive language task for Epsilon was Receptive Letter Sounds. The targets and corresponding SDs used during Epsilon’s experiment can be found in Appendix G.

Experiment I. Figure 4.9 displays the accuracy data of each target for Epsilon. The mean number of sessions to mastery criterion for Epsilon during Condition S was 3.0 sessions, with a range of 3.0 – 3.0. The mean number of sessions required to reach mastery criteria across targets for Epsilon during Condition C was 3.2 sessions, with a range of 3.0 – 4.0. During Condition S, Epsilon reached mastery criterion on 9 targets, which is 100% of all targets presented during this condition. During Condition C, Epsilon reached mastery criterion on 10 targets, which is 100% of all targets presented during this condition. Data corresponding to vowel sounds were not counted due to the unique nature of vowel sounds. Table 4.3 displays the number of targets to which Epsilon was exposed, the number of experimental sessions to reach mastery criterion, and the percentage of targets mastered during Experiment I. Figure 4.10 displays the number of sessions necessary to reach mastery criterion per target across time in Experiment I. A slight decrease in the number of sessions necessary to reach mastery criterion can be seen in both conditions as the study progressed.

Experiment II. One hundred percent of targets mastered during Experiment I using a simple verbal instruction were successfully generalized to a probe SD during Experiment II. One hundred percent of targets mastered during Experiment I using a complex verbal instruction were successfully generalized to a probe SD during Experiment II. Table 4.4 summarizes the successful and unsuccessful generalization of mastered targets to previously untaught SDs during Experiment II.
Figure 4.9: Percent correct responses by Epsilon to targets presented by simple (S) and complex (C) instructional language during Experiment I. Open squares represent the discrimination training level, MTA. Closed squares represent the discrimination training level, RR/All. Open triangles represent the discrimination training level, MTD. * indicates target was a member of the vowel family and data did not count in raw calculations.
Six participated in 81 sessions in Experiment I over a period of 8 weeks and six Experiment II sessions, 3 days following the final session of Experiment I. The receptive language task for Six was Receptive Letter Sounds. The targets and corresponding SDs used during Six’s experiment can be found in Appendix G.

Experiment I. Figure 4.11 displays the accuracy data of each target for Six. The mean number of sessions to mastery criterion for Six during Condition S was 3.0 sessions, with a range of 3.0 – 3.0. The mean number of sessions required to reach mastery criteria across targets for Six during Condition C was 4.2 sessions, with a range of 3.0 – 8.0. During Condition S, Six reached mastery criterion on 10 targets, which is 100% of all targets presented during this condition. During Condition C, Six reached mastery criterion on 10 targets, which is 100% of all targets presented during this condition. 4.3 displays the number of targets to which Six was exposed, the
Figure 4.11: Percent correct responses by Six to targets presented by simple (S) and complex (C) instructional language during Experiment I. Open squares represent the discrimination training level, MTA. Closed squares represent the discrimination training level, RR/All. Open triangles represent the discrimination training level, MTD.
number of experimental sessions to reach mastery criterion, and the percentage of targets mastered during Experiment I. Figure 4.12 displays the number of sessions necessary to reach mastery criterion per target across time in Experiment I. A slight decrease in the number of sessions necessary to reach mastery criterion can be seen in Condition C as the study progressed.

![Graph showing number of sessions to reach mastery criterion per target across time in Experiment I.](image)

**Figure 4.12:** Number of sessions to reach mastery criterion by Six targets presented by simple and complex instructional language.

*Experiment II.* Ninety percent of targets mastered during Experiment I using a simple verbal instruction were successfully generalized to a probe SD during Experiment II. Ten percent of targets mastered during Experiment I using a simple verbal instruction were unsuccessfully generalized to a probe SD during Experiment II. One hundred percent of targets mastered during Experiment I using a complex verbal instruction were successfully generalized to a probe SD during Experiment II. Table 4.4 summarizes the successful and unsuccessful generalization of mastered targets to previously untaught SDs during Experiment II.
Social Validity

Social validity was measured using a questionnaire. A total of 27 questionnaires were collected from the 3 parents of the participants, 20 instructional aides, and 4 generalization assessors. Results of the questionnaire are illustrated in Table 4.5.

When asked which type of instruction the child was more accurate with, 24 respondents answered simple instructions while 3 respondents felt that neither type of instruction influenced the child’s accuracy. When asked with which type of instruction the child learned faster, 24 respondents answered simple, no respondents answered complex and 3 respondents felt neither type of instruction influenced the child’s accuracy. When asked which type of instruction the respondents were more comfortable using, 24 felt more comfortable with simple instructions, no respondents indicated that the complex instructions were more comfortable and 3 respondents did not feel comfortable with either type of instruction.

The respondents were asked which type of instruction most represented language used by teachers in the classroom, 23 respondents felt the complex instructions were more representative while 4 respondents indicated that neither type of instruction was representative. Nineteen respondents would prefer to use the simple instructions, 5 respondents would prefer to use the complex instructions and 3 respondents would not prefer to use either type of instruction.

When asked which type of instruction was easiest to implement, 25 respondents indicated that the simple instructions were the easiest to implement while 2 respondents indicated that neither type of instruction was easier than the other to
implement. Conversely, 24 respondents indicated that the complex instructions were the hardest to implement while 3 respondents chose neither type of instruction as being hardest to implement. Twenty respondents felt that the children preferred the simple instructions while 3 indicated that they felt the children preferred the complex instructions and 4 respondents chose neither when asked which type of instruction the child preferred.
<table>
<thead>
<tr>
<th>Question</th>
<th>Simple Instructions</th>
<th>Complex Instructions</th>
<th>Neither</th>
</tr>
</thead>
<tbody>
<tr>
<td>In your opinion, to which type of instructional language, if any, did the child respond more accurately?</td>
<td>24</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>In your opinion, with which type of instructional language, if any, did students learn targets faster?</td>
<td>24</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>With which type of instructional language did you feel most comfortable?</td>
<td>24</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Which type of instructional language do you feel most represented ongoing practices in today’s classroom?</td>
<td>0</td>
<td>23</td>
<td>4</td>
</tr>
<tr>
<td>Which type of instructional language would you prefer to use?</td>
<td>19</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Which type of instructional language was easiest to implement?</td>
<td>27</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Which type of instructional language was hardest to implement?</td>
<td>0</td>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>Which type of instructional language do you think the participant preferred?</td>
<td>20</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4.5: Answers to the social validity questionnaire by 27 respondents.
This study examined the language used by teachers to instruct students with autism. The study, consisting of two experiments, evaluated the effects of simple and complex verbal instructions on the accuracy of children’s responses to receptive tasks. Experiment I compared the responses to receptive tasks presented with simple and complex instructional language, to determine variances in accuracy of individual responses and sessions to criterion of targets of receptive skills. Experiment II investigated the differing effects of simple and complex instructions used by teachers when assessing maintenance and generalization of previously learned receptive tasks. These skills were tested using simple and complex instructional language for the purposes of maintenance and generalization across antecedent conditions.

This chapter discusses the results as they relate to three research questions. Limitations of the study, implication for practice, and directions for future research are discussed. The chapter concludes with a summary of the study.
Research Question One

What are the comparative effects of teachers’ simple versus complex instructional language, during discrete trial discrimination training of receptive language tasks on the number of sessions to criterion tasks by children with autism?

Simple instructional language resulted in fewer number of sessions to reach mastery criterion than complex instructional language for all six participants. In other words, all six participants learned targets faster during the simple instructional language condition than the complex instructional language condition. The data for Beta, who had the lowest receptive language score on the Reynell prior to the start of the study, showed the largest mean number of sessions to criterion for both conditions as compared to the other participants. The data for Alpha shows the biggest difference between the conditions, over 2, in the number of sessions necessary to reach mastery as compared to all other participants. Said another way, the data show that over 20 additional discrete trials were necessary for Alpha to reach mastery criterion on targets presented with complex instructional language as opposed to simple instructional language during receptive language tasks. Over 10 additional discrete discrimination trials were necessary for Beta, Gamma, Delta, and Six to reach mastery criterion on targets presented with complex instructional language as opposed to simple instructional language during receptive language tasks. The data showed that less than 10 additional discrete trials were necessary for Epsilon to reach mastery criterion on targets presented with complex instructional language as opposed to simple instructional language during receptive language tasks. The findings in this study support those of Clark (2000) who also found children with
higher symptoms of autistic symptoms and lower receptive language skills had more success with simple instructional language than more typical or complex instructional language. However, the findings of this study are converse to those in Clark with regard to children with higher receptive language skills. All children in this study learned targets faster when presented with simple instructional language as opposed to complex instructional language.

For Alpha, Beta, and Gamma there is an apparent decreasing trend of the number of sessions to reach mastery criterion during Condition C. This decreasing trend suggests that with more practice trials, the number of sessions necessary to reach mastery criterion for novel items presented with complex instructional language may become the same as the number of sessions necessary to reach mastery criterion for novel items presented with simple instructional language. The complex language itself did not vary between conditions so it is not possible to forecast whether this trend would be the same if the complex language varied between sessions or trials.

Research Question Two

*What are the effects of complex instructional language on the response accuracy to receptive language tasks initially learned with simple instructional language by children with autism?*

Data from discrete discrimination trials implemented using complex instructional language (Experiment II) showed successful (100%) generalization for the targets originally taught with simple instructional language (Experiment I) for Epsilon and Six, the participants with the highest receptive language scores on the Reynell at the start of the study. Data from the participants with comparatively
moderate receptive language scores on the Reynell, Alpha, Gamma, and Delta, showed moderate levels of generalization (50%, 70%, and 70% success respectively) from the simple instructional language used in Experiment I to the complex instructional language used in Experiment II. Data from the participant with the lowest receptive language score on the Reynell, Beta, showed the lowest level of generalization (33.3%) from the simple instructional language used in Experiment I to the complex instructional language used in Experiment II.

Research Question Three

*What are the effects of simple instructional language on the response accuracy to receptive language tasks initially learned with complex instructional language by children with autism?*

Data from discrete discrimination trials implemented using simple instructional language (Experiment II) showed successful (100%) generalization for the targets originally taught with complex instructional language (Experiment I) for Alpha, Epsilon, and Six. Data from the participants with comparatively moderate receptive language scores on the Reynell, Alpha, Gamma, and Delta, showed varied levels of generalization (100%, 60%, and 64% success respectively) from the complex instructional language used in Experiment I to the simple instructional language used in Experiment II. Data from the participant with the lowest receptive language score on the Reynell, Beta, showed a higher level of generalization (100%) relative to Alpha, Gamma, and Delta, from the complex instructional language used in Experiment I to the simple instructional language used in Experiment II.
The two participants, Alpha and Beta, the youngest of all the participants, had higher generalization success with targets taught using complex instructional language (Experiment I) to targets assessed with simple instructional language (Experiment II) than the reverse. Gamma, Delta, Epsilon, and Six had similar levels of success for both generalization settings (simple to complex instructional language, and complex to simple instructional language). These data suggest that using complex instructional language during the initial acquisition of targets during receptive language tasks does not increase the difficulty of generalizing to simple instructional language, in fact using complex instructional language during the initial acquisition of targets during receptive language tasks may make increase the likelihood of generalization to simple instructional language for some learners (Alpha and Beta).

The data from this study extend Clark (2000) and Chavez-Brown et al., (2005) by assessing the generalization components previously discussed. In addition, the data from this study further extend these studies by assessing the mean number of sessions necessary to reach criterion for targets within the simple and complex instructional language conditions.

Limitations of the Study

The results of this study should be interpreted within the context of several limitations. These limitations include the receptive language tasks, setting, duration of the study, floor and ceiling effects, and maintenance and generalization.

Receptive Language Tasks

Three different receptive language tasks, receptive object labels, receptive letter names, and receptive phonics, were used during the study. Alpha, Beta, and
Gamma participated in a receptive object label task. Delta participated in a receptive letter name task. Epsilon and Six participated in a receptive phonics task. Delta had the highest mean number of sessions to criterion for simple instructional language. It is possible that the discrepancy between the mean number of sessions to criterion for simple instructional language for Delta (4.3) and the rest of the participants (ranging from 3.0-3.5) was a result of the different tasks. Delta’s mean number of sessions to criterion (5.0) for complex instructional language was also higher than most of the participants (ranging from 3.2-4.8) except for Alpha (5.5). It should be noted though that Alpha received the lowest receptive language score on the Reynell perhaps accounting for his high mean.

The tasks were determined based on each child’s current instructional goals. As a result, Epsilon and Six, the oldest participants in the study, were assigned the receptive phonics task, a task presumably more difficult than the receptive object label tasks in which Alpha, Beta, and Gamma participated. However, this presumed difficulty did not reflect in the mean scores of Epsilon and Six who met mastery criterion on all targets and successfully generalized those targets to the opposing condition (i.e., simple to complex instructional language and complex to simple instructional language).

Setting
A note should be made regarding the differences in setting variables for each participant. First, the therapy rooms for each child were different. The available toys, activities, temperature, and lighting were different across these rooms. Every effort
was made to make these rooms as similar as possible. However, it was not possible to
determine if differences in the data could be attributed to the differences in the
therapy rooms.

The presence of the instructional aides was another variable that was not
controlled across participants during the study. The presence of the instructional aides
for each child was kept consistent for that child but not across children. For example,
the instructional aides, Cherie, Ann, Patrick, Meg, and Jason implemented the
procedures for the study with Alpha. However, those instructional aides did not
implement the procedures for Beta. Instead Scott, Kristen, Chrissy, Mary, and Bryan
did so for Beta. IOA and procedural integrity measures were assessed per participant
to ensure consistency of procedural implementation and IOA. It is not possible to
determine if the presence or absence of certain instructional aides had any effects on
the dependent variable.

Lastly, the materials used in the study were not the same for each participant.
Materials for Alpha and Beta were obtained by retrieving pictures of targets from the
internet (Appendix C). Materials for Gamma consisted of picture cards from the
Language Builder set (Different Roads to Learning, 2002). Materials for Delta,
Epsilon, and Six consisted of index cards with individual letters (Maximo 72-pt. font)
 glued on them. It is not possible to determine if the materials used affected the
dependent variable in the study.

*Duration of the Study*

The study took place over a period of 6 weeks. Over that time downward
trends were apparent in Alpha, Beta, and Gamma’s data of mean number of sessions
to reach criterion. A longer period of study would allow investigators to determine whether the lower mean at the end of the study would continue to be low for the acquisition of future targets.

Floor and Ceiling Effects

The procedures in the study dictated a minimum of 3 experimental sessions to reach mastery criterion (1 session of MTA at 90% or above and 2 sessions of RR/all at 90% or above) thereby creating a floor for the mean number of sessions necessary to reach criterion. Epsilon and Six were at this floor during condition S. Without the mastery criterion it might have been possible for Epsilon and Six to have lower means to master during condition S.

The procedures in the study dictated a ceiling of 12 experimental sessions to reach mastery criterion (1 session of MTA, 5 sessions of RR/all at less then 90%, 1 session of MTD, 5 sessions of RR/all at less than 90%). Due to this ceiling, Beta did not reach mastery criterion on three targets. Therefore Beta’s mean number of sessions to criterion was in actuality higher than that reported because the reported mean reflected the ceiling for the three targets that did not reach mastery criterion (i.e. reached the ceiling of the study procedures without mastery).

Maintenance and Generalization

Maintenance and generalization was assessed via Experiment II approximately one week after the conclusion of Experiment I. There was only one generalization measure involving the complexity of the instructional language. Other generalization components such as different materials, different setting, and different instructional aides were not assessed.
In addition, the generalization of complex instructional language was only tested with simple instructional language; it was not tested with different complex instructional language. For example, the phonetic sound /c/ was taught in Experiment I using the SD “Remember, the sound /c/ is the first sound in the words castle and cake, can you find it?” and was assessed for generalization using the SD “c” but was not assessed for different complex SDs such as “Kite and candy start with the sound /c/, can you find it?” It is possible that this generalization did occur but no attempt was made to determine the occurrence of this generalization. In addition no attempt was made to program for this type of generalization.

Implications for Practice

Clark (2000) related receptive language scores on standardized assessments to the successful acquisition of targets during receptive language tasks with simple or complex instructional language. Clark reported that children who display higher level symptoms of autism and lower receptive language scores would perform better when a discriminative stimulus made of simplified instructional language was presented than for a discriminative stimulus made of more typical language. The data from the present study support the results obtained by Clark in that all participants regardless of receptive language score acquired targets more quickly when the targets were presented with simple instructional language then when the targets were presented with complex instructional language. However, as time went on, the mean number of sessions necessary in acquiring targets when presented with complex instructional language lowered to that of the mean number of sessions
necessary in acquiring targets presented with simple instructional language for Alpha, Beta, and Gamma. The merging of means indicates that teaching with simple instructional language may not be as advantageous as originally thought.

Data collected in response to the fourth question on the social validity questionnaire indicate that the complex instructional language in this study was more representative of what is commonly found in present day classrooms. Strategies for effective inclusion of children with disabilities are now federally mandated. A great advantage would be had if initial teaching strategies could more accurately reflect practices in the classroom, specifically instructional language, while remaining effective and efficient.

Four out of the six participants were more likely to generalize targets presented with complex instructional language to simple instructional language than vice versa. This finding is another indicator that teaching with simple instructional language may not be as advantageous as originally thought. However, since generalization of complex instructional language to other complex instructional language was not assessed during this study, a conclusion that teaching with complex instructional language is necessarily more beneficial for the child should not yet be reached.

Directions for Future Research

Continued research regarding the efficacy of interventions for increasing receptive language skills of children with autism is necessary. Future research as an offshoot from this study are identified and discussed.
Maintenance and Generalization

Maintenance and generalization of behavior change resulting from differing types of instructional language is an important area for further research. In the current study all participants required fewer sessions on average to acquire new targets in receptive language tasks. By the end of the study there appeared to be no difference between the mean number of sessions necessary to reach criterion for simple and complex instructional language. This finding may place more importance on the effects of simple versus complex instructional language on the generalization outcomes.

In the current study all participants had similar or better generalization outcomes when initially taught with complex instructional language as opposed to being taught with simple instructional language. Future studies should attempt to determine whether it was the difficulty of the generalization task itself or the instructional language used during the initial teaching that affects the generalization outcomes. For instance, did the participants in this study have better generalization outcomes when initially taught with complex instructional language because the generalization task used employed simple instructional language as compared to the generalization task used to assess the targets initially taught with simple instructional language, which employed complex instructional language, thus inherently a more difficult task?
Future studies should focus more specifically on tactics for increasing the likelihood and extent of generalization. The generalization measures should be expanded to include multiple SDs for each target utilizing different grammatical and substantive forms of complex instructional language. Generalization should be assessed across different sets of materials as well.

Other generalization measures should include measures of expressive language. Anecdotal reports by instructional aides in this study included instances when the participant would say the name of the target when responding to the simple SD or repeat parts of the complex SD as well as touch the target when responding to the complex SD. Researchers should assess response generalization across the expressive language domain with respect to teaching receptive language tasks with complex and simple instructional language.

Another area of generalization to assess would be stimulus generalization with regard to the components of the complex SD. Each SD consisting of complex instructional language used during the study was actually created using descriptors, including colors, functions, and class, of the target. For instance, the complex SD for worm was, “Remember, a worm lives in the dirt and we can use it for fishing bait. Can you find it?” Generalization could be assessed by testing the SDs “Can you find the one that lives in the dirt?” or “Can you find the one we use for fishing bait?” If successfully tested, it may be possible to teach multiple receptive concepts (e.g., color, function, class) to a child at one time, thus creating an even more efficient teaching environment.
Hart and Risley (1995) identified 5 factors that increase the language acquisition for a variety of learners including: language diversity, feedback, guidance style, language emphasis, and responsiveness. Different forms of complex instructional language should be assessed to determine if the diversity of the instruction affects the various elements the children could respond to such as function or class of objects as suggested by Hart and Risley.

Werts, Wolery, Holcombe, and Gast (1995) reviewed the parameters and effects of various elements of instructional feedback. Results indicated that students acquire and maintain additional elements of feedback stimuli. The feedback stimuli is similar to the consequence portion of discrete trial in this study. However, the antecedent portion or the instructional language used should be manipulated to extend this study and determine to what extent children with autism respond to additional components of the instructional language. Generalization should be assessed across different sets of materials as well.

*Standardized Assessments*

Future research should investigate the relation between standardized test scores, the mean number of sessions necessary to master targets within receptive language tasks taught using simple and complex instructional language, and the generalization of receptive language tasks to other forms of language. The present study did not have enough learners at any one particular level of functioning on the Reynell or the GARS to draw any firm conclusions regarding receptive language level functioning, level of severity of autistic symptoms and the rate of acquisition targets within receptive language tasks when taught using simple versus complex
instructional language. Replications of the current study with students of different ages and ability levels would increase knowledge as to what types of students are most likely to benefit from receptive language instruction that uses simple instructional language as opposed to receptive language instruction that uses complex instructional language.

Summary

Research is needed to identify effective and efficient instructional methods for teaching receptive language skills to children with autism. Six preschoolers diagnosed with autism participated in two experiments on the effects of simple or complex instructional language on the children's acquisition and maintenance of receptive language tasks. Each session in Experiment I consisted of 10 discrete discrimination training trials in which the teacher used either simplified instructional language (e.g., "touch pencil" for an object identification task) or complex language (e.g., "Balls are fun to throw and play catch with. Can you find the ball?") for each trial. The dependent variable was the number of sessions required to master a target (at least 90% correct responses for two consecutive sessions).

Results of Experiment I showed that all children learned receptive tasks in fewer sessions when their teachers used simple instructional language rather than complex language. This finding supports those of Clark (2000) who also found children with higher symptoms of autistic symptoms and lower receptive language skills had more success with simple instructional language than more typical or complex instructional language.
For the children who entered the study with higher levels of receptive language skills, the use of simple or complex instructional language had little effects on the number of sessions necessary to master a target. This study extends the studies of Clark (2000) and Chavez-Brown, et al., (2005) by observing the number of sessions necessary to reach criterion over time. This study found that as time went on, the number of sessions necessary to reach criterion decreased over time for targets presented with complex instructional language.

In Experiment II, the instructional aide used simple language to present targets that the child had mastered with complex language in Experiment I, and vice versa. Results of Experiment II showed that the youngest participants were more accurate when responding to simple language for targets that had been taught with complex language in Experiment I than vice versa. Results also showed that the youngest children were more accurate when responding to simple language for targets that had been taught with complex language in Experiment I than those children who were 1.5-2.0 years older. The oldest children responded with equal accuracy to complex and simple instructions.

Future investigations should focus on replicating these findings with other children of varying receptive language abilities and severity of autistic characteristics. In addition, research should assess the generalization and maintenance of these findings to other materials, settings, various forms of instructional language and the components (color, class, and function) of that language.
REFERENCES


APPENDIX A

PARENT INFORMATION LETTER AND CONSENT
CONSENT TO PARTICIPATE IN A CLINICAL RESEARCH STUDY

STUDY TITLE: The Comparative Effects of Simple and Complex Instructional Language on the Acquisition and Maintenance of Receptive Tasks by Children with Autism

STUDY SPONSOR: Not Applicable

STUDY DOCTOR: Jacqueline Wynn, Ph.D.
Corinne M. Murphy, M.A.

CONTACT TELEPHONE NUMBER: 614.657.4448
614.309.3341 (24 hours a day, 7 days a week)

SUBJECT’S NAME: ___________________ DATE OF BIRTH: _______________

NOTE: The words “you” and “your” are used in this consent form. These words refer to the study volunteer whether a child or an adult.

1) INTRODUCTION
We invite you to be in this research study because your child has been receiving intensive behavioral intervention services for the treatment of an autism spectrum disorder from the Children’s Hospital IBI Clinic Behavioral Intervention Services. Please learn enough about this research study, its risks and benefits, to decide whether you should agree to participate. We must explain the study to you, and give you a chance to ask questions about anything you do not understand. This process is called “informed consent”. It is up to you to choose if you want to be in this study. You may refuse to be in this study or quit this study at any time, and standard medical care will still be available here or at a doctor of your choice without a penalty or loss of benefits to you. It is important to understand that there may not be any benefit from being in this study, but we may learn something that could help others.

Before agreeing to participate, it is important to read and understand the study information in this consent form. By signing the consent form, you agree to be in this study. If this study involves a child between 9 and 18 years of age, he/she must also agree to be in the study by signing an Assent form or on the assent line of this form. You will be given a signed and dated copy of the consent and the assent form.
2) **WHY ARE WE DOING THIS RESEARCH STUDY?**

This is a study to find out more effective ways for therapists and teachers to talk to children during instruction of receptive language tasks. The goal of my research is to contribute to what is known about effective instruction for students with autism.

3) **WHERE WILL THE STUDY BE DONE AND HOW MANY SUBJECTS WILL TAKE PART?**

This study will be done at Children’s Hospital with approximately 10 subjects.

4) **WHAT WILL HAPPEN DURING THE STUDY AND HOW LONG WILL IT LAST?**

While participating in this study, your child will continue to participate in his/her prescribed behavioral intervention services provided by the staff of Children’s Hospital Intensive Behavioral Intervention Clinic.

The study will take place during your child’s ongoing IBI therapy sessions. The study will take place during the months April – June. Each session of the study will last between 3 to 5 minutes and occur two times during your child’s therapy session. One experiment will take place with two experiments.

The first experiment of the experiment will use the same discrimination training procedures currently used by Children’s Hospital Autism Center to teach receptive language tasks in your child’s behavioral intervention program. The same levels of discrimination training, mass trial alone, mass trial with distractor, and random rotation all, with which you and your child are currently familiar will be used during the experiment. As in your child’s home program, a target will be presented to your child using the simple verbal instruction such as “Touch car.” Upon reaching mastery criteria (8/10 trials), a new target will be introduced using the complex verbal instruction such as “The letter A is the first letter of the Alphabet, can you find it?”

The nature of the instructions for these tasks will alternate between complex and simple across experimental sessions. The rate at which your child reaches mastery criteria using simple verbal instruction will be compared to the rate at which your child reaches mastery criteria using the complex verbal instruction. Each experimental session will last between 3-5 minutes and be comprised of 10 discrete trials. A target will be considered mastered once it is demonstrated successfully 8/10 trials for two successive sessions in random rotation all.

The second experiment of the experiment will assess your child’s ability to maintain skills that have been taught in the past and generalize those skills to instructions that are more complex than those instructions used during the original teaching trials. For example, the targets orange, ball, and monkey were previously mastered in the random rotation all format using simple instructions such as “Touch orange.” The aide will place a picture of each of these items on the table. The aide will then give the complex instruction (“an orange is a fruit, it is round, and you can eat it, can you find the orange?” ) and your child will be assessed with regard to the accuracy of his/her response. Experimental sessions will last between approximately 3-5 minutes.
5) **WHAT BAD THINGS CAN POSSIBLY HAPPEN DURING THIS STUDY?**

Since the same instructional strategies and protocols are being used in this study as those found in your child’s school setting and behavioral home program, no additional risks are evident to your child should you choose to allow his/her participation.

There may be other risks of being in this research study, which are not known at this time.

6) **WHAT GOOD THINGS CAN POSSIBLY HAPPEN DURING THIS STUDY?**

Your child will potentially benefit from participation in my study. At the conclusion of the study it is possible that we will be able to identify more effective instructional language as well as a more effective instructional format for your child.

7) **WHAT HAPPENS IF BEING IN THIS STUDY CAUSES INJURIES?**

It is unlikely that your child will be injured during the course of this study, however if being in this study causes an injury, Children's Hospital will provide medical care. You may have to pay for the cost of this care. This does not mean that you give up any of your rights under state or federal laws to ask for this care to be paid by someone else.

8) **OTHER IMPORTANT INFORMATION**

   Does not apply

9) **SPECIAL INFORMATION ABOUT PREGNANCY:**

   Does not apply

10) **WHAT WILL HAPPEN IF NEW INFORMATION IS FOUND OUT ABOUT THE DRUG OR TREATMENT?**

    Does not apply

11) **WHAT OTHER TREATMENTS OR OPTIONS ARE THERE?**

    Does not apply

12) **WHAT WILL HAPPEN IF I DO NOT FINISH THIS STUDY?**

    It is your choice to be in this study or to stop at any time. If you decide to stop being in this study, it is OK, but you must call the study doctor or the study
coordinator. If you stop being in the study, there will not be a penalty or loss of benefits to which you are otherwise entitled. The study doctor will talk to you about any medical issues regarding stopping.

If at any time the study doctor believes participating in this study is not the best choice of care, the study may be stopped and other care prescribed. If the study instructions are not followed, participation in the study may also be stopped. If unexpected medical problems come up, the study doctor or the sponsor, Jacqueline Wynn, PhD, may decide to stop your participation in the study.

13) **WILL THERE BE ANY COSTS TO ME?**

It will not cost you anything to be in this study. You will not be paid to be in this study.

14) **HOW WILL MY STUDY INFORMATION BE KEPT PRIVATE?**

Information collected for this study is confidential to the extent provided by law. Data collected and entered into the Case Report Forms are the property of the study sponsor, Children’s Hospital Autism Center. In the event of any publication regarding this study, your child's identity will not be revealed. Employees from the following organizations may receive copies of the study records and may review your child’s medical records related to this study:

- PI and their research employees
- The Ohio State University research employees
- The Office for Human Research Protections (OHRP)
- The Children’s Hospital Institutional Review Board (a committee that reviews all human subject research)

Information collected for this study will be kept confidential to the extent allowed by law. Information used and/or disclosed (shared with someone outside of Children’s Hospital) may include information that can identify you. This is called “protected health information” or PHI. By agreeing to be in this study, you are giving permission or authorizing Jacqueline Wynn (Study Director) and her study staff to collect, use, and disclose your PHI for this research study. Information collected is the property of Children’s Hospital Autism Center. In the event of any publication regarding this study, your identity will not be revealed.

- **People or Companies authorized to use, disclose, and receive PHI collected or created by this research study:**
  - Corinne M. Murphy, M.A.
  - Jacqueline Wynn, Ph.D. and research staff of the CHI Autism Center
  - William L. Heward, Ed.D. The Ohio State University
  - Children’s Hospital IRB
  - The Ohio State University IRB
Because of the need to give information to these people, absolute confidentiality cannot be guaranteed. Information given to these people may no longer be protected by federal privacy rules.

- **PHI that may be used or disclosed:** *Diagnostic information, videotapes*

- **Reason(s) why the use or disclosure is being made:**

If you have a bad outcome or adverse event from being in this study, the Study Director and staff or other health care providers may need to look at your entire medical records.

The PHI collected or created under this research study will be used/disclosed as needed until the end of the study. The records of this study will be kept for an indefinite period of time.

You may decide not to authorize the use and disclosure of your PHI, however, if it is required for this study, you will not be able to be in this study. If you agree to be in this study and later decide to withdraw, you may also withdraw your authorization to use your PHI. This request must be made in writing to the Study Director. If you withdraw your authorization, no new PHI may be collected and the PHI already collected may not be used unless it has already been used or is needed to complete the study analysis and reports.

15) **WHOM SHOULD I CALL IF I HAVE QUESTIONS OR PROBLEMS?**

If you have questions about anything while on this study, you have 24-hour access to talk to your study doctor at Jacqueline Wynn, Ph.D. 614.657.4448

If you have questions or are worried about your rights as a research volunteer, please call (614) 722-2708, Children's Hospital, Institutional Review Board, (IRB, a committee that reviews all research in humans at Children’s Hospital).
Subject’s Name ______________________  Date of Birth ______________________

SUBJECT or SUBJECT’S LEGAL REPRESENTATIVE STATEMENT

I have read this consent form and have had a chance to ask questions about this research study. These questions have been answered to my satisfaction. If I have more questions about participation in this study or a research-related injury, I may contact the Study Doctor. By signing this consent form, I certify that all health information I have given is true and correct to the best of my knowledge.

I have been given a copy of the Children’s Hospital Notice of Privacy Practices. I understand that my right to my patient information that is created or collected by Children’s Hospital in the course of this research can be temporarily suspended for as long as the research is in progress. I also understand that my right to access will be reinstated upon completion of this research.

I agree to participate in this study. I will be given a copy of this consent form with all the signatures for my own records.

CONSENT SIGNATURES

SUBJECT or SUBJECT’S LEGAL REPRESENTATIVE  DATE SIGNED

SUBJECT or SUBJECT’S LEGAL REPRESENTATIVE  DATE SIGNED

PERSON OBTAINING CONSENT  DATE SIGNED
I certify that I have explained the research, its purposes, and the procedures to the subject or subject’s legal representative before requesting their signature.

STUDY INVESTIGATOR  DATE SIGNED

If this study involves investigational drugs, send a copy to the Pharmacy along with the prescription or no drugs will be dispensed.
APPENDIX B
THERAPY ROOM
APPENDIX C

MATERIALS
APPENDIX D

DATA SHEETS
Receptive Object Labels – Discrimination Training

Participant: _________________________ Condition: ___________
Date: ___________________________
Aide: ___________________________

Instructional Antecedent: ___________________________

Target: ___________________________
Level: MTA MTD RR/ALL

S<sup>R+</sup> Assmt: Yes No ___________

1. P _______ C I NR PB EC
2. P _______ C I NR PB EC
3. P _______ C I NR PB EC
4. P _______ C I NR PB EC
5. P _______ C I NR PB EC
6. P _______ C I NR PB EC
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8. P _______ C I NR PB EC
9. P _______ C I NR PB EC
10. P _______ C I NR PB EC

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Notes:

121
Receptive Object Labels – Discrimination Training

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<th>Participant: Alpha</th>
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<td>Session: AM</td>
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<tr>
<td>Aide: Chelsea</td>
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Instructional Antecedent:
Remember, we draw and paint on paper. Can you find it?

Target: Paper

Level: MTA MTD RR/ALL

S^R+ Assmt: Yes No Radio

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Notes: Alpha said worm as he touched the worm

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\frac{10}{10} = \frac{100}{100} \text{% Accuracy}
\]
Receptive Letter Names – Discrimination Training

Participant: _________________________  Condition: ___________
Date: ___________________________
Aide: ___________________________

Session: ___________

Instructional Antecedent:
P - Prompt
C – Correct
I – Incorrect
NR – Nonresponse
PB – Problem Behavior
EC – Error Correction

Target: ___________________________

Level: MTA  MTD  RR/ALL

S^R+ Assmt: Yes  No  ___________

|   | P |  |  |  |  |  |  |
|---|---|---|---|---|---|---|
| 1. |   | C | I | NR | PB | EC |
| 2. |   | C | I | NR | PB | EC |
| 3. |   | C | I | NR | PB | EC |
| 4. |   | C | I | NR | PB | EC |
| 5. |   | C | I | NR | PB | EC |
| 6. |   | C | I | NR | PB | EC |
| 7. |   | C | I | NR | PB | EC |
| 8. |   | C | I | NR | PB | EC |
| 9. |   | C | I | NR | PB | EC |
| 10.|   | C | I | NR | PB | EC |

#Correct  #Incorrect  #NR  #PB  #Prompt  #EC

/  = (100)
#Correct  #Total  %Accuracy

Notes:

123
Receptive Letter Sounds – Discrimination Training

| Participant: _________________________ | Condition: ___________ |
| Date: _____________________________ | Session: ____________ |
| Aide: _____________________________ | |

Instructional Antecedent: _____________________________

Target: _____________________________

Level: MTA MTD RR/ALL

S^R+ Assmt: Yes No _____________

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<tr>
<th>#Correct</th>
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<th>#NR</th>
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<th>#Prompt</th>
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<td>1. P ______ C I NR PB EC</td>
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<td>2. P ______ C I NR PB EC</td>
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<td>3. P ______ C I NR PB EC</td>
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<td>4. P ______ C I NR PB EC</td>
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<td>5. P ______ C I NR PB EC</td>
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\]

Notes: 124
# Receptive Object Labels – Experiment II Probe

**Participant:** _________________________  **Condition:** Simple  
**Date:** _________________________  **Session:** Probe  
**Aide:** _________________________  **Inst. Ant.:** Complex

+ = correct  
- = incorrect  
NR = nonresponse  
PB = problem behavior

<table>
<thead>
<tr>
<th>Target</th>
<th>Probe SD</th>
<th>Check 1</th>
<th>Check 2</th>
<th>Check 3</th>
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</thead>
<tbody>
<tr>
<td>Trombone</td>
<td>“Remember, the trombone is an instrument with a long slide. Can you find it?”</td>
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<tr>
<td>Flute</td>
<td>“Remember, one of the prettiest instruments in the band is the flute. Can you find one?”</td>
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<tr>
<td>Worm</td>
<td>“Remember, a worm lives in the dirt and we can use it for fishing bait. Can you find it?”</td>
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<tr>
<td>Stapler</td>
<td>“Remember, we use a stapler when we need to keep pieces of paper in one spot. Can you find it?”</td>
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<tr>
<td>Necklace</td>
<td>“Remember, mommy wears necklaces around her neck. Can you find one?”</td>
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<td></td>
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</tr>
<tr>
<td>Post-its</td>
<td>“Remember, post-its help mommy and daddy remember to do chores. Can you find one?”</td>
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</tr>
<tr>
<td>Paper</td>
<td>“Remember, we draw and paint on paper. Can you find it?”</td>
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<tr>
<td>Screwdriver</td>
<td>“Remember, a screwdriver is the tool that is used to tighten screws. Can you find it?”</td>
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<tr>
<td>Roller coaster</td>
<td>“Remember, we yell “weee!” when we go up and down on a roller coaster. Can you find one?”</td>
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<tr>
<td>Wheel</td>
<td>“Remember, wheels are round and can be found on bicycles, cars, and trucks. Can you find one?”</td>
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</tbody>
</table>
**Receptive Object Labels – Experiment II Probe**

Participant: _______Beta__________  Condition: Simple
Date: ____________06/07/06_____________  Session: Probe
Aide: _______Julie_______________  Inst. Ant.: Complex

+ = correct  
- = incorrect  
NR = nonresponse  
PB = problem behavior

<table>
<thead>
<tr>
<th>Target</th>
<th>Probe SD</th>
<th>Check 1</th>
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<th>Check 3</th>
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</thead>
<tbody>
<tr>
<td>Trombone</td>
<td>“Remember, the trombone is an instrument with a long slide. Can you find it?”</td>
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<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Flute</td>
<td>“Remember, one of the prettiest instruments in the band is the flute. Can you find one?“</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Worm</td>
<td>“Remember, a worm lives in the dirt and we can use it for fishing bait. Can you find it?”</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Stapler</td>
<td>“Remember, we use a stapler when we need to keep pieces of paper in one spot. Can you find it?”</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Necklace</td>
<td>“Remember, mommy wears necklaces around her neck. Can you find one?“</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Post-its</td>
<td>“Remember, post-its help mommy and daddy remember to do chores. Can you find one?“</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Paper</td>
<td>“Remember, we draw and paint on paper. Can you find it?“</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Screwdriver</td>
<td>“Remember, a screwdriver is the tool that is used to tighten screws. Can you find it?“</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Roller coaster</td>
<td>“Remember, we yell “weee!” when we go up and down on a roller coaster. Can you find one?”</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Wheel</td>
<td>“Remember, wheels are round and can be found on bicycles, cars, and trucks. Can you find one?“</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
Receptive Object Labels – Experiment II Probe

Participant: _________________________  Condition: Complex
Date: _______________________________  Session: Probe
Aide: _______________________________  Inst. Ant.: Simple

+ = correct  
- = incorrect  
NR = nonresponse  
PB = problem behavior

<table>
<thead>
<tr>
<th>Target</th>
<th>Probe SD</th>
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<th>Check 3</th>
</tr>
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<tr>
<td>Tuba</td>
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<tr>
<td>Drums</td>
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<tr>
<td>Fly</td>
<td>Fly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hole-punch</td>
<td>Hole-punch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earrings</td>
<td>Earrings</td>
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<td></td>
</tr>
<tr>
<td>Stapler Remover</td>
<td>Stapler Remover</td>
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<td></td>
</tr>
<tr>
<td>Canvas</td>
<td>Canvas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuts &amp; Bolts</td>
<td>Nuts &amp; Bolts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td>Radio</td>
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</tr>
<tr>
<td>Highlighter</td>
<td>Highlighter</td>
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</tr>
</tbody>
</table>

127
### Receptive Letters – Experiment II Probe

**Participant:** _________________________  **Condition:** Simple  
**Date:** ___________________________  **Session:** Probe  
**Aide:** ___________________________  **Inst. Ant.:** Complex  

+ = correct  
- = incorrect  
NR = nonresponse  
PB = problem behavior

<table>
<thead>
<tr>
<th>Target</th>
<th>Probe SD</th>
<th>Check 1</th>
<th>Check 2</th>
<th>Check 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>“Remember, the words brown and bat start with the letter b. Can you find it?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g</td>
<td>“Remember, g is the first letter in the words grape and guppy. Can you find one?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k</td>
<td>“Remember, the words kite and keep start with the letter k. Can you find it?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>“Remember, m is the first letter in the words mommy and muffin. Can you find one?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q</td>
<td>“Remember, the words queen quilt starts with the letter q. Can you find it?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>s</td>
<td>“Remember, s is the first letter in the words song and soup. Can you find one?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>w</td>
<td>“Remember, w is the first letter in the words window and wedding. Can you find it?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>y</td>
<td>“Remember, the words yoyo and yes start with the letter y. Can you find one?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>“Remember, the words very and vehicle start with the letter v. Can you find it?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>z</td>
<td>“Remember, z is the first letter in the words zoo and zebra. Can you find one?”</td>
<td></td>
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</tr>
</tbody>
</table>
Receptive Letters – Experiment II Probe

Participant: _________________________  Condition: Complex
Date: ______________________________   Session: Probe
Aide: ______________________________  Inst. Ant.: Simple

+ = correct
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NR = nonresponse
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<table>
<thead>
<tr>
<th>Target</th>
<th>Probe SD</th>
<th>Check 1</th>
<th>Check 2</th>
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<tbody>
<tr>
<td>c</td>
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</tr>
<tr>
<td>d</td>
<td>d</td>
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</tr>
<tr>
<td>f</td>
<td>f</td>
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<tr>
<td>k</td>
<td>k</td>
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<td>l</td>
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<td>n</td>
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<td>r</td>
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<tr>
<td>t</td>
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</table>

129
Receptive Phonics – Experiment II Probe

**Participant:** _________________________  **Condition:** Simple
**Date:** ___________________________  **Session:** Probe
**Aide:** ___________________________  **Inst. Ant.:** Complex

+ = correct  
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<table>
<thead>
<tr>
<th>Target</th>
<th>Probe SD</th>
<th>Check 1</th>
<th>Check 2</th>
<th>Check 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>/b/</td>
<td>“Remember, the words brown and bat start with the sound /b/. Can you find it?”</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>/g/</td>
<td>“Remember, /g/ is the first sound in the words grape and guppy. Can you find it?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/m/</td>
<td>“Remember, /m/ is the first sound in the words mommy and muffin. Can you find it?”</td>
<td></td>
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</tr>
<tr>
<td>/qu/</td>
<td>“Remember, the words queen quilt starts with the sound /qu/. Can you find it?”</td>
<td></td>
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<tr>
<td>/s/</td>
<td>“Remember, /s/ is the first sound in the words song and soup. Can you find it?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/w/</td>
<td>“Remember, /w/ is the first sound in the words window and wedding. Can you find it?”</td>
<td></td>
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</tr>
<tr>
<td>/y/</td>
<td>“Remember, the words yoyo and yes start with the sound /y/. Can you find it?”</td>
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<tr>
<td>/v/</td>
<td>“Remember, the words very and vehicle start with the sound /v/. Can you find it?”</td>
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<tr>
<td>/z/</td>
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Receptive Phonics – Experiment II Probe

Participant: _________________________  Condition: Complex  Session: Probe
Date: ___________________________  Inst. Ant.: Simple
Aide: ___________________________  + = correct
                                                - = incorrect
                                                NR = nonresponse
                                                PB = problem behavior

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<tr>
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<tr>
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<td>/n/</td>
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<td></td>
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</tr>
<tr>
<td>/r/</td>
<td>/r/</td>
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APPENDIX E

PROCEDURAL INTEGRITY AND IOA
**PROCEDURAL INTEGRITY CHECKLIST & IOA**

<table>
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<th>Session #</th>
<th>Date</th>
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<tbody>
<tr>
<td>Participant</td>
<td>IA</td>
<td>Target</td>
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**Brief Reinforcer Assessment**

- 2 Items Provided: **YES**  **NO**
- 30 second free access period: **YES**  **NO**

**Discrimination Training Level**

<table>
<thead>
<tr>
<th>Correct</th>
<th>Incorrect</th>
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</table>

**Discrete Trial**

<p>| | | | | | | | |</p>
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<tbody>
<tr>
<td>1.</td>
<td>P</td>
<td>SD</td>
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<td>Target</td>
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<td>2.</td>
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<td>3.</td>
<td>P</td>
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<tr>
<td>4.</td>
<td>P</td>
<td>SD</td>
<td>SR</td>
<td>Target</td>
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</tr>
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<td>5.</td>
<td>P</td>
<td>SD</td>
<td>SR</td>
<td>Target</td>
<td>SB</td>
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</tr>
<tr>
<td>6.</td>
<td>P</td>
<td>SD</td>
<td>SR</td>
<td>Target</td>
<td>SB</td>
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<td>7.</td>
<td>P</td>
<td>SD</td>
<td>SR</td>
<td>Target</td>
<td>SB</td>
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<td>8.</td>
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<td>SD</td>
<td>SR</td>
<td>Target</td>
<td>SB</td>
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</tr>
<tr>
<td>9.</td>
<td>P</td>
<td>SD</td>
<td>SR</td>
<td>Target</td>
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**IV INTEGRITY**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td># Correct Teacher Behaviors = _______  # Data Matches = _______</td>
</tr>
<tr>
<td># Total Teacher Behaviors = _______  # Data Mismatches = _______</td>
</tr>
<tr>
<td># Correct / # Total X 100 = _______  # Data Matches / # Total = _______</td>
</tr>
</tbody>
</table>
# TRAINING PROCEDURE CHECKLIST

Aide: ___________________

Date: ___________________

<p>| | | |</p>
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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Model Complex Verbal Instruction</td>
<td>Y N N/A</td>
</tr>
<tr>
<td>2.</td>
<td>Aide Demonstration of Complex Verbal Inst.</td>
<td>Y N N/A</td>
</tr>
<tr>
<td>3.</td>
<td>Model Simple Verbal Instruction</td>
<td>Y N N/A</td>
</tr>
<tr>
<td>4.</td>
<td>Aide Demonstration of Simple Verbal Inst.</td>
<td>Y N N/A</td>
</tr>
<tr>
<td>5.</td>
<td>Review of Discrimination Training</td>
<td>Y N N/A</td>
</tr>
<tr>
<td>6.</td>
<td>Aide Demonstration of Discrimination Proc.</td>
<td>Y N N/A</td>
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<tr>
<td>7.</td>
<td>Review Mastery Criteria for Level Transition</td>
<td>Y N N/A</td>
</tr>
<tr>
<td>8.</td>
<td>Model Whole Language Approach</td>
<td>Y N N/A</td>
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<tr>
<td>9.</td>
<td>Aide Demonstration of Whole Language Proc.</td>
<td>Y N N/A</td>
</tr>
<tr>
<td>10.</td>
<td>Model Probe Procedures</td>
<td>Y N N/A</td>
</tr>
<tr>
<td>11.</td>
<td>Aide Demonstrate Probe Procedures</td>
<td>Y N N/A</td>
</tr>
</tbody>
</table>

Experimenter Signature: ___________________ Date: _____________
APPENDIX G

TASK AND TARGET LISTS
# Future Study Targets – Receptive Object Labels
(Alpha and Beta)

## SIMPLE

<table>
<thead>
<tr>
<th>Target</th>
<th>SD</th>
<th>Target</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Trombone</strong></td>
<td>Trombone</td>
<td><strong>2. Flute</strong></td>
<td>Flute</td>
</tr>
<tr>
<td><strong>3. Worm</strong></td>
<td>Worm</td>
<td><strong>4. Stapler</strong></td>
<td>Stapler</td>
</tr>
<tr>
<td><strong>5. Necklace</strong></td>
<td>Necklace</td>
<td><strong>6. Post-its</strong></td>
<td>Post-its</td>
</tr>
<tr>
<td><strong>7. Paper</strong></td>
<td>Paper</td>
<td><strong>8. Screwdriver</strong></td>
<td>Screwdriver</td>
</tr>
<tr>
<td><strong>9. Roller coaster</strong></td>
<td>Rollercoaster</td>
<td><strong>10. Wheel</strong></td>
<td>Wheel</td>
</tr>
</tbody>
</table>

## COMPLEX

<table>
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<th>Target</th>
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</tr>
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<tr>
<td><strong>1. Trombone</strong></td>
<td>Trombone</td>
<td><strong>2. Flute</strong></td>
<td>Flute</td>
</tr>
<tr>
<td><strong>3. Worm</strong></td>
<td>Worm</td>
<td><strong>4. Stapler</strong></td>
<td>Hole-punch</td>
</tr>
<tr>
<td><strong>5. Necklace</strong></td>
<td>Earrings</td>
<td><strong>6. Post-its</strong></td>
<td>Stapler Remover</td>
</tr>
<tr>
<td><strong>7. Paper</strong></td>
<td>Canvas</td>
<td><strong>8. Screwdriver</strong></td>
<td>Nuts &amp; bolts</td>
</tr>
<tr>
<td><strong>9. Roller coaster</strong></td>
<td>Radio</td>
<td><strong>10. Wheel</strong></td>
<td>Highlighter</td>
</tr>
</tbody>
</table>

(Please cross off list, once introduced)

1. **Trombone**
   - Remember, the tuba is the biggest instrument in the band. Can you find it?
2. **Flute**
   - Remember, the drums are the loudest instrument in the band. Can you find them?
3. **Worm**
   - Remember, a fly is an annoying bug that flies around and says Bzzz. Can you find it?
4. **Stapler**
   - Remember, the hole-punch is the thing used to make holes in paper. Can you find one?
5. **Necklace**
   - Remember, earrings are jewelry that mommy likes to wear on her ears. Can you find them?
6. **Post-its**
   - Remember, we use a stapler remover to remove the staples from paper. Can you find it?
7. **Paper**
   - Remember, painters use colors to paint pictures on canvas. Can you find it?
8. **Screwdriver**
   - Remember carpenters use nuts and bolts to keep wood together. Can you find them?
9. **Roller coaster**
   - Remember, we listen to songs and CDs on the radio. Can you find it?
10. **Wheel**
    - Remember, a highlighter is bright and colors just like a marker. Can you find one?
Future Study Targets – Receptive Object Labels  
(Gamma)

SIMPLE             COMPLEX
(Please cross off list, once introduced)

<table>
<thead>
<tr>
<th>Target</th>
<th>SD</th>
<th>Target</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. camera</td>
<td>camera</td>
<td>Play-Doh</td>
<td>Remember, you can make play-doh into a lot of shapes and in comes in a lot of colors, can you find it?</td>
</tr>
<tr>
<td>2. wagon</td>
<td>wagon</td>
<td>Spaghetti</td>
<td>Remember, spaghetti is noodles and sauce and you it. Can you find it?</td>
</tr>
<tr>
<td>3. CD</td>
<td>CD</td>
<td>Carrots</td>
<td>Remember, carrots are an orange vegetable that you eat and grows in the ground. Can you find them?</td>
</tr>
<tr>
<td>4. strawberries</td>
<td>strawberries</td>
<td>Peach</td>
<td>Remember, a fruit that is sweet, fuzzy, and orange is called a peach. Can you find one?</td>
</tr>
<tr>
<td>5. dresser</td>
<td>dresser</td>
<td>Tricycle</td>
<td>Remember, tricycles are like bikes but have three wheels. Can you find it?</td>
</tr>
<tr>
<td>6. motorcycle</td>
<td>motorcycle</td>
<td>Soap</td>
<td>Remember, we wash dishes and our hands with soap. Can you find it?</td>
</tr>
<tr>
<td>7. clouds</td>
<td>clouds</td>
<td>Belt</td>
<td>Remember, a belt is what we use to hold our pants up. Can you find one?</td>
</tr>
<tr>
<td>8. giraffe</td>
<td>giraffe</td>
<td>Elephant</td>
<td>Remember, an elephant is an animal that lives in the jungle and has a long trunk. Can you find it?</td>
</tr>
<tr>
<td>9. hammer</td>
<td>hammer</td>
<td>Wrench</td>
<td>Remember, plumbers use wrenches to tighten pipes. Can you find one?</td>
</tr>
<tr>
<td>10. screwdriver</td>
<td>screwdriver</td>
<td>Chips</td>
<td>Remember, chips are a crunchy food that we can eat with lunch or as a snack. Can you find them?</td>
</tr>
<tr>
<td>11. green beans</td>
<td>green beans</td>
<td>Cracker</td>
<td>Remember, when we like to eat crackers with cheese or with soup. Can you find it?</td>
</tr>
</tbody>
</table>
### Future Study Targets – Receptive Letters

(Delta)

- **SIMPLE**
- **COMPLEX**

(Please cross off list, once introduced)

<table>
<thead>
<tr>
<th>Target</th>
<th>SD</th>
<th>Target</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. w</strong></td>
<td>w</td>
<td><strong>c</strong></td>
<td></td>
</tr>
<tr>
<td><strong>2. b</strong></td>
<td>b</td>
<td><strong>d</strong></td>
<td></td>
</tr>
<tr>
<td><strong>3. y</strong></td>
<td>y</td>
<td><strong>f</strong></td>
<td></td>
</tr>
<tr>
<td><strong>4. g</strong></td>
<td>g</td>
<td><strong>h</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5. z</strong></td>
<td>z</td>
<td><strong>j</strong></td>
<td></td>
</tr>
<tr>
<td><strong>6. k</strong></td>
<td>k</td>
<td><strong>l</strong></td>
<td></td>
</tr>
<tr>
<td><strong>7. m</strong></td>
<td>m</td>
<td><strong>n</strong></td>
<td></td>
</tr>
<tr>
<td><strong>8. x</strong></td>
<td>x</td>
<td><strong>p</strong></td>
<td></td>
</tr>
<tr>
<td><strong>9. q</strong></td>
<td>q</td>
<td><strong>r</strong></td>
<td></td>
</tr>
<tr>
<td><strong>10. s</strong></td>
<td>s</td>
<td><strong>t</strong></td>
<td></td>
</tr>
</tbody>
</table>

Remember, ‘c’ is the third letter of the alphabet and says /c/. Can you find it?

Remember, dog starts with the letter ‘d’ which says /d/. Can you find one?

Remember, ‘f’ is the fifth letter of the alphabet and says /f/. Can you find it?

Remember, ‘h’ is the first letter in the word hat and sounds like /h/. Can you find one?

Remember, jumping starts with the letter ‘j’ which sounds like /j/. Can you find it?

Remember, ‘l’ comes after ‘k’ in the alphabet and says /l/. Can you find it?

Remember, ‘n’ is the first letter in the word net and sounds like /n/. Can you find one?

Remember, ‘p’ looks like an upside down ‘d.’ Can you find it?

Remember, a lion’s roar starts with the letter ‘r’ that sounds like /r/. Can you find one?

Remember, the letter ‘t’ is two lines crossing. Can you find it?

Remember, ‘v’ starts the words violet and victory. Can you find it?
Future Study Targets – Receptive Letter Sounds  
(Epsilon and Six)

**SIMPLE**

<table>
<thead>
<tr>
<th>Target</th>
<th>SD</th>
<th>Target</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. w</td>
<td>/w/</td>
<td>c</td>
<td>Remember, the words /candy/ and /cat/ start with the sound /c/. Can you find it?</td>
</tr>
<tr>
<td>2. b</td>
<td>/b/</td>
<td>d</td>
<td>Remember, /d/ is the first sound in the words /dog/ and /daddy/. Can you find it?</td>
</tr>
<tr>
<td>3. z</td>
<td>/z/</td>
<td>f</td>
<td>Remember, the words /fun/ and /friend/ start with the sound /f/. Can you find it?</td>
</tr>
<tr>
<td>4. g</td>
<td>/g/</td>
<td>h</td>
<td>Remember, /h/ is the first sound in the words /hat/ and /heart/. Can you find one?</td>
</tr>
<tr>
<td>5. v</td>
<td>/v/</td>
<td>j</td>
<td>Remember, the words /jump/ and /jello/ start with the sound /j/. Can you find it?</td>
</tr>
<tr>
<td>6. k</td>
<td>/k/</td>
<td>l</td>
<td>Remember, /l/ is the first sound in the words /love/ and /last/. Can you find it?</td>
</tr>
<tr>
<td>7. m</td>
<td>/m/</td>
<td>n</td>
<td>Remember, the words /now/ and /nine/ start with the sound /n/. Can you find it?</td>
</tr>
<tr>
<td>8. y</td>
<td>/y/</td>
<td>p</td>
<td>Remember, /p/ is the first sound in the words /party/ and /pizza/. Can you find it?</td>
</tr>
<tr>
<td>9. q</td>
<td>/qu/</td>
<td>r</td>
<td>Remember, the words /roar/ and /red/ start with the sound /r/. Can you find it?</td>
</tr>
<tr>
<td>10. s</td>
<td>/s/</td>
<td>t</td>
<td>Remember, /t/ is the first sound in /ten/ and /tire/. Can you find it?</td>
</tr>
</tbody>
</table>

**COMPLEX**

<table>
<thead>
<tr>
<th>Target</th>
<th>SD</th>
<th>Target</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>v</td>
<td>Remember, the words /very/ and /van/ start with the sound /v/. Can you find it?</td>
</tr>
</tbody>
</table>
APPENDIX H

SOCIAL VALIDITY QUESTIONNAIRE
Social Validity Questionnaire

1) In your opinion, to which type of instruction, if any, did the children respond more accurately?
   Simple Verbal Instructions    Complex Verbal Instructions    Neither

2) In your opinion, with which type of instructional language, if any, did the children learn targets faster?
   Simple Verbal Instructions    Complex Verbal Instructions    Neither

3) With which type of instructional language did you feel most comfortable?
   Simple Verbal Instructions    Complex Verbal Instructions    Neither

4) Which type of instructional language do you feel most represented ongoing practices in today’s classroom?
   Simple Verbal Instructions    Complex Verbal Instructions    Neither

5) Which type of instructional language would you prefer to use?
   Simple Verbal Instructions    Complex Verbal Instructions    Neither

6) Which type of instructional language was easiest to implement?
   Simple Verbal Instructions    Complex Verbal Instructions    Neither
7) **Which type of instructional language was hardest to implement?**

Simple Verbal Instructions  Complex Verbal Instructions  Neither

8) **Which type of instructional language do you think the participant preferred?**

Simple Verbal Instructions  Complex Verbal Instructions  Neither

9) **What was your overall impression of the experiment?**

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

__________________________________________________________________